

**DEVELOPING AND EVALUATING *Aloe vera* AND
Vetiveria zizanioides TREATED EYE PAD**

By
RAJARAJESHWARI, S.
(Reg. No. 11PFA11)

A THESIS SUBMITTED TO THE
AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND
HIGHER EDUCATION FOR WOMEN, UNIVERSITY,
COIMBATORE – 641 043

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN
TEXTILES AND FASHION APPAREL

MAY 2013

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SIGNATURE OF THE
HEAD OF THE DEPARTMENT



SIGNATURE OF THE GUIDE

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CHAPTER – I

INTRODUCTION

Cloth makes the Man” is the old sayings which we accept as a truism without giving it a much thought. The records of man’s use of textiles dates back thousands of years before the birth of Christ (Mullick, 2004). People have used textile of various types for covering, warmth, personnel adornment and even display personnel wealth. So, textile is used for these purposes and everyone is an ultimate consumer (Singh, 2004).

It is the nature of textiles to be a part of its time, to be current and even textile industry plays an active role in the modern world (Anand, 2005). Textiles have always played a central role in a evolution of human culture by being at the forefront of both technological and artistic development (Yogita et al., 2006). Textiles have become a part of every phase of life. According to American textile manufacturers institute, Textile go to war, it reaches space, can become roof, choke an oil spill, intimate an artery, hold safely in car seat from back, support tyres, baby diaper, roads line, keep dry, wrap wounds and so on (Vishnu, 2006).

Today the textile industry enjoys a special place in our country. As the second largest employment generator, this industry contributes to nearly 30 percentage of the total exports (Sekhri, 2011). The industrial and medicinal uses of textiles are of many variety. Such as automobile industry uses textiles to make tires, cords, etc. Textile travel to the moon was done in 20,000 layers \$ 100,000 space suit (Sara et al., 2002).

Textile industries are facing challenges in the field of quality and products due to the globalization of the world market (Nataraj, 2005). A textile is any type of material made from fibres or other extended linear material such as thread or yarn. The production of textiles in an ancient craft, whose speed and scale of production has been altered almost beyond recognition by mass

production and the introduction of modern manufacturing techniques (Thomas, 2006).

Textiles are a broad discipline and for most people who work in the subject it is a very practical discipline too. It provides fundamentals such as warmth and protection. They help us to identify one another and can signal social status and role (Usha, 2000).

Natural fibres are those which are obtained from natural source or grow in nature. Among them cotton, jute, flax, wool and silk are important in terms of production, industrial activity and usage pattern (Jindal, 2006). Natural fibres are more environment friendly than synthetic fibres both in terms of production and their disposal, natural fibres are completely biodegradable. It can thus play a key role in the emerging green economy (Appadi, 2000).

The word fibre creates a mental picture of a long, thin, hair like object and indeed textile fibres are like that in its general physical shape. Though, not all fibres are suitable for textile purposes because a textile fibre must possess sufficient length, fineness, strength and flexibility to be suitable for fabric manufactures (Mahadevan, 2009).

Cotton is a vegetable fibre derived from lint on the cotton seed (Nimkar, 2006). The cotton fibre is a single elongated cell that is flat, twisted and ribbon like with a wide inner hollow. This natural fibre has good strength when it is being wet, so that its strength may increase temporarily by as much as 30 per cent (Bernard, 2009).

The word cotton is derived from the Arabic depending upon the Arabian dialect, it is pronounced kutan, qutn, qutun etc. As the cotton fibre is obtained from a plant it is classified as natural, cellulose, seed, mono-cellular, staple fibre (Vilensky et al., 2005). Cotton is strong and reasonably low in price in the cellulose variety. The fibre is short and fine fibre usually about 1 inch long. Cotton is called dead fibre because it has little luster, wrinkle resistance and elasticity (Vidyasagar, 1998). A cellulosic fibre creates soft,

coolness and the stylish trendy look to the world of textiles. It has an excellent moisture absorbance, comfortness and breathability (Rajendran, 1998). Cotton is a soft, staple fibre that grows in a form known as a boll around the seeds of cotton plant, cotton produces a soft fabric which breathes as the fibre absorbs and release perspiration quickly and it also a good heat conductor (www.fibre2fabric.com).

When the fabric comes out of the loom they do not appear attractive, while they are under process of spinning they get dirty. We have to clean them in order to improve their appearance, bring out their distinctive characteristics and prepare them for the market (Parvathi, 2007). A finish is a process given to the fabric to improve its qualities such as appearance, hand drape and other properties. Most fabric are given some finish. There are two main groups of finishes, physical finishes and chemical finishes. Most of the physical finishes are routine finishes like singeing and calendaring. The chemical finishes are more functional in nature. They add certain qualities to a particular fabric and helps to overcome short comings of a fabric (D'Souza et al., 2000). Textile finishing is a very diversified sector due to the processed raw materials, manufacturing techniques and finalized products (Smith 2006). It plays a vital role for quality and value. The fabric dyed and finished with may get curative, therapeutic properties and become protective functional textile (Srivastava, 2010).

In our country medicinal plants are widely used by all sections of people either as folk medicine or indirectly in the pharmaceutical preparations of modern medicines. Plants were worshiped and regard as more valuable than gold not only in our country but also in other parts of the world (Trivedi, 2009). Medicinal plants are still used on a regular basis. There is a renewed interest especially in developed countries, in using plants to treat human livestock and pets (Tandon et al., 2004). Plants have been used for healing purposes and in treatment of various diseases from time immemorial. They are the source for some very potential drugs which play a vital role in human ailments to the extent that, survival of human race depends on plants

(Agarwal, 2002). Medicinal and aromatic plants have been an integral part of health and health care for centuries and will continue to play a vital role in public health for the generations to come. Medicinal plants are accessible, affordable and appropriate source of primary health care (Prabhuji et al., 2005).

Aloe vera belongs to the family Liliaceae and nearly there are about 150 species in *Aloe vera*. The common varieties are *Aloe barbadensis* Miller, *Aloe saponaria*, *Aloe chinensis*, *Aloe variegata*, *Aloe forex*, *Aloe lalifolia* and *Curacoa aloe*, of these the most popular is *Aloe vera* Miller which has most therapeutic value and referred as a “True aloe”.

People call *Aloe vera* the miracle plant. In olden days, they said that it will keep the white ants away, but now its uses are endless. From treating various skin conditions to preventing ageing skin, it contains the highest concentration of healing agents which is beneficial for the skin (Srivastava, 2010). *Aloe vera* gel is widely used for the external treatment of minor wounds and inflammatory skin disorder. The gel is used in the treatment of minor skin irritation including burns, bruises and abrasion (Agarwal et al., 2012).

Vetiver is a grass from the Poaceae family of plants, which also includes lemon grass and *Citronella*, *vetiver* which is a fast growing perennial that survive upto 50 years or more with a large interlinked root system (www.about.com). *Vetiveria zizanioides* is native to India and has been in traditional use since ancient times for its perfumery oil obtained from its roots. Vetiver grows in the sub-tropical and tropical areas of India, particularly along the river banks.

The name ‘vetiver’ is derived from the Tamil word “Vettiver”. It is also called Vetivert. Vetiver is known to be in use in India both for its fragrant oil and as traditional medicine (www.ayurvedam.com). Vetiver plant is an important as its roots are having highly medicinal and aromatic properties. It is cultivated in Kerala and Tamil Nadu. This is the robust grass with spongy

roots and long thin leaves with small brown purple flower. Vetiver is a boon for farmers in warm climate as it prevents soil erosion. It has anti-inflammatory and anti-septic effects that provide relief from inflammations in circulatory system and nervous system. This aromatic herbs has sedative and antiseptic properties and is also useful to promote the manufacturer of red blood cells. The oil obtained from vetiver, which has sedative effects and aids in treatment of emotional out bursts, such as anger, anxiety, epileptic and hysteric attacks, restlessness, nervous etc. (Vyas, 2008).

An Eye mask or Eye pad is a small patch that is worn in front of eyes. It may be a cloth patch attached around the head by an elastic band or by a string or an adhesive bandage (www.wikipedia.com). The range of eye pad helps in relieving stress since the eye is one of the most sensitive sense organs, heat, dust, light and other factors can damage eyes. A cold eye pad provides relief and rejuvenates the eyes. It soothes the eyes and relaxes eye muscles (www.sleepmaster.us).

Considering the above qualities the investigator planned to study the **“DEVELOPING AND EVALUATING *Aloe vera* AND *Vetiveria zizanioides* TREATED EYE PAD”**. Hence the objectives of study are to :

- Procure an eco-friendly 40s count cotton fabric.
- Select the natural coolant herbal source namely *Aloe vera* and *Vetiveria zizanioides*
- Apply coolant finish to the fabric
- Design the eye pads
- Evaluate the product through objective and subjective methods.

CHAPTER – II

REVIEW OF LITERATURE

The review of literature pertaining to the study “**DEVELOPING AND EVALUATING *Aloe vera* AND *Vetiveria zizanioides* TREATED EYE PAD**”, presented under the following headings :

- 2.1 Cotton
 - 2.1.1. History of Cotton
 - 2.1.2 Properties of Cotton
 - 2.1.3 Uses of Cotton
- 2.2 Weaving
 - 2.2.1 History of Weaving
 - 2.2.2 Types of Weaving
 - 2.2.3 Plain Weave
- 2.3 Finishing
 - 2.3.1 Classification of Finishes
 - 2.3.2 Functional Finishes
- 2.4 Herbal Coolant Eye pad
 - 2.4.1 Eye pad
 - 2.4.2 Natural / Herbal Coolant Eye pad
 - 2.4.3 Chemical / Synthetic Eye pad
- 2.5 Pilot Study
 - 2.5.1 Optimization of Herbal Source
 - 2.5.2 Optimization of Temperature
 - 2.5.3 Optimization of Time
 - 2.5.4 Optimization of pH
- 2.6 Finishing Methods
 - 2.6.1 Dip and Dry Method
 - 2.6.2 Spray Method
 - 2.6.3 Pad Cure Dry Method
- 2.7 Selection of Herbs

- 2.7.1 *Aloe vera*
- 2.7.2 Properties and Uses
- 2.7.3 *Vetiveria zizanioides*
- 2.7.4 Properties and Uses

2.1 COTTON

Cotton is a soft, staple fibre that grows around the seeds of the cotton plant (*Gossipium*) a shrub native to tropical and sub-tropical region around the world, including the America, India and Africa. Cotton is a gift of nature which plays a vital role. It is most widely used natural fibre in clothing (Kaplan, 2008). The cotton fibre is a single elongated cell that is flat-twisted and ribbon like with a wide inner hollow. This natural fibre has a good strength, when wet it may increase temporarily by as much 30 per cent cotton may be permanently strengthened by mercerization and ammoniating. It has a good abrasion resistance (Bernard, 2009).

Cotton fibre grows in the seed pod or boll of the cotton plant each fiber is a single elongated cell that is flat-twisted and ribbon like with a wide inner hollow (lumen). It is composed of about 90 per cent cellulose and 6 per cent moisture, the remainder consists of natural impurities (Singh, 2003). Cotton is known as “King of Cotton” because of economic and cultural influence (www.cotton.com). Cotton is a fibre that grows from the surface of seeds in the pods, of a bushy mallow plant and is composed basically of a substance called cellulose (Corbmann, 2009). Cotton as a textile fibre is associated with man, right from birth to last breath. Cotton enjoys a unique position among textiles and is often referred to as “King of fibre” (Shukla, 2005).

2.1.1 History

The origin of cotton is lost in legend for it is older than the recorded history, probably it originated in India. For it is mentioned in “Rig veda” written nearly 3,500 years ago (Sekhri, 2011). The cotton was first grown about 4000 years ago in India. In ancient past, people in most of the countries were not

aware about the cotton fibre. They were dependent only on animal fibre for apparel as well as for meeting other requirement relating to safety and shelter (www.Indiantextilejournal.com). Cotton was used in Egypt as early as 3000 BC but there is no doubt that India developed cotton production as an industry. India is the acknowledge birth place of cotton and the original home of the best and finest cotton fabrics produced in the world for thousands of years, right upto the 19th century AD (Hess, 2000).

The word cotton is derived from the Arabic, depending upon the Arabian dialect, it is pronounced kutan, qutn, qutun etc., As the cotton fibre is obtained from a plant it is classified as a natural cellulose, seed monocellular, staple fibre (Gohl and Vilensky, 2005). Cotton was known to the ancient world long before written records were made, reference to it are found in the work of Greek and Roman writer (Pandey, 2000). The cotton is being used as the material for clothing since long and its origin can be traced to 2,300 BC (Nakamura, 2000). One of the earliest reference to cotton in literature comes from Rig-veda, believed to be written about 3,500 years, which mentions threads in the loom (Shenai, 2000).

2.1.2 Properties of Cotton

Cotton fibre are made up of cellulose which constitutes approximately 98 per cent. In addition to this water in 5.8 per cent and the rest weight contributes in natural impurities (Gupta, 2005). Cotton chemically consists of 88.96 per cent pure cellulose along with protein, pectin substances (Naik and Wilson, 2009). The strength of the fibre increases at high humidity at higher moisture. In general, the tensile strength increases upto a relative humidity of 60 per cent and then it remains mostly constants (Mishra, 2006). Mostly cotton fibre 8.506 moisture but it has the ability to absorb 15 per cent – 20 per cent of the moisture due to these properties it takes time while drying (Vankar, 2008). Cotton fabrics are very comfortable to wear due to their soft drape and a smooth hand. They have an excellent absorbing capacity thus keeping the person comfortable (Collier, 2001). Cotton is not affected by friction to

sunlight, heat and alkalis, but it is deteriorated by the action of acids and oxidizing agents such as hydrogen peroxide and chlorine bleaching compounds (Hall, 2004).

2.1.3 Uses

Cotton is exclusively used in apparel fabric for men and women wear and household fabrics like bed sheets, towels, rugs and carpets. Cotton is blended with other man-made fibres. It can also be used in industrial application as tyre cords, bags, shoes and medical suppliers and requirements (Jindal, 2009). The fibres can be made into a wide variety of fabrics ranging from light weight voiles to heavy sail clothes and thick piled velveteen, suitable for a variety of wearing apparel, home furnishes and industrial uses (www.studentbritannica.com). Cotton has a wide variety of uses, especially in the textile industry. Cotton is spun into thread, that is used in many clothing products such as underwear, socks and T-Shirts (Jindal, 2006). Cotton is used to make a number of textile products, it has many versatile, intrinsic qualities that make it a fibre for all masses and occasion. Cotton upholstery fabrics are attractive and durable, comfortable, easy to spot clean and retain their appearance (Rastogi, 2009).

2.2 WEAVING

The art of weaving or perhaps more correctly the art of “interlacing”, preceded that of spinning. The most widely used method of making fabric has always been weaving. Regardless of culture, woven fabric has been the foundation of making cloth for thousands of years. The latin word “textile” simply means the “weave” (Barker, 2009).

Weaving is the process of interlacing objects, long, slender and flexible to make a single fabric. It is a process begun by the birds in their nest building and continued by primitive man in clothing and basketry. It was adopted to the simple handloom by people of rudimentary civilization and finally in our modern era to the powerloom (Amsden, 2003). Weaving is one of the primary

method of textile production and it involves interlinking a set of vertical threads with a set of horizontal threads. The set of vertical threads are known as warp and set of horizontal threads are known as weft (Rastogi, 2009).

Woven fabric consists of two series of threads, warp and weft, interlaced at right angles to each other. The warp threads run the length of the fabric and the weft threads run across the width of the fabric. The right angle position of yarn gives the cloth more firmness and rigidity than yarn arrangement in knits, braids or laces. Woven fabrics are widely used.

Weaving is done in a machine called loom. The loom has undergone significant modifications, but the basic principles and operations remains the same. The warp is held in parallel order. The loom is wrapped with warp threads passing through heddles on two or more harnesses. The warp threads are moved up and down by the harnesses creating a space called shed. The raising and lowering sequence of warp threads gives rise to many possible structures. Both warp and weft can be visible in the final product (Hollen et al., 2000).

2.2.1 History

The art of forming a fabric by interlacing at right angles two or more sets of yarn or other materials. It is one of the most ancient fundamental art as indicated by archaeological evidence. In primitive culture, women practiced weaving. In the 19th century Greece, Italy and Spain become proficiers, tapestry weaving was brought to a high art in France. In colonial America weaving was a household industry allied with agriculture. The 18th century weaving and spinning inventions marked the transition from the old era of domestic craftsmanship to the tremendous organised industry of today (Thomas, 2006). Weaving is acknowledged as one of the oldest surviving crafts in the world. The tradition of weaving traces back to Neolithic times that is approximately 12,000 years ago (Rastogi, 2009).

2.2.2 Types of Weaving

There are difference methods of inter-lacing which give infinite variety of weaves. Two kinds of warp and weft inter sections can be found in the woven fabric, depending on the mutual position of warp and weft threads at the point of intersection. Different combinations of these two kinds of intersections can form short or long floats of warp and weft threads and can form different weave (Singh, 2004).

The two main categories of woven patterns are the basic weave and complex or fancy weave. The basic weave are plain weave, twill weave and sateen weave (Nakamura, 2000). More than two harnesses are required for advanced weaves, and as many as for fancy weaves. They are pile, double cloth, gauze, swivel, lappet, dobby and jacquard (Langford et al., 2002).

2.2.3 Plain Weave

Plain weave is the most popular, interlacing of plain weave which also called taffeta weave, linen weave, calico weave, or tabby weave. The weave repeat is therefore only 2 ends and 2 picks. The plain weave has the shortest repeat and the lightest interlacing of any common weave. The plain weave will give a stronger and stiffer fabric than any other weave (Vidyasagar, 2008). In the simple form consists of two series of threads, warp and weft interlaced at right angles to each other. The warp threads run the length of the fabric and the weft threads run across the width of the fabric (Mahadevan, 2009). Plain weave is the simplest of all weaves having a repeat size of 2. The range of application of this weave is wide. The plain weave has the maximum number of binding points. The threads interlaced on alternate order of 1 up and 1 down. The thread density is limited. Cloth thickness and mass per unit area are limited. It produces a relatively stronger fabric that is obtained by any other simple combination of threads, excepting that a 'gauze' or cross weaving (Gokarneshan, 2009).

The plain weave sometimes referred to as the tabby, homespun, or taffeta weave. It is the simplest type of construction and is consequently inexpensive to produce. On the loom, the plain weave requires only two harnesses (Corbmann, 2000). The plain weave fabric have no right or wrong side till they are not printed or given a finish. Plain weave fabrics are less absorbent than other weaves. By various fibres, novelty or bulk special effects can be provided to the plain weave fabric. The plain weave is the simplest of the three basic weaves that can be made on a loom without any modification. Each warp yarn interlaces with each filling yarn to form the maximum number of interlacings (Saddler et al., 2000).

2.3 FINISHING

In general, the term finishing applies to all of the operations both chemical and physically carried out on the grey fabric. In textiles, chemical are widely used to add value to fabric through effects varying from various feel or to adding to the functionality and durability of the fabric such as water, oil repellent finish, wrinkle free finish (Bhala, 2012). The name textile finishing covers an extremely wide range of activities, which are performed on textiles before they reach the final customers (Parvathi, 2007). A finish is a process given to a fabric to improve its qualities such as appearance, hand, drape and other properties. There are two main group of finishes, physical finish and chemical finishes. Most of the physical finish are routine finishes like singeing and calendaring (Souza, 2000). Finishing not only catches the eyes, but the feel and touch that the treated material imparts, buyers always expect a high degree of weaving comfort and finishing plays an important role in achieving (Sivakumar et al., 2008). When the fabric comes out of the loom they do not appear attractive. While they are under process of spinning, weaving they get dirty. In order to clean them, improve their appearance, bring out their distinctive characteristics and prepare them for the market, so it is necessary to give the preliminary treatments such as desizing, scouring, bleaching (Gupta et al., 2005). Basic finishes are also called a preparatory finishes.

Preparatory finishes are finishes that are added at the beginning of the textile production process (Colussy et al., 2007).

2.3.1 Classification of Finishes

Textile finishing is a very diversified sector due to the processed raw material, manufacturing techniques and finalized products. Trends in fashion cause a continuous change in colouring and functional finishes (Smith, 2006). Finishing is the process that incorporate some specific function to textiles by using chemical or physical methods. It is done to fibre, yarn or fabric either before or after fabrication to change the appearance, the hand or the performance (Stephens, 2003). Finishes are classified in several ways. It is classified as physical or mechanical and chemical finishes on the basis of techniques. Permanent finish, durable, semi-durable finish, temporary finish, on the basis of degree of performance. Generally, it is classified as basic finish and special finishes (Mullick, 2006).

2.3.2 Functional Finishes

Functional finishes is defined as the textile which assume as additional function over and above the conventional purposes. Functional finishes represent the next generation of finishing industry which make textile materials to act by themselves (Tarafer, 2011). Functional finishes improve the performance of the fabric by calendaring to a specific end use. Some examples are water repellent, crease resistance, mildew and moth resistant, fire proof finish, water proof finish, anti-microbial finish etc., Functional finishes is also known as special or aesthetic finish (Neelima, 2009). Textiles have to be functional, easy care, attractive and practical. These requirements can be met by using modern finishing methods. The finish must last as long as the life of textile material with periodic washing and sterilizing. The finish must be comfortable to human as well as for ecology (Rekha et al., 2005). Many times functional finishes may or may not be able to easily seen looking at the fabric.

However, they serve a significant purpose in the overall performance or function of the fibre, yarn or fabric (Parvathi, 2007).

2.4 HERBAL COOLANT EYE PAD

2.4.1 Eye Pad

Eye pad is a small patch that is worn in front of eyes. It may be a cloth patch attached around the head by an elastic band or by a string (www.wikipedia.org). There are various range of eye pad which helps in relieving stress. Since the eyes is one of the most sensitive organ, heat, dust, light and other factors can damage these products. A cold eye pad provides relief and rejuvenates the eyes. It soothes eyes and relaxes eye muscles. They will also help to reduce puffiness and the appearance of dark circle under eyes (www.sleepmaster.us).

2.4.2 Natural / Herbal Coolant Eye pad

Eye pad is also a tension relief. Eye pads are designed to sooth tired eyes. The common use of eye pad is tension reduction. It is helpful to relaxes, red itchy and tired eyes. Head sufferers often use herbal masks to encourage the muscle around the head and neck to relax. A few varieties of eye pads have a cloth covering. Therapeutic eye pads may contain aromatic herbs such as champhomile, lavender, vetiver, cucumber are used as herbal source. It soothes tired eyes, and help to reduce puffiness. Cooling properties of *Aloe vera*, cucumber and green tea revitalizes and refreshes and makes eyes look fresh and rested and its ayurvedic properties keeps eyes safe.

2.4.3 Chemical / Synthetic Eye Pad

The common use of eye pad is to reduce tension. Eye pads designed to sooth eyes. Synthetic/chemically treated eye pads is filled with glass beads enclosed in thermal plastics, it helpful to relaxes and tired eyes slip into paradise with a blast of coolness. Ultra plush eye pads conforms to face and forehead with its viscoelastic memory foam material. Some cooling eye pads

are pre-moistened with hyaluronic acid and broccoli extract, panthenol etc. are used to prepare eye pads. The hydrogen patches with a cooling effects are simple, to use and release their concentrated ingredients immediately.

2.5 PILOT STUDY

2.5.1 Optimization Parameters of Herbal Source

Various herbs such as vetiver, *Aloe vera*, lavender, lemon grass, were selected for the pilot study which have the coolant and aromatic property. 50 grams of selected herb was soaked in 100 ml ethanol solution for 24 hours. After 24 hours the ethanol was evaporated from the extraction of finishing agent. The selected coolant and aromatic herbal extract was applied to the selected fabric. Based on the cooling and aromatic property, *Vetiveria zizanioides* and *Aloe vera* were selected for the study.

2.5.2 Optimization of Temperature

Time and temperature was considered as important aspect in treating the fabric for finishing process. Fabric samples were treated with different temperature such as 40°C, 60°C, 80°C and 100°C. Thus 80°C were taken for the final study.

2.5.3 Optimization of Time

The fabric samples were treated with 1 : 10 ratio mixed sources and kept in different time intervals such as 35 minutes, 40 minutes and 60 minutes. From the pilot study, 40 minutes was given a better result than others.

2.5.4 Optimization of pH

pH is the measure of intensity of acidity and alkalinity and determine the concentration of hydrogen ions present in water (Ansari, 2008). It is the most important parameter as it indicates instantaneously, the acidic or alkaline condition of the effluent water (Kentel, 2002). pH can be measured

using a litmus paper, pH indicator with a colour scale or a specially designed voltmeter called pH meter (Alexander, 2000).

The pH meter was first standardized using buffer solution of pH 7.0. The electrodes were rinsed in distilled water and immersed in herbal extract and readings were noted in digital display.

2.6 FINISHING METHOD

2.6.1 Dip and Dry Method

Dip and dry method is one of the simplest method of finishing. The extraction of herbs were applied to the selected cotton fabric at the ratio of 1 : 10. Then the fabric was taken out from the bath and allow it to dry under shade to remove its moisture.

2.6.2 Spray Method

Method of wet application of finishes on fabrics are mostly either by exhaustion technique or by padding concentrated solution and depend on the substrate and the feasibility of adopting either of the process. Application by spray technique method, finishing could also by spray technique, finishing may be done by spraying an extraction solution on selected fabric and allow it for drying under shade.

2.6.3 Pad Cure Dry Method

The method of wet application on fabrics are mostly either by exhaustion technique or by pad cure dry method. It can be done with padding mangle machine, which gives better finishing and wipes the drawbacks of other two methods, such as dip dry and spraying technique padding mangle method of application is feasible for all softness (www.technitex.com). The extracted solution was poured inside the padding mangle and selected fabric was passed through rollers of 40 minutes. The temperature was set at 80°C and the fabric was cured for 40 minutes for good penetration of the finishing

agent. Then the fabric was removed from the curing chamber, washed thoroughly and dried under shade.

2.7 SOLUTION OF HERBS

2.7.1 *Aloe vera*

Aloe vera belongs to the family Liliaceae and nearly there are about 150 species in *Aloe vera*. The common varieties are *Aloe barbadensis* Miller, *Aloe saponaria*, *Aloe chinensis*, *Aloe lalifolia*. Of these the most popular is *Aloe barbadensis* Miller which has most therapeutic value and referred as "True aloe". The word "Aloe" has organized from an Arabic word "Alloeh" meaning "a shining bitter substances" among the different species, "Vera" means "true" (Selvan et al., 2004). *Aloe vera* is coarse looking, with a short stem 30-60 cm in height, leaf size is approximately. 38 cm long, 10 cm broad and 1.9 cm thick and is densely crowded. The leaves are fleshy tapering to a blunt point, smooth, pale green, having thorny prickles on their margins (Singh, 2010). *Aloe vera* is also known as "wand of heaven". In India aloe vera has been referred to as "kumari" in Ayurvedic treatments. *Aloe vera* has been found described in writings in many different cultures and as far as the Greek, Egyptian and Roman era's. There have been mentions of the aloe plant in the rig veda which is the earliest book of natural medicine, dating BCE 4,500 and BCE 1,600 (www.aloe1.com).

2.7.2 Properties and Uses

Aloe vera contains a broad spectrum of free amino acids, free monosaccharides and total saccharides released upon hydrolysis, sterols. *Aloe vera* leaves contains phytochemicals, under study for possible bioactivity, such as acetylated mannanes, polymannas, anthraquinone, c-glycosides, emodin, lectins, major chemical constituents. Water and polyaraccharids, such as pectin, hemi-cellulose, glucomannan, acemannan and mannose (Shelton, 2000).

Aloe vera has been known and used for centuries for its health, beauty, medicinal and health care properties. It also uses for treating various skin treatments. Preventing ageing, it contains the highest concentration of healing agents which is beneficial for skin. *Aloe vera* is also used for the external treatment of minor skin irritation, including burns, bruises and abrasion (Agarwal et al., 2012).

2.7.3 *Vetiveria zizanioides*

Vetiveria zizanioides is native to India and has been in traditional use since ancient times. Vetiver grows particularly along river banks. Vetiver is a grass from the Poecaea family of plants which also includes lemon grass and citronella. Vetiver is a fast growing plant that survive upto 50 years or more with a large interlinked root system. Vetiver is the robust grass with spongy roots and long thin leaves with small brown purple flower (Vyas, 2008).

The name 'vetiver' is derived from the Tamil word 'vetiver'. It is also called vetivert. Vetiver is known to be use in India both for its fragrant oil and as traditional medicinal value (www.herballergy.com). The botanical name of vetiver is *Veriveria zizanioides* and originally distributed in the old world tropics. It is believed to be native to Northern India, where it has usually been found growing widely or traditionally cultivated into low, damp wet land. The plant grows all over India and is also cultivated in the plains and lower hills up to 1200 meters elevation. The leaves are narrow, linear 25-30 cm long and 1 cm broad, erect with compressed sheaths. The plant grows 1-15 meters in height and flowers (Baker, 2010). Vetiver is one of the most versatile genera in plant kingdom. For example, the species *Vetiveria zizanioides* produces oderous roots from which a precious essential oil is distilled and used in a variety of applications (www.ayurvedam.com).

2.7.4 Properties and Uses

Vetiver leaves contains chemical compounds such as cellulose, hemicelluloses, lignin and crude, protein as well as various minerals.

Vetiver plant is an important plant as its roots having highly medicinal and aromatic properties, it is cultivated in Kerala and Tamil Nadu. Vetiver is a boon for farmers in warm climate as it prevents soil erosion. It has anti-inflammatory and anti-septic effects that provide relief from inflammations in circulatory system and nervous system. This aromatic herbs has sedative and anti-septic properties and is also useful to promote the manufacturers of red blood cells. The oil obtained from “vetiver” as sedative effects and aids in the treatment of emotional outburst, such as anger, anxiety, epileptic and hysteric attacks, restless, nervous etc. (Vyar, 2008).

CHAPTER – III

EXPERIMENTAL PROCEDURE

Experimental procedure pertaining to the study “**DEVELOPING AND EVALUATING *Aloe vera* AND *Vetiveria zizanioides* TREATED EYE PAD**” is discussed under the following headings :

- 3.1 Survey
 - 3.1.1 Selection of Tool – Questionnaire
- 3.2 Selection of Fabric Formation
- 3.3 Pretreatment of Fabric
 - 3.3.1 Scouring
 - 3.3.2 Bleaching
 - 3.3.3 Desizing
- 3.4 Selection of Finishing
 - 3.4.1 Collection and Storage of Natural Source
 - 3.4.2 Extraction of Natural Source
- 3.5 Selection of Binder
- 3.6 Optimization of Finishing Parameters
 - 3.6.1 Concentration of Herbal Solution
 - 3.6.2 Citric Acid
 - 3.6.3 Optimization of Temperature
 - 3.6.4 Optimization of Time
 - 3.6.5 Optimized of pH
 - 3.6.6 Optimized Parameters
- 3.7 Method of Finishing Process
- 3.8 Evaluation of Finished Fabric
 - 3.8.1 Objective Evaluation
 - 3.8.1.1 Physical Property
 - 3.8.1.1.a. Fabric Thickness
 - 3.8.1.1.b. Fabric Weight
 - 3.8.1.2 Mechanical Property

3.8.1.2.a. Fabric Tensile Strength and Elongation

3.8.1.3 Comfort Property

3.8.1.3.a. Fabric Stiffness

3.8.1.3.b. Fabric Crease Recovery

3.8.1.3.c. Fabric Air Permeability

3.8.1.4 Absorbency Property

3.8.1.4.a. Drop Test

3.8.1.4.b. Sinking Test

3.8.1.4.c. Capillary Test

3.9 Nomenclature

3.10 Statistical Analysis

3.1 SURVEY

According to Kothari (2008), a survey is a data collection tool used to gather information about individuals. Survey can be useful to collect data on phenomena that cannot be directly observed.

3.1.1 Selection of Tool – Questionnaire

Questionnaire is a research instrument consisting of a series of questions and other prompts for the purposes of gathering information from respondents. Here the investigator prepared a questionnaire (Appendix – I) to collect information from the people about awareness, preference and rating and recommendations for eye pads, 30 samples were taken to consolidate data (Appendix – II).

3.2 SELECTION OF FABRIC FORMATION

Weaving is the process of interlacing long, slender and flexible threads to make a single fabric. It is a process begun by the birds in their nest building and continued by primitive man in clothing and basketry (Amsden, 2003). The most widely used method of making fabric has always been weaving (Kathleen, 2007). The construction of cloth will determine how a fabric is used and how it should be cared for, the name of the fabric is determined by the

fabric structure. The most widely accepted definition for weaving in fabric that is formed by two yarns interlaced at right angles (Greenberg et al., 2007). The right angle position of yarn gives the cloth more firmness and rigidity than yarn arrangements in knits, braids or laces. Because of these structures, yarn can be unravelled from adjacent sides. Woven fabric are widely used and weaving is one of the oldest methods of making cloth (Hollen et al., 2003). Weaving is done in a machine called a loom. The loom is wrapped with warp threads passing through heddles on two or more harnesses. The warp threads are moved up and down by the harnesses creating a space called shed. The weft threads are wound onto spool called bobbins. The bobbins are placed in a shuttle which carries the weft threads through the shed. The raising and lowering sequence of warp threads given rises to many possible weave structures. Both warp and weft can be visible in the final products (Parvathi, 2007). Plain weave is the simple form, these consists of two series of threads, warp and weft interlaced at right angles to each other, the warp threads run the length of the fabric and the weft threads run across the width of the fabric (Mahadevan, 2009).

3.3 PRETREATMENT OF FABRIC

The term pre-treatment summarises all types of well finishing process like scouring, desizing, bleaching, etc. of the fibres, yarn or fabric. The employed techniques depend upon factors such as type of process, type and quality of materials and desized effects of the final product (Smith, 2006). Pretreatments are essential for successful finishing. Pretreatment improves wettability of fibres. They are applied before the final finishes are given as the fabric that comes from weavers contains impurities (Garg et al., 2005).

3.3.1 Scouring

Scouring is a cleaning process for removing natural and acquired impurities from fibre and fabric (Smith, 2006). To remove the natural impurities, the desized cloth is subjected to scouring (Manivasakam 2000). Fabrics received as gray cloth have a lot of impurities naturally present in

them. These may be oil, waxes and dirt strains acquired during construction of the fabric. Complete removal or cleaning of this impurities is important before applying any other finish. This cleaning is called scouring and is done to all fabrics with the help of soap solution and chemicals. After cleaning, the fabric becomes smooth, neat and more absorbent (Musalle, 2005).

Recipe for Scouring

Fabric weight	-	1 kg
Sodium hydroxide	-	2%
Sodium bicarbonate	-	4%
Wetting agent	-	0.5%
Water	-	15 litres
Temperature	-	50°C to 60°C
Time	-	15 minutes

The cotton fabric was scoured in water bath containing by using the above chemicals, temperature was maintained.

3.3.2 Bleaching

Bleach is to import perfect whiteness to the fabric by removing the natural colouring matter from the fabric. To bleach it has well as to eliminate any impurities by which they may become contained and more or less solid (Tailfer, 2008).

Recipe for Bleaching

Fabric weight	-	1 kg
Hydrogen peroxide	-	2%
Soda ash	-	1%
Wetting agent	-	1%
Water	-	10 litres
Temperature	-	60°C
Time	-	30 minutes

3.3.3 Desizing

Desizing plays an important role in achieving a perfect fabric feel. The impurities present in cotton fabric are sizing ingredients, fat, waxes, pectins and natural colouring matter. Efficient removal of these impurities during gray preparation is essential to guarantee proper dyeing, printing and finishing process (Prabaharan, 2007).

Recipe for Desizing

Fabric weight	-	1 kg
Hydrochloric acid	-	Few drops
Water	-	10 litres
Temperature	-	100°C
Time	-	35 – 40 minutes

3.4 SELECTION OF FINISHING

Health and hygiene are the primary requirements for human beings to live comfortably and work with maximum efficiency (Thilagavathi et al., 2007). Today computers have become a part of everyone's life. With this advancement even a school going children have started spending long hours in front of computers. It results eye itching, watering and redness inspite of using thick glasses and protective measures were developed. Academicians and researchers are on the set for eye cooling substances and eye pads are used to solve this burning problems of the day. several herbs are used throughout the world as aromatic and cooling property. Hence, the investigator selected natural herbs for this study to reduce environmental pollution.

3.4.1 Collection and Storage of Natural Source

Aloe vera (Plates – I and II) is a coarse looking plant, with a short stem 30 – 60 cm in height, leaf size is approximately 38 cm long, 10 cm broad and 1.9 cm thick and is densely crowded (Singh, 2010). People call *Aloe vera* as a

miracle plant. It contains the highest concentration of healing agent which is beneficial for skin (Srivastava, 2010). *Aloe vera* gel and powder is widely used in the treatment of minor wounds, skin irrigation including burns and abrasion (Agarwal et al., 2013).

Vetivria zizanioides (Plates – III and IV) is native to India and has been in traditional use since ancient times for its perfumery oil obtained from its roots. Vetiver is an important plant as its roots are having highly medicinal and aromatic properties. This is the robust grass with spongy roots and long thin leaves with small brown purple flower (Vyar, 2008). This aromatic herbs has sedative and anti-septic properties and is also useful to promote the manufacturer of red blood cells. The oil obtained from the *Vetiveria zizanioides* has sedative effects and aids in the treatment of emotional outburst, such as anger, anxiety, restlessness, etc. (www.himalayahealthcare.com). The *Aloe vera* powder procured from the ayurvedic medicine shop and the *Vetiveria zizanioides* (vetiver roots) were collected from Coimbatore in Tamil Nadu. The collected *Vetiveria zizanioides* roots was washed thoroughly with soft water to remove the dust content. After rinsing thoroughly the roots were wiped well with a clean cloth and these collected roots were dried under shade. After drying, the grinding was carried out to breakdown the roots into fine powder. These powder was stored in air tight containers separately these powder was used in production of coolant eye pad.

3.4.2 Extraction of Natural Source

An extraction of natural sources to selected to be carried out by various methods like aqueous, alkaline, acidic or alcoholic method. As water is said to be “Universal solvent” (Kothavari et al., 2006). Extraction (Plate – V) refers to separating the desired material by physical or chemical means with the aid of a solvent. Active substances were extracted from the powder by ethanol extraction method. Ethanol is an organic solvent manufactured from molasses by the fermentation in the presence of yeast. It is used as a solvent (Yadav, 2008). 100 grams of the selected herbal powder was dissolved in 500 ml of

ethanol for extraction. The mixture was allowed to stand for 24 hours. Then the mixture was distilled and evaporated carefully.

3.5 Selection of Binder

The binder is a film forming agent made up of a long chain macro molecules which when applied to the textile together with the pigments produces a three dimensional linked network. The binder should be colourless, odourless, evenly thick, smooth and good adhesion (Khojo et al., 2003). Citric acid is chiefly obtained from the lime and lemon fruits. It is developed from the limes by incipient fermentation. Filtering the product by powdered chalk, then neutralizing at the same time, the marker decomposes the insoluble calcium with sulphuric acid, forming white crystals, soluble in water with a keen acid taste (Murphy, 2008). It is a good cross linking agent or binder and due to this reason the investigator selected citric acid for the study.

3.6 OPTIMIZATION OF FINISHING PARAMETERS

3.6.1 Concentration of Herbal Solution

100 grams of the selected herb was soaked in ethanol for 24 hours. After 24 hours the ethanol was evaporated from the extraction of finishing agents. The various concentration of the herbal extract such as 25, 50, 75 and 100 per cent was applied to the selected fabric. Based on the pilot study, 100 per cent herbal extract was selected for the study.

3.6.2 Citric Acid

Citric acid is considered as an important aspect in binding the herbs to the fabric in the finishing process. Citric acid gives good result as a mordant. Hence the investigator selected 100 per cent extracted and 100 per cent concentrated citric acid in the ratio of 9 : 1 for the study.

3.6.3 Optimization of Temperature

An optimize the soluble temperature for the finish, fabric sample were treated with 1 : 10 ratio in different temperature such as 40°C, 60°C, 80°C and 100°C. from the pilot study, 80°C which gives better finishes to other temperature were given. To select the temperature at 80°C for final study.

3.6.4 Optimization of Time

The fabric sample were treated with 1 : 10 ratio mixed sources and kept in different time intervals such as 35 minutes and 40 minutes and 60 minutes. From the pilot study, 40 minutes is given better result than others.

3.6.5 Optimization of pH

The pH meter (Plate – VI) was first standardized using buffer solution of pH 7.0. The electrodes were rinsed in distilled water and immersed in herbal extract and readings were noted in digital display. Hence the investigator selected pH 4.5 for the study.

3.6.6 Optimized Parameters

TABLE – I
OPTIMIZED PARAMETERS

S.No.	Criteria	Pilot Study	Selected Parameters
1..	Herbal solution	25, 50, 75, 100	100 per cent
2.	Citric acid	7 : 1, 8 : 1, 9 : 1	9 : 1
3.	Time	35, 40, 60 minutes	40 minutes
4.	Temperature	40°, 60°, 80°C	80°C
5.	pH	4 – 8	4.5

From the Table – I, it is clear that the herbal extract solution was mixed with water and one per cent citric acid was added. The temperature was

maintained 80°C for 40 minutes with pH level 4.5. Thus the above parameters were selected for the study.

3.7 METHOD OF FINISHING PROCESS

The method of wet application of finishes on fabric are mostly either by exhaustion techniques or by padding mangle method (Plate – VIII) (Sampath, 2003). The padding mangle method of application is feasible for all softness (www.technitex.com). The extracted solution was poured inside the padding mangle and the selected fabric was passed inside the machine for 40 minutes. The temperature was set at 80°C and the fabric was cured for 40 minutes for the good penetration of the finishing agents. Then the fabric was removed from the curing chamber, washing thoroughly and was dried under the shade.

3.8 EVALUATION OF FINISHED FABRIC

The finished samples were evaluated by subjectively and objectively.

3.8.1 Objective Evaluation

Textile testing is the process of inspecting, measuring, evaluating characteristics and properties of textile material. The unfinished and sample treated with selected natural herbs were tested for their respective laboratory tests namely fabric weight, fabric thickness, fabric strength and elongation, wettability and absorbency tests.

3.8.1.1 Physical Property

This includes fabric thickness and fabric weight.

3.8.1.1.a. Fabric Thickness

Thickness (Plate – VIII) is defined as the distance between the upper and lower surface of the material measured under a standard pressure using



PLATE – I
Aloe vera



PLATE – II
Aloe vera POWDER



PLATE – III
Vetiveria zizanioides (ROOT)



PLATE – IV
Vetiveria zizanioides POWDER



PLATE – V

Aloe barbadensis AND *Vetiveria zizanioides* ETHANOL SOLUTION



PLATE – VI

pH METER



PLATE – VII

PADDING MANGLE

the thickness gauge. The thickness of a fabric is one of its basic properties giving information on its warmth, heaviness or stiffness in use. Thickness measurements are rarely used as they are very sensitive to the pressure used in the measurement. Fabric weight per unit is used commercially as an indicator of thickness (Basu and Chellamal, 2006).

The fabric thickness tester, a handy instrument was used to find the thickness of the sample. Then the distance between the plates is noted from the dial gauge. Five readings were taken randomly and mean was calculated to find out the thickness of original and finished fabrics.

3.8.1.1.b. Fabric Weight

Fabric weight is the relative weight of the fabric and expressed as the weight of a particular size, piece in grams per square meter or ounces per square yard. The investigator cut the samples from original and finished fabric by using GSM Cutter (Plate – IX) and weighed the fabric using a digital weighing balance. Five readings were noted for each and the individual mean was calculated.

3.8.1.2. Mechanical Property

3.8.1.2.a. Fabric Tensile Strength and Elongation

Strength of fabric is the essence of textile without which the value is nothing. The tensile is a measure of the resistance of the fabric to a tensile load or stress in either warp or weft direction.

The tensile strength of the fabric can be determined using the instrument Cloth Tensile Strength Tester (Plate – X). It gives the measurement of the breaking strength as the resistance of the fabric to a tensile load or stress in either warp or weft direction and elongation as extent of deformation along the axis of a material under a tensile stress. Five samples were cut from the warp and weft directions. Each sample is 10.5 inch in length and 1.5 inch width. Lengthwise yarns from the sides of the strip were

raveled out upto quarter inch from each strip. Each sample was kept perpendicular to the load, the load was applied and the readings were recorded in kilograms and elongation in inches as soon as the samples were broken. Five readings were taken for each samples and the mean strength and elongation was calculated.

3.8.1.3 Comfort Property

It includes fabric stiffness, crease recovery and air permeability.

3.8.1.3.a. Fabric Stiffness

Fabric stiffness indicates the resistance of the fabric to bending and it is a key factor in the study of handle and drape (Saville, 2004).

Eureka Stiffness Tester (Plate – XI) was used to determine the stiffness in bending length, using a scale of 6 inches length and 1 inch width as template. Five samples were cut from the warp and weft directions. Each fabric sample was mounted on the platform and tip of the fabric coincide with the index line which is viewed in the mirror. The bending length was read from the scale mark opposite to the zero line on the side of the platform. Five readings were taken for each sample and the mean was calculated to find out the fabric stiffness of original, finished fabric.

3.8.1.3.b Fabric Crease Recovery

Crease of a fabric results in the bending of constituent fibres. Crease recovery is measured quantitatively in terms of crease recovery angle (BIS, 2000). Eureka Crease Recovery Tester (Plate – XII) was used for the study. Five samples were cut from the warp and weft direction with templates, 2 inch long and 1 inch wide. The sample was folded using tweezers and the folded sample was placed on the lower plate of the loading device and the load is applied for 5 minutes. Then the sample was kept on the clamp of the instrument. As the sample recovered the dial is rotated to keep the free edge of the specimen in line with the knife edge. The recovery angle in degrees



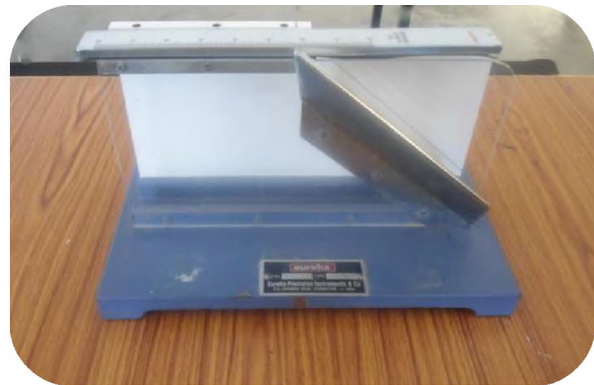
**PLATE – VIII
THICKNESS GAUGE**



**PLATE – IX
GSM CUTTER**



**PLATE – X
TENSILE STRENGTH AND
ELONGATION TESTER**



**PLATE – XI
STIFFNESS TESTER**



**PLATE – XII
CREASE RECOVERY TESTER**

was read on the dial. Five readings were taken for each sample and the mean was calculated to find out the crease recovery of original and finished fabrics.

3.8.1.3.c. Fabric Air Permeability

Air permeability of a fabric is the volume of air measured in cubic cm passed per second through 1 sq.cm. for the fabric at the pressure of 1 cm head of water (Basu, 2006). Air permeability of a fabric is the degree to which the material is penetrates by air. Air flows through a fabric occurs when the air pressure is different on the two sides of the fabric. As fabric porosity increases, air permeability increases. Air permeability of a fabric is the volume of air measured in cubic cm passed per second through 1 sq. cm. for the fabric at the pressure of 1 cm head of water.

The Air Permeability Tester (Plate – XIII) consists of a circular clamp to hold the specimen and a spring loaded clamp to press the specimen. While testing, the room atmospheric air was drawn through the specimen by means of suction pump. The rate of air flow through the specimen was controlled by valves. The air flow was adjusted to desired pressure from 0-25 mm the rate of air flow was read from the rotameters. They are calibrated to indicate air flow in cubic centimeter per second at 27°C and 760 mm of mercury. The area of the sample exposed to air was one inch diameter. From the readings of the rotometer air permeability was calculated using

$$\text{Air permeability} = \frac{\text{Average rate of air flow}}{\text{Area of sample exposed to air}} \text{ cc/sec/sq.cm.}$$

Five readings were taken for each sample and the mean was calculated for the original and finished fabric.

3.8.1.4 Absorbency Property

The wettability and absorbency of the sample are evaluated by drop test, sinking and capillary test.

3.8.1.4.a. Drop Test

The ability of the fibre to take up the moisture is termed as absorbency. Wettability is the time taken in seconds for a drop of water to sink into the fabric, if any fabric takes more than 200 seconds to absorb water is considered as unwettable.

A burette filled with distilled water was clamped in a stand (Plate – XIV). The sample was mounted in an embroidery and was placed at the base of the stand. The distance between the sample and burette nozzle was kept constant. The nozzle of the burette was opened to allow a drop of water to fall on the sample. The stop watch was started simultaneously and it was stopped when the drop of water sank fully into the material and the time is noted. The same procedure was repeated for all the samples. Five readings were taken for each sample and the mean was calculated to find out the fabric absorbency of original and finished fabric.

3.8.1.4.b. Sinking Test

Sinking Test (Plate – XV) involves a simple test of wettability of fabric. Five samples were cut into size of 1 inch in length and 1 inch width from each sample. A 100 ml beaker was filled with distilled water and few drops of wetting agent were added into the distilled water. The sample was dropped on the surface of water from a standard height. The stop watch was started when the fabric struck the surface of water and stopped when the sample sunk below the surface of water surface. The same procedure was repeated for all the samples. Five readings were taken for each sample and the mean was calculated to find out the sinking time of the fabrics.

3.8.1.4.c. Capillary Test

The Capillary Travel Method (Plate – XVI) measures the rapidity of absorption. Five samples were cut into size of 11 inch in length and 1 inch width from each sample. One end of the sample strip was pasted with a glass



PLATE – XIII
AIR PERMEABILITY



PLATE – XIV
DROP TEST



PLATE – XV
SINKING TEST



PLATE – XVI
CAPILLARY RISE TEST



PLATE – XVII
EYE PAD

rod which was placed on heavy wooden blocks and other end was allowed to immerse in a distilled water. The rise of the water level in the strip was noted by keeping the length of the fabric 5 cms constant. The same procedure was repeated for all the samples. The capillary rise of each material was recorded carefully to find the absorbency of original and finished fabrics.

3.9 NOMENCLATURE

The nomenclature of the sample is given below.

OCF - Original Cotton Fabric

AVFF - *Aloe vera* and *Vetiveria zizanioides* finished fabrics.

3.10 STATISTICAL ANALYSIS

The results of the tests were analysed statistically by selecting appropriate tests. The difference between the samples and within the samples was using 'ANOVA'. This analysis will help in exact results arrived in this study.

CHAPTER – IV

RESULTS AND DISCUSSION

The results of the study “**DEVELOPING AND EVALUATING *Aloe vera* AND *Vetiveria zizanioides* TREATED EYE PAD**” is discussed under the following headings :

- 4.1 Tests for Physical Properties
 - 4.1.1 Fabric Thickness
 - 4.1.2 Fabric Weight
- 4.2 Tests for Mechanical Properties
 - 4.2.1 Fabric Tensile Strength
 - 4.2.2 Fabric Elongation
- 4.3 Tests for Comfort Properties
 - 4.3.1 Fabric Stiffness
 - 4.3.2 Fabric Crease Recovery
 - 4.3.3 Fabric Air Permeability
- 4.4. Tests for Absorbency
 - 4.4.1 Drop Test
 - 4.4.2 Sinking Test
 - 4.4.3 Capillary Test
- 4.5 Wear Study

4.1 TESTS FOR PHYSICAL PROPERTIES

4.1.1.a. Fabric Thickness

The results of fabric thickness was shown in the Table – II.

TABLE – II
ANALYSIS OF VARIANCE OF FABRIC THICKNESS

S.No.	Samples	Mean Thickness (mm)	Loss or Gain Over Original	Percentage of Loss or Gain Over Original (%)	'F' Ratio
1.	Original Fabric	32			9.84*
2.	Finished Fabric	33	- 1	3.125	

* Significant at five per cent level

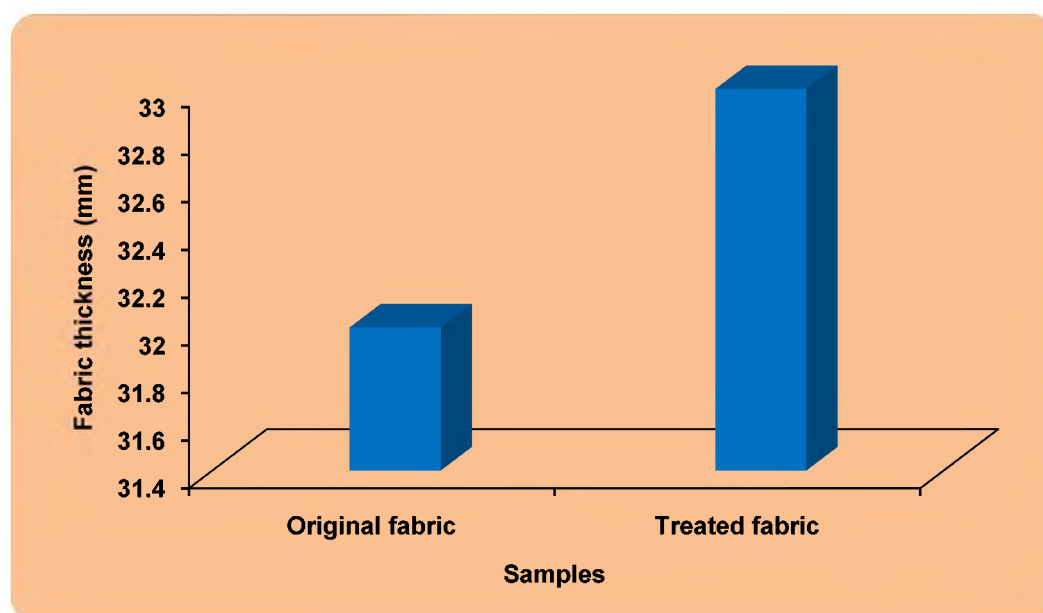


FIGURE – 1
FABRIC THICKNESS

The Table – II and Figure – 1 shows that the fabric thickness has increased in finished sample of cotton about 33 mm (3.125 per cent) respectively, when compared to its original fabric statistically proved that there was a significant difference at five per cent level. Thus it could be concluded

that the finished cotton fabric shows maximum thickness when compared to its original sample.

4.1.1.b. Fabric Weight

The result of fabric weight was shown in Table – III.

TABLE – III
ANALYSIS OF VARIANCE OF FABRIC WEIGHT

S.No.	Samples	Mean weight (GSM)	Loss or gain over original	Percentage of loss or gain original (%)	'F' ratio
1.	Original fabric	1.17			
2.	Finished fabric	1.19	-0.02	1.70	8.005*

* Significant at five per cent level

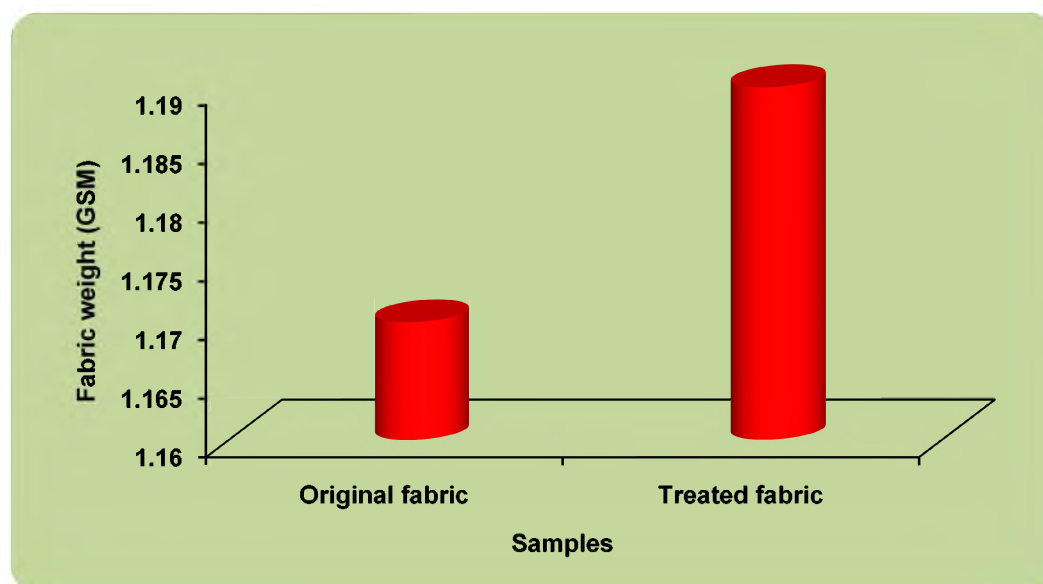


FIGURE – 2
FABRIC WEIGHT

The Table – III and Figure – 2 shows that the fabric weight has increased in finished sample of cotton fabrics about 1.19 (1.70%) respectively when compared to its original cotton fabric. Statistically proved that there was a significant difference at five per cent level. Thus it could be concluded that

the finished fabric with *Aloe vera* and *Vetiveria zizanoides* shows maximum fabric weight when compared to its original fabric.

4.2 TEST FOR MECHANICAL PROPERTIES

4.2.1 Fabric Tensile Strength

The results of fabric tensile strength in warp and weft directions are discussed in the Tables – IV and V.

TABLE – IV
ANALYSIS OF VARIANCE OF FABRIC TENSILE STRENGTH – WARP

S.No.	Samples	Mean Value (kg)	Loss or Gain Over Original	Percentage of Loss or Gain Over Original (%)	'F' Ratio
1.	Original Fabric	32.2			19.2308*
2.	Finished Fabric	37.2	- 5	15.527	

* Significant at five per cent level

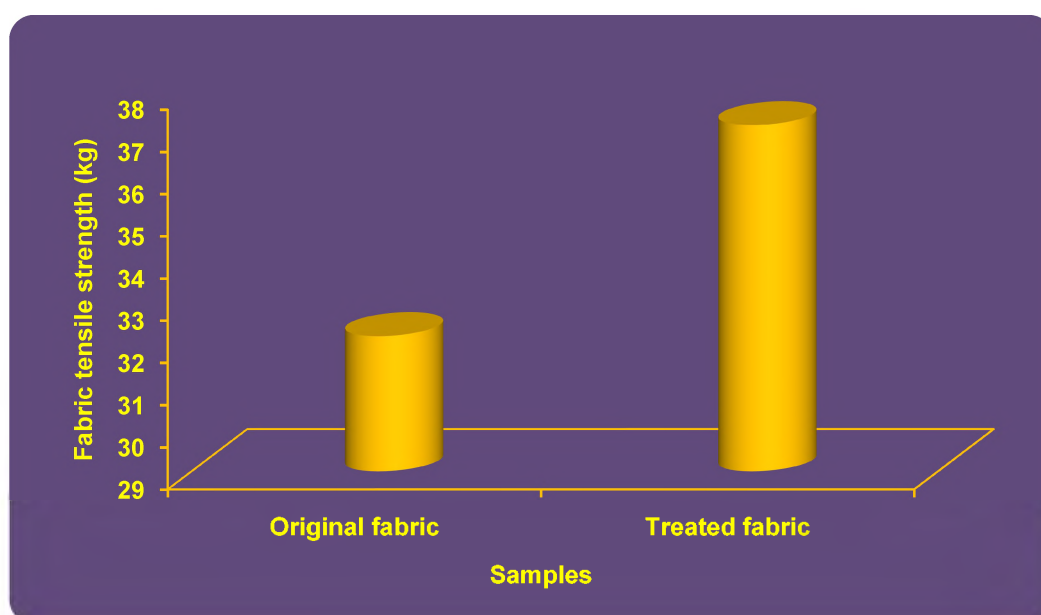


FIGURE – 3
FABRIC TENSILE STRENGTH – WARP

The Table – IV and Figure – 3 shows that the fabric tensile strength along warp has increased in finished sample of cotton about 37.2 (15.527 per cent) respectively when compared to original fabric. Statistically proved that there was a significant difference at five per cent level. Thus, it could be concluded that the finished cotton fabric with *Aloe vera* and *Vetiveria zizanioides* shows maximum tensile strength when compared to its original fabric.

TABLE – V
ANALYSIS OF VARIANCE OF FABRIC TENSILE STRENGTH – WEFT

S.No.	Samples	Mean Value (kg)	Loss or Gain Over Original	Percentage of Loss or Gain Over Original (%)	'F' Ratio
1.	Original Fabric	23			73.5000**
2.	Finished Fabric	31.4	- 8.4	36.52	

** Significant at one per cent level

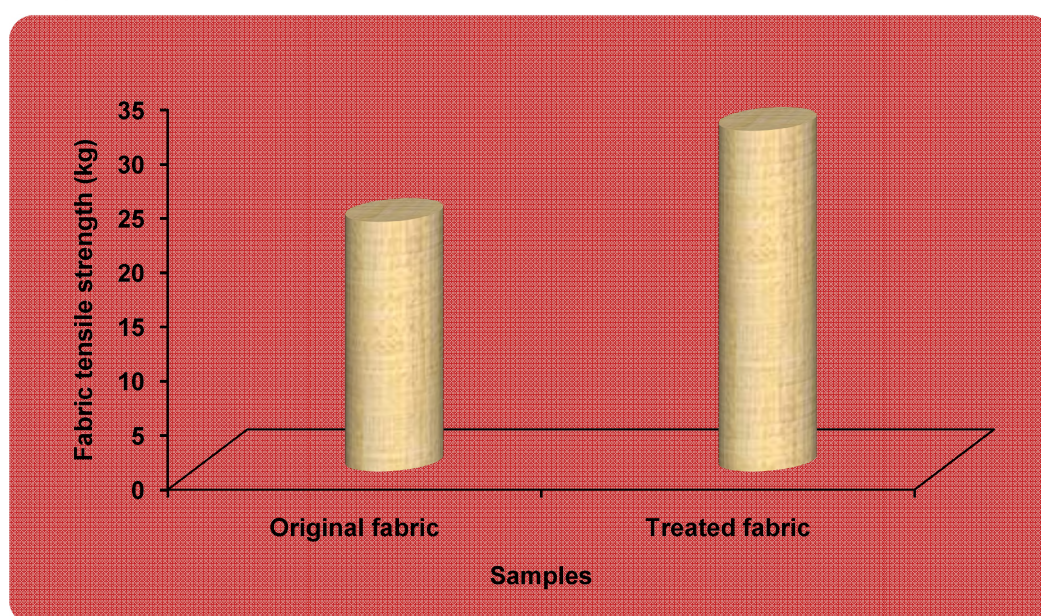


FIGURE – 4
FABRIC TENSILE STRENGTH – WEFT

The Table – V and Figure – 4 shows that the fabric tensile strength have increased in finished cotton fabric about 31.4 (36.52 per cent) respectively when compared to the original fabric statistically proved that there was a significant difference at one per cent level. Thus it could be concluded that the finished cotton fabrics with *Aloe vera* and *Vetiveria zizanioides* shows maximum tensile strength when compared to its original sample.

4.2.2 Fabric Elongation

The results of the fabric elongation in warp and weft directions are listed in the Tables – VI and VII.

TABLE – VI
ANALYSIS OF VARIANCE OF FABRIC ELONGATION – WARP

S.No.	Sample	Mean (inches)	Loss or gain over original	Percentage of loss or gain original (%)	'F' ratio
1.	Original fabric	9.8			
2.	Finished fabric	10.5	-0.7	7.14	0.01

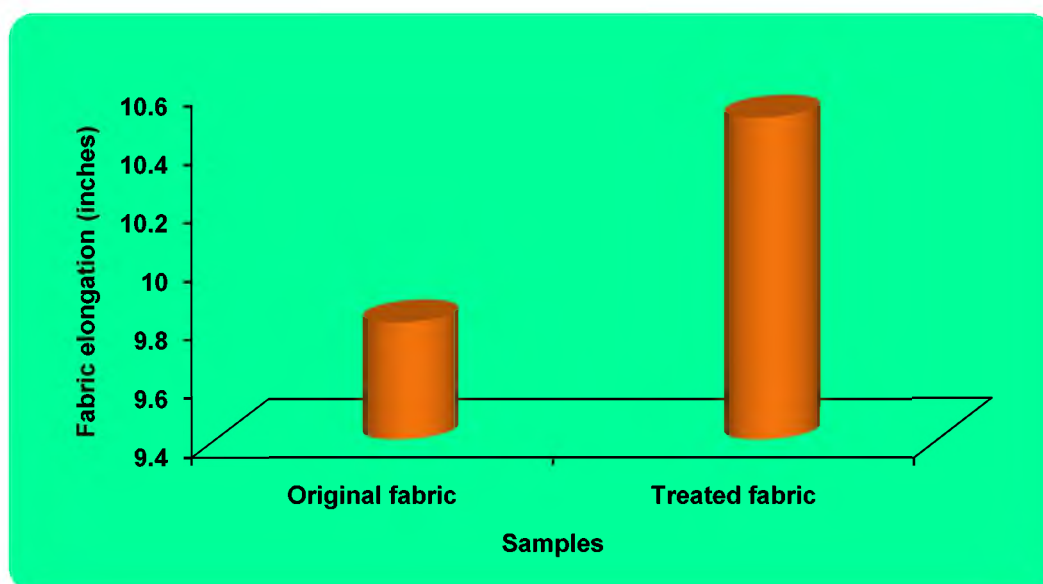


FIGURE – 5
FABRIC ELONGATION – WARP

The Table – VI and Figure – 5 shows that the fabric elongation along warp have increased in finished cotton fabric about 10.5 (7.14%) when compared to its original fabrics. Statistically proved that there was no significant difference between samples. Thus it could be concluded that the cotton fabric finished with *Aloe vera* and *Vetiveria zizainoides* shows maximum elongation when compared to its original cotton fabric.

TABLE – VII
ANALYSIS OF VARIANCE OF FABRIC ELONGATION – WEFT

S.No.	Samples	Mean (inches)	Loss or gain over original	Percentage of loss or gain original (%)	'F' ratio
1.	Original fabric	9.1			
2.	Finished fabric	10	-0.9	9.890	8.03*

* Significant at five per cent level

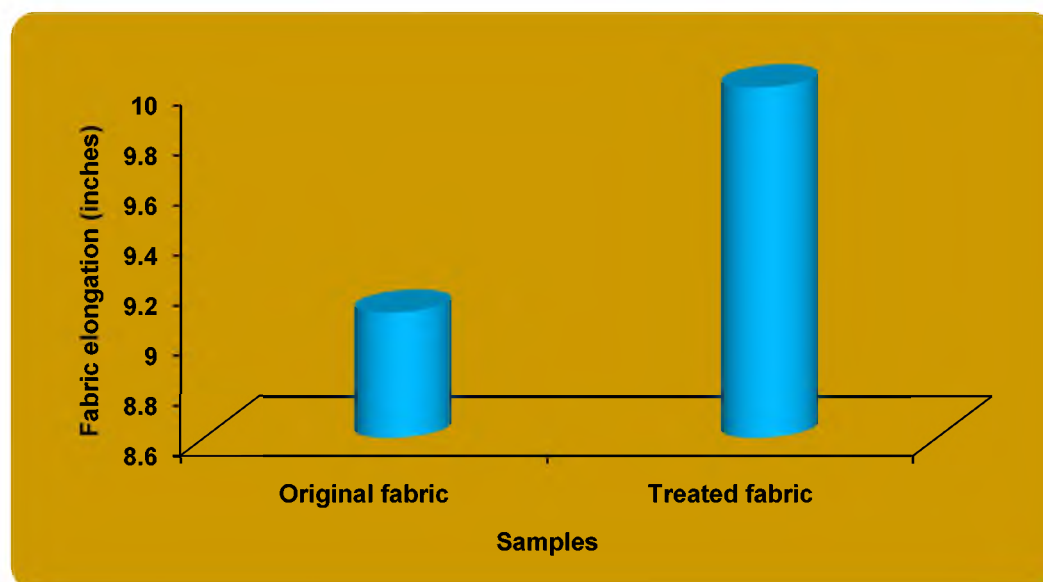


FIGURE – 6
FABRIC ELONGATION – WEFT

The Table – VII and Figure – 6 shows that the fabric elongation along weft have increased in finished cotton fabric about 10 (9.89%) respectively when compared to its original fabric. Statistically proved that there was a

significant difference at five per cent level. Thus it could be concluded that the cotton fabric finished with *Aloe vera* and *Vetiveria zizanoides* shows maximum elongation when compared to its original fabric.

4.3 TEST FOR COMFORT PROPERTIES

4.3.1 Fabric Stiffness

The results of fabric stiffness in warp and weft directions are discussed in the Tables – VIII and IX.

TABLE – VIII
ANALYSIS OF VARIANCE OF FABRIC STIFFNESS – WARP

S.No.	Samples	Mean Value (cm)	Loss or Gain Over Original	Percentage of Loss or Gain Over Original (%)	'F' Ratio
1.	Original Fabric	2.16			16.9067*
2.	Finished Fabric	2.42	- 0.26	12.03	

* Significant at five per cent level

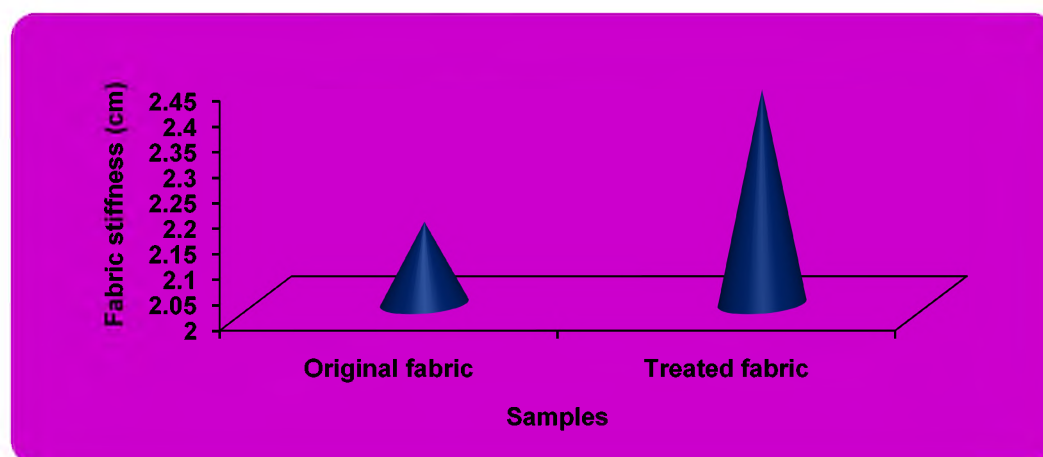


FIGURE – 7
FABRIC STIFFNESS – WARP

From the above table, the fabric stiffness has increased in treated cotton fabric about 2.42 (12.03 per cent) respectively, when compared to its original fabric statistically proved that there was a significant difference at five

per cent level. Thus, it could be concluded that the treated cotton fabrics with *Aloe vera* and *Vetiveria zizanioides* shows maximum stiffness when compared to original fabric.

TABLE – IX
ANALYSIS OF VARIANCE OF FABRIC STIFFNESS – WEFT

S.No.	Samples	Mean Value (cm)	Loss or Gain Over Original	Percentage of Loss or Gain Over Original (%)	'F' Ratio
1.	Original Fabric	1.72			7.8605*
2.	Finished Fabric	1.98	- 0.22	12.5	

* Significant at five per cent level

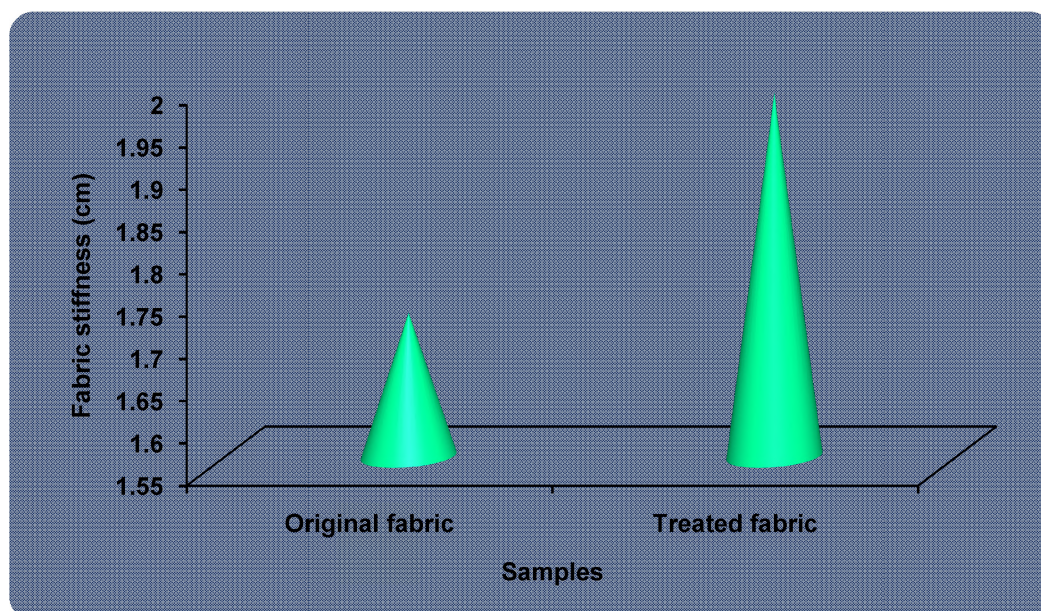


FIGURE – 8
FABRIC STIFFNESS – WEFT

From the above table, the fabric stiffness has increased in treated cotton fabric about 1.98 (12.5 per cent) respectively. When compared to its original fabric statistically proved that there was significant difference at five per cent level. Thus it could be concluded that the treated cotton fabric with

Aloe vera and *Vetiveria zizanioides* shows maximum stiffness when compared to its original fabric.

4.3.2 Fabric Crease Recovery

The results of fabric crease recovery are listed in the Table - X

TABLE – X
ANALYSIS OF VARIANCE OF FABRIC CREASE RECOVERY

S.No.	Samples	Mean Value (angle)	Loss or Gain Over Original	Percentage of Loss or Gain Over Original (%)	'F' Ratio
1.	Original Fabric	112.8			25.5575**
2.	Finished Fabric	105.2	7.6	6.205	

** Significant at one per cent level

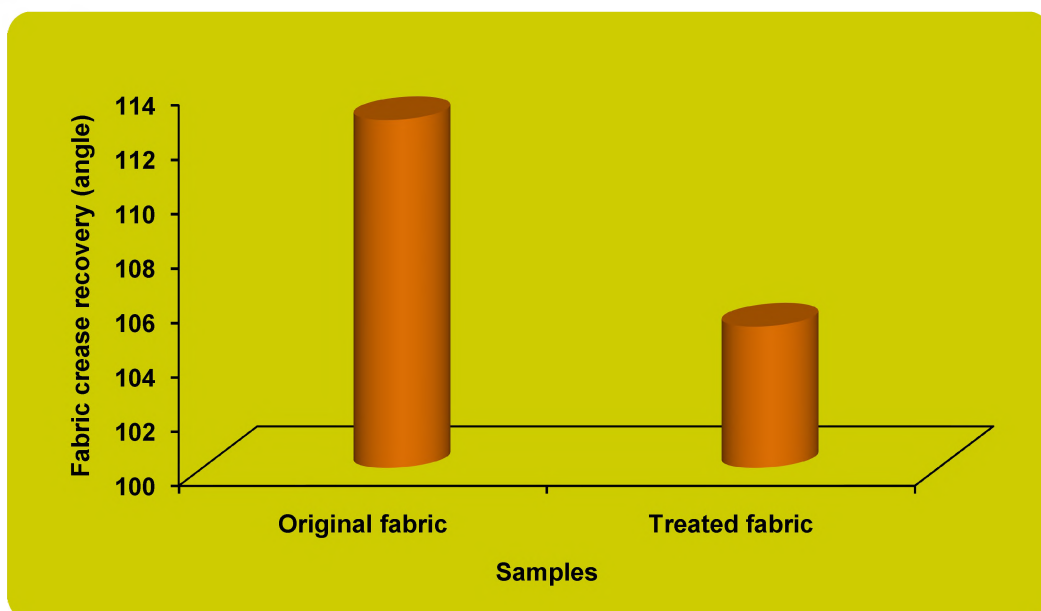


FIGURE – 9
FABRIC CREASE RECOVERY

The Table – X and Figure – 9 shows that the fabric crease recovery have increased in finished sample of cotton fabrics of about 105.2 (6.205) percent respectively when compared to its original fabric. Statistically proved that there was a significant difference at one per cent level. Thus, it could be

concluded that the finished cotton fabric with *Aloe vera* and *Vetiveria zizainoides* shows maximum crease recovery when compared to its original fabric.

4.3.3 Fabric Air Permeability

The results of fabric air permeability are shown in the Table – XI.

TABLE – XI
FABRIC AIR PERMEABILITY

S.No.	Samples	Mean value (cc / sec/sq.cm)	Loss or gain over original	Percentage of loss or gain original (%)	'F' ratio
1.	Original fabric	95.9			13.5000*
2.	Finished fabric	96.8	-0.9	0.93	

* Significant at five per cent level

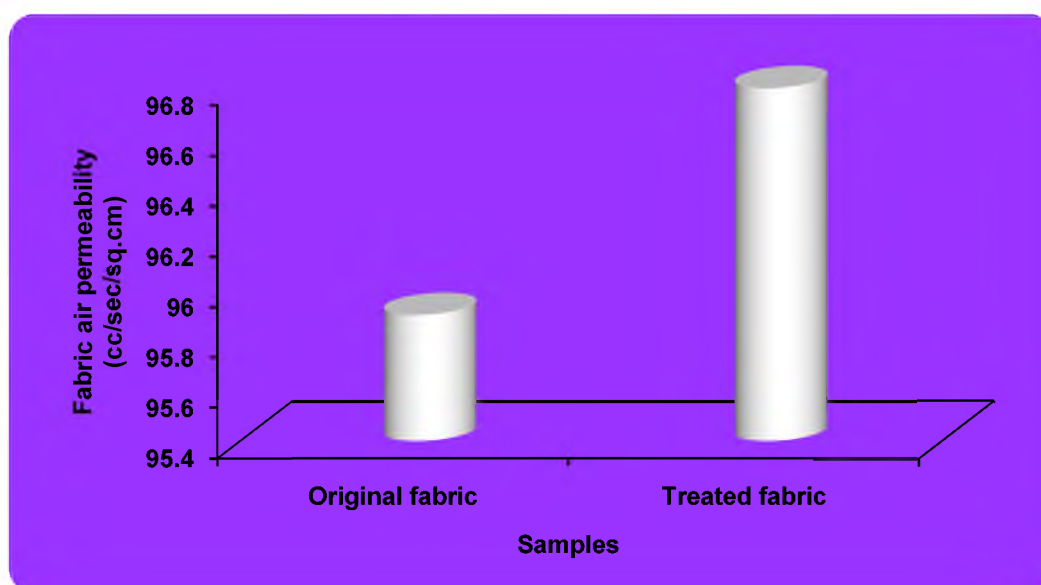


FIGURE – 10
FABRIC AIR PERMEABILITY

The Table – XI and Figure – 10 shows that the fabric air permeability has increased in finished cotton fabrics of about 96.8 (0.93) per cent respectively when compared to its original fabrics. Statistically proved that

there was a significant difference at five per cent level. Thus it could be concluded that the cotton fabrics with *Aloe vera* and *Vetiveria zizainoides* shows maximum air permeability when compared to its original fabrics.

4.4 TESTS FOR ABSORBENCY

4.4.1 Drop Test

The results of drop test are discussed below in the Table – XII.

TABLE – XII
ANALYSIS OF VARIANCE OF DROP TEST

S.No.	Samples	Mean value (seconds)	Loss or gain over original	Percentage of loss or gain original (%)	'F' ratio
1.	Original fabric	3.144			24.2760**
2.	Finished fabric	4.734	-1.59	50.5	

** Significant at one per cent level

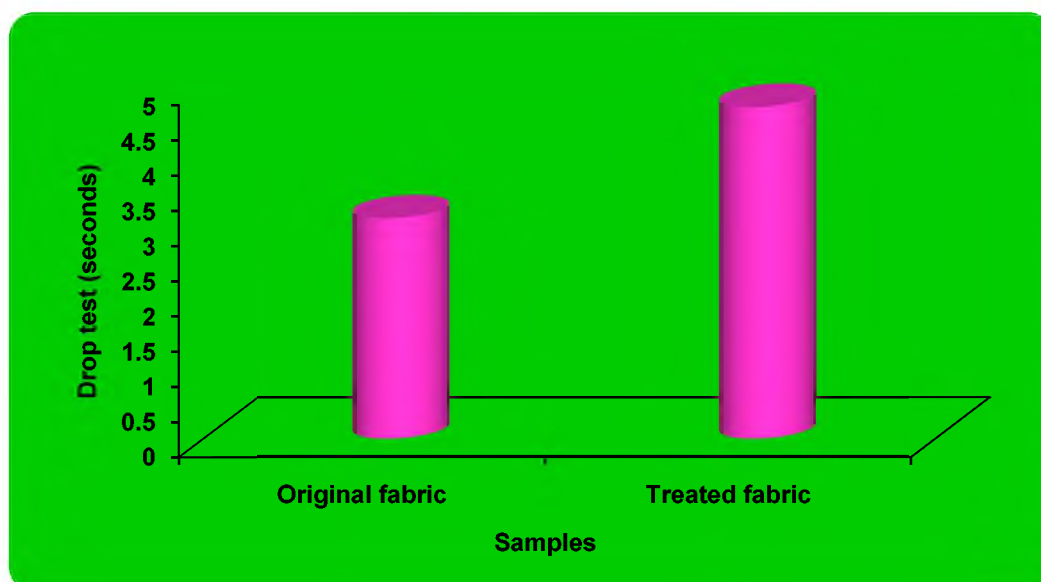


FIGURE – 11
DROP TEST

The Table – XII and Figure – 11 shows that the absorbency has increased in finished cotton sample about 4.734 (50.5) per cent respectively

when compared to its original fabrics. Statistically proved that there was a significant difference at one per cent level. Thus it could be concluded that the finished cotton fabrics with *Aloe vera* and *Vetiveria zizainoides* shows maximum absorbency when compared to its original fabric.

4.4.2 Sinking Test

The results of sinking tests are listed in the Table – XIII.

TABLE – XIII
ANALYSIS OF VARIANCE OF SINKINGTEST

S.No.	Samples	Mean value (seconds)	Loss or gain over original	Percentage of loss or gain original (%)	'F' ratio
1.	Original fabric	3.66			10.7126*
2.	Finished fabric	7.324	-3.664	100.9	

* Significant at five per cent level

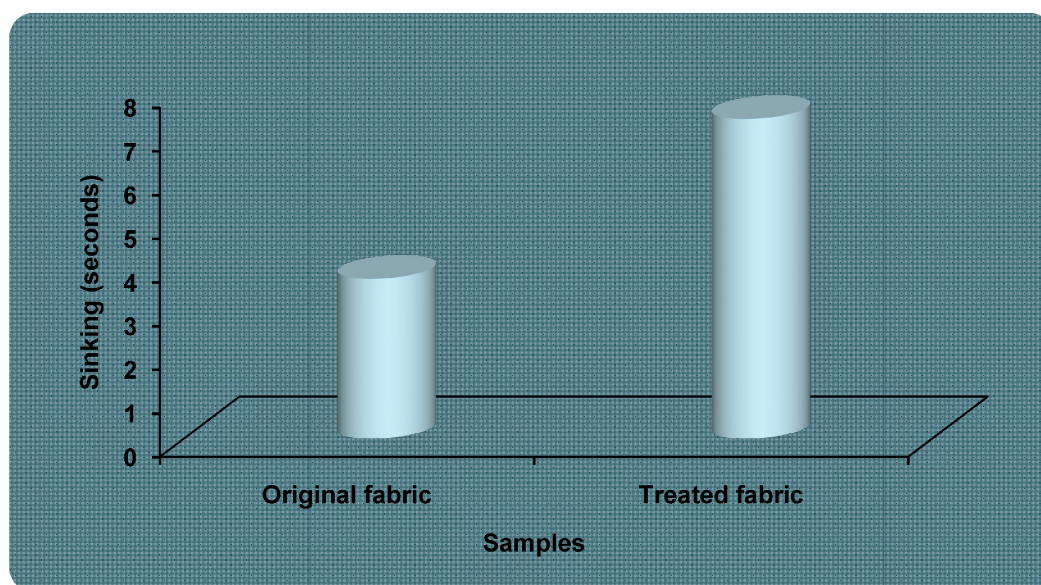


FIGURE – 12
SINKING TEST

The Table – XII and Figure – 12 shows that the fabric absorbency time has increased in finished sample of cotton fabric about 7.32 (100.9) per cent

respectively when compared to its original fabrics. Statistically proved that there was a significant difference at five per cent level. Thus, it could be concluded that the finished cotton fabric with *Aloe vera* and *Vetiveria zizanioides* shows maximum absorbency time when compared to its original fabric.

4.4.3 Capillary Test

The results of capillary test are discussed in Table – XIV.

TABLE – XIV
ANALYSIS OF VARIANCE OF CAPILLARY TEST

S.No.	Samples	Mean (seconds)	Loss or gain over original	Percentage of loss or gain original (%)	'F' ratio
1.	Original fabric	12.7			
2.	Finished fabric	13.5	-0.8	6.299	0.06*

* Significant at five per cent level

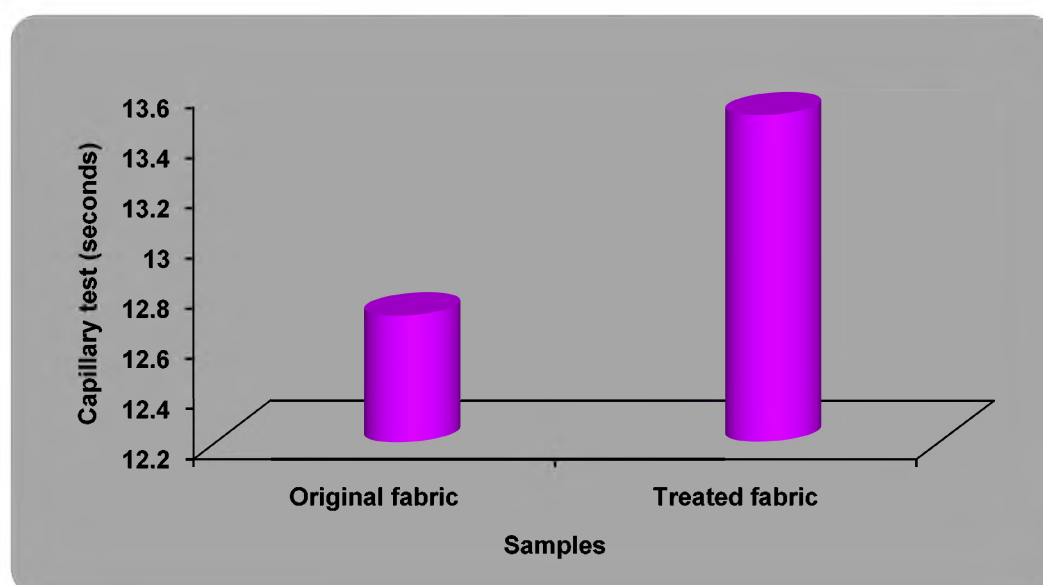


FIGURE – 13
CAPILLARY TEST

The Table – XIV and Figure – 13 shows that the fabric absorbency has increased in finished cotton fabric about 13.5 (6.299%) when compared to its original fabrics. Statistically proved that there was a significant difference at one per cent level. Thus, it could be concluded that the cotton fabric finished with *Aloe vera* and *Vetiveria zizanioides* shows maximum absorbency when compared to its original fabrics.

4.5 WEAR STUDY

The assessment of the fabric quality and its performance in actual enduses of commercial importance (Kulkarni, 2000). 15 students from the post graduate were selected as samples those who works in computer for long hours. They were asked to use the herbal treated eye pads (Plate – XVII) for 10 – 15 minutes. The wearers stated that the herbal treated eye pad did not cause any irritation and allergies. They expressed that the product was good and it gives coolant effects, calmness and it helps to relax eyes.

CHAPTER – V

SUMMARY AND CONCLUSION

The summary pertaining to the study entitled **“DEVELOPING AND EVALUATING *Aloe vera* AND *Vetiveria zizanioides* TREATED EYE PAD”** is discussed here :

Textiles and clothing find immense use in day to day life. They are mainly to cover the human body for protection against all adversities. It has become an integral part of every one's life. They are used to protect human body against climatic conditions. Hence, textiles in apparel has retained an important place in human life starting from historical era to today's modern world. In today's era of modernization of the textile industry, going through advancements of technology in every field of their industry. To ensure our security safety from the hazards, we need to equally the technology from our protection. Protective textiles refers to these textile products which have a functionality of giving protection.

Textile industry is facing enormous challenges today. The highly competitive market, ever-changing customer demands, cost reduction, value addition and strict environmental rules force organizations to try emerging techniques are demanded.

The consumers are now increasingly aware of the hygienic lifestyles and there is a necessity and expectation for a wide range of textile products finished with eco-friendly properties. Eyes is very important because every part of body has one source to reduce the heat expect eyes, which is more important organ. The main causes of thermal discomfort in eyes are continuous usage of computers, irregular sleep, television, stress and tension. There are some exercise to soothing of eyes and massaging and can be cured by appropriate medicine, but according to the old saying “prevention is better than cure” which means controlling of diseases before human get affected. Hence the investigator decide to use herbs for providing coolant

effect to eyes in cotton fabrics. Owing to its properties like absorbency, biodegradability, high strength, non-allergic, non-toxic, softness, cooling capacity. Hence, 100 per cent cotton was selected for the study.

Finishing is done to a fibre, yarn or fabric to improve its appearance, properties for its end use. Natural finishes have many advantages such as non-toxic, bio-degradable, cost-effective and availability. *Aloe vera* and *Vetiveria zizanioides* were selected as a natural finishing agents. These natural finishing agents requires a binder to adhere into the fabric, hence citric acid used as a binding agents, extraction of the herbal solution was done by ethanolic extract.

The pilot study were conducted with various parameters such as time, temperature, material, liquor ratio, rotations was changed and finally find out the best parameters for the final study. Then herbal finish was applied to the selected fabric using padding mangle technique. Then it was evaluated through subjective and objective methods. The objective tests include that the physical, mechanical, comfort and absorbency property test.

The specific objectives of the study are :

- To select the natural cellulosic fabric of 40s count
- To select the natural coolant herbal source namely *Aloe vera* and *Vetiveria zizanioides*.
- To apply coolant finish to cotton fabric.
- To evaluate the unfinished and finished fabric both subjectively and objectively.
- To construct the selected end product eye pad.

EVALUATION OF SAMPLES

Evaluation of original and finished cotton fabrics were tested by objective evaluation such as physical, mechanical, comfort and absorbency properties. The tests of laboratory tests were proved statistically.

EVALUATION

- The fabric thickness of AVFF had maximum thickness of 3.12 per cent when compared with original fabrics. Statistically proved that there was a significant difference at five per cent level.
- The weight of the AVFF has maximum weight of 7.14 per cent when compared with original fabric. Statistically proved that there was a significant difference at five per cent level.
- The tensile strength of fabric along warp in AVFF had maximum strength of 15.5 per cent when compared to its original fabric. Statistically proved that there was a significant difference at one per cent level.
- The tensile strength of the fabric along weft in AVFF had maximum strength of 36.5 per cent when compared to its original fabric. Statistically proved that there was a significant difference at one per cent level.
- The fabric elongation along warp in AVFF had maximum elongation of 7.14 per cent when compared to its original fabric. Statistically proved that there was no significant difference between samples.
- The fabric elongation along weft in AVFF had maximum elongation of 9.8 per cent when compared to its original fabric. Statistically proved that there was a significant difference at five per cent level.
- The fabric stiffness along weft in AVFF had maximum stiffness of 12.5 per cent when compared to its original fabric. Statistically proved that there was a significant difference at five per cent level.
- The fabric stiffness along weft in AVFF had maximum stiffness of 12.5 per cent respectively when compared to its original fabric statistically proved that there was a significant difference at five per cent level.
- The crease recovery in AVFF had maximum crease recovery of 6.2 per cent and there was a significant difference at one per cent level.

- The air permeability of AVFF had maximum air permeability of about 0.93 per cent when compared to original fabric statistically proved that there was a significant difference at five per cent level.
- The herbal finished samples had good absorbency as per the drop, sinking and capillary rise test.

CONCLUSION

In the present day, most of us are very conscious about our health and hygiene with the increasing work load and the need to spend several hours continuously in front of the computer system, it has become the need of time to design such accessories which will provide instant relaxation and release all the tension. From this study it was concluded that the eye pad treated with *Aloe vera* and *Vetiveria zizanioides* showed good coolant effect, which are non-toxic, non-allergic, non-skin irritant and eco-friendly. *Aloe vera* adds coolant effect and aroma of vetiver gives calmness to mind. Thus the eye pad helps to relax. *Aloe vera* and *Vetiveria zizanioides* finished cotton fabric has increased in fabric thickness, strength, elongation, stiffness and has good absorbency when compared to its original cotton fabric. Thus, the herbal finished eye pad gives good coolant effect.

RECOMMENDATIONS

- The same study could be carried out with various cooling property herbs.
- Similar study could be carried out on nonwoven fabrics.
- To obtain the good absorbency property, the finishing method can be done with nanospray techniques and microencapsulates method.

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APPENDIX – I
SURVEY QUESTIONNAIRE

Name :

Age :

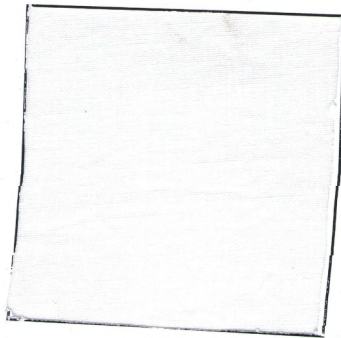
1. Have you ever heard about eye pad ?
Yes No
2. Where did you heard about this product ?
Media Friends Sales Agent
3. What influenced you to use eye pad ?
Coolant property Aroma Both
4. How often you have been using this product ?
Regularly Occasionally Rarely
5. For which type of materials you will prefer for eye pad ?
Cotton Synthetic
6. How would you rate the colours of the product ?
Excellent Good Fair
7. How would you rate the texture of the product ?
Excellent Good Fair
8. How would you rate the fragrance of the product ?
Excellent Good Fair
9. How would you rate the affordability of the product ?
Excellent Good Fair

10. How often you are used to sit in front of computer ?
Regularly Occasionally Rarely
11. How would you rate the design of the product ?
Excellent Good Fair
12. Which type of finish you [refer for the product ?
Coolant Aroma Both
13. Are you satisfied with this product ?
Yes No
14. Would you recommended using this product ?
Yes No
15. What recommendation you have for the overall improvement of the product ?

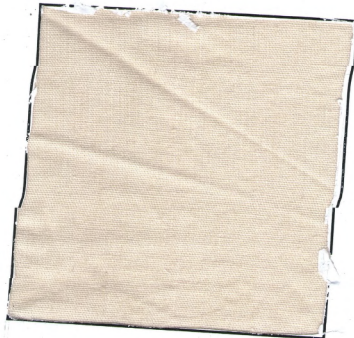
APPENDIX – II
CONSOLIDATED TABLE OF THE SURVEY

S.No.	Title	Options		
1.	Product Awareness	Yes		No
		25		5
2.	Awareness medium	Medial	Friends	Sales person
		20	10	-
3.	Use of computers	Regularly	Occasionally	Rarely
		30	-	-
4.	Materials	Cotton		Synthetics
		28		2
5.	Finish	Coolant	Fragrance	Both
		2	1	27
6.	Fragrance	Excellent	Good	Fair
		25	5	-
7.	Texture	Excellent	Good	Fair
		30	-	-
8.	Recommendation	Excellent	Good	Fair
		30	-	-
9.	Availability	Excellent	Good	Fair
		24	6	-
10.	Satisfaction	Excellent	Good	Fair
		26	4	-

APPENDIX - III
DETAILS OF THE SAMPLE



OCF



AVFF