Antibacterial Efficiency of Face Mask Treated with Selected Herbal Extracts

BY

SHALINI .S

(20PBX008)

A Thesis submitted to

Avinashilingam Institute for Home Science and Higher Education

For women

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In partial fulfilment of the requirements for the Degree of

MASTER OF SCIENCE IN BIO TEXTILES

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IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF SCIENCE
IN
TEXTILES AND FASHION APPAREL
MAY 2022

CERTIFIED AS A BONAFIDE RESEARCH WORK

30/5/22
SIGNATURE OF THE
HEAD OF THE DEPARTMENT

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SIGNATURE OF THE
SUPERVISOR

CERTIFICATE FROM THE SUPERVISOR

I certify that the dissertation entitled "**Antibacterial Efficiency of Face Mask Treated with Selected Herbal Extracts**" was submitted for the degree of Master of Science (M.Sc.,) Biotextiles by Shalini. S is the record of project work carried out by her during the academic year 2021 to 2022 under my guidance and supervision and this work has not formed the basis for the award of any Degree, Diploma, Associate ship, Fellowship, Titles in this University or any other similar institution of higher learning.

29/8/22

Signature of the supervisor with Designation

29/8/22

Signature of the HOD

DECLARATION

I declare that the dissertation entitled "**Antibacterial Efficiency of Face Mask Treated with Selected Herbal Extracts**" submitted by me for the degree of Master of Science (M.Sc.,) is the record of work carried out by me during the period from 2021 to 2022 under the guidance of Dr. **(Tmt.) K. KALAIARASI**, M.Sc., M.Phil., PhD (Avinashilingam), Associate Professor, Department of Textiles and Clothing, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-642 043 and has not formed the basis for the award of any Degree, Diploma, Associateship Fellowship, Titles in this University or any other similar institution of higher learning

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Signature of the Candidate

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INTRODUCTION

1. INTRODUCTION

Common colds can be caused by many different types of viruses. Antibiotics do not cure or shorten the duration of the illness. A common cold is a viral infection of your nose and throat, many types of viruses can cause a common cold. To recover the common cold, it will take a week or 10 days to cure. Runny nose, sore throat, cough, mild headache, body pain, sneezing, fever, feel unwell, throat pain, headache, breathing problem, wash your hand twice in a day, close your mouth while coughing don't share your utensils, food and drinking glasses, stay away from people who have cold take hot water, take lemon water and honey, take rest, keep stream using a tablet or by adding natural herbs such as neem etc.

Flu is a respiratory illness caused by influenza viruses most people who get the flu recover completely in 2to to3 weeks but some people develop serious and treating medical complications such as pneumonia. Annual influenza vaccination is used to prevent illnesses and death caused by influenza. Influenza H1N1 viruses. Fever, chills, muscular pain, cough, runny nose, headache fatigue, wash your hand thoroughly &frequently stay away from others, sleep well, eat nutrient rich diet drink water &fluid, take rest, drink water broth, drink herbal tea, and apply essential oils while washing.

Covid 19 is a disease caused by a new strain of corona viruses" CO" stand for corona "VI" for virus and 'D" for disease .COVID 19 viruses is new virus linked to the same family of viruses as severe acute respiratory syndrome (SARS) & some type of common cold .Fever, cough, shortness of breath, are the common symptoms of the disease, muscle pain and sore throat are other less common symptoms. In some studies, it has been shown that the virus also involved the central nervous system and the symptoms of loss of smell and difficulty in breathing.

The virus is usually transmitted from person to person through droplets formed due to coughing, talking, sneezing, etc.., and contact transmission such as contacting with oral, and eye mucous membrane (Lepelltier *et.al*, 2020). Natural textile based face masks are designed and produced by integrating smart bio-structure, chemical, or technologies into the textile materials to provide more functionality such as comfort and protection to the wearer or patient .Modern medical textile have superior properties such as antibacterial, antifungal, prevent allergies cross –contamination and odour,durable,and many more benefits. It is suggested that Nano -fibre layer face masks (Das *et al*.,2020).

CDC recommented wearing the surgical masks over the cloth mask also worked well against the COVID 19 these kinds of double masks prevent the spreading as well as exposing or protecting the wearers from viruses. Additionally, it was also recommented to wear multiple layer mask i.e.., KN95, surgical mask, which dramatically prevent the virus exposure and spreading cloth mask or surgical. Stay home, when sick, cover mouth and nose with tissue when coughing or sneezing, dispose used tissue immediately wash hand often with soap and water, cleaning frequently touched surface and objects take rest, stay home, drink fluid, and wear a mask.

Cloth mask have 3 layer including middle, disposable, inner layer absorbent material and middle layer non -woven non- absorbent material such as polypropylene, outer layer polyester or polyester blend ,wash your hand frequently, wear a mask don't touch eyes, nose or mouth avoid contact with sick people ,maintain social distance from people .Banda is one type of mask is a triangular or square piece of cloth that often worn as a head or neck covering, provide some production against cough or sneeze. In cloth mask type of finishes are given like herbal finishes such as neem, tulsi, aloe Vera, turmeric, these herbs used as a finishing for a cloth masks, like placing bunch of vetiver, lemongrass and eucalyptus Sangeetha saravana decided to make regular cotton and they lined with vetiver roots.

Vetiver refreshing aromatic fragrance vetiver has antifungal, antibacterial properties. Inhaling vetiver improve immunity relief from insomnia, fatigue, stress, keeps the body cool. Properties of Vetiver Act as antioxidant, Act as Antimicrobial agent, Anti-inflammatory, It boosts immune system, It keeps our body cool, Rejuvenates Mind and body, Refreshing Aroma, properties of lemongrass are natural decolourizer, skin health ,hair health, kills bacteria, fever reducer, effective antiseptic agent, heals cold or flu, boots immunity ,removes harmful toxic waste. Textiles and clothing are in permanent contact with microorganisms from the environment and the human skin. Textile materials are good carriers of various types of microorganisms and can cause health related problems to the wearer.

These micro-organisms create problems in textile, including discolouration, stains and fibre damage, unpleasant odour and a slick, slimy feel. Hence to protect the wearer from infection, textile fabrics can be finished with antimicrobial agents. Antimicrobial textiles with improved functionality find a variety of applications such as health and hygiene products, specially the garments worn close to the skin and several medical applications, such as infection control and barrier material. Herbal antimicrobial finish is one of the special finishes which can

be applied to the textile material to protect the skin of the wearer. Azadirachta indica, commonly known as neem. Neem has been extensively used in Ayurveda. All parts of the neem –tree, leaves, flower, seed, fruit, root and bark have been used traditionally for the treatment of inflammation, infection, fever, skin disease and dental disorders. Neem leaf and its constituents have been demonstrated to exhibit anti-inflammatory, anti-ulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant properties. Properties of vetiver act as antiseptic, act as antimicrobial agent, and act as anti-inflammatory, boost immune system, keeps body cool, refreshing aroma.

There is a vast resource of natural antimicrobial finish which can be used for imparting antimicrobial property to textile substrates. Some of the mostly used natural antimicrobial agents are clove, cardamom, curry leaves, neem, tulsi stem, leave, aloe Vera, etc. Several studies have been done on antimicrobial activity of cotton fabric treated with neem and vetiver effect of laundering on herbal finishes, antibacterial treatment on cotton fabric from neem, vetiver etc...

Considering the importance of antibacterial finished face masks, the present study "Antibacterial Efficiency of Face Mask Treated with Selected Herbal Extract" was aimed with the following objectives

- To finish the selected fabric with herbal extracts
- To develop herbal finished face mask
- To design and construct a face mask
- To determine the antibacterial activity of face masks treated with selected herbal extracts.
- To evaluate the antibacterial durability of the face mask.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

2.1 Face mask

2.1.1 Effectiveness of facemask

2.1.2 Natural textile cloth mask

2.2 Types of masks

2.3 Antibacterial herbal finish on textile

2.4 Fabric for making mask

2. 5 Medicinal herbs

2.5.1. Neem

2.5.2 Eucalyptus

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2.5.9 Turmeric

2.5.10 Athimathuram

2.5.11 Karpooravalli

2.6 Properties of herbs

2.7 Benefits of Wearing mask

2.1 Face Mask

A covering for the mouth and nose that is worn especially to reduce the spread of infectious agents such as bacteria or viruses face mask have been adopted as one of the measure to reduce the COVID 19 spread. A face mask is one of the personal protective equipment PPES used for shielding healthy people .The mask is worn to minimize exposure to various hazards such as physical, chemical, head ,biological most preferable PPE in COVID 19 epidemic is N95 (air purifying mask). Generally, face mask can protect the wearer from inhalation of hazardous gases and air bone microbes.

Mask classified into two categories surgical, respiratory, surgical mask are prepared from non-woven fabric through melt brown process, three-layer outer layer, middle and inner layer. Outer layer made of non –woven ,middle layer made of medical grade filter paper, Inner layer made of soft non –woven fabric ,surgical mask do not allow to penetrate large diameter particles .The penetrate efficiency was against bacteria droplets. Respiratory mask are usually used to inhale in hazardous toxic atmosphere mask usage in different environments and type of filter or cartridges. Two main type of respirators are air purifying respiration, air supplying respiration. Respirators are most useful in different industries including defence, health care, pharmaceutical, oil and gas, mining, agriculture, textile, Beside respirators and surgical mask another type of protective mask is also available such type of mask are N95and cloth mask, KN95 has four layer in which the middle layer act as filter layer fabricated from combination of needle punched cotton fabric, both side of the outer layer made of non-woven fabric. (M.Alfelali *et al.,* 2016)

2.1.1 Effectiveness of Wearing Face Mask

The use of face mask is preliminary essential to stop spread virus through the air. The use of the face mask is uncomfortable, however face mask do not lead to lowering the body oxygen level of health care workers (Yang *et al* .,2017) There are different oxidative methods to measure the breathing zone, the preliminary result shows that weaving of cloth mask over the nose and mouth can significantly reduce the risk of spreading the virus it indicates how face masks work to slow air-bone infection or stop viruses (Staymates *et al*.,2020)

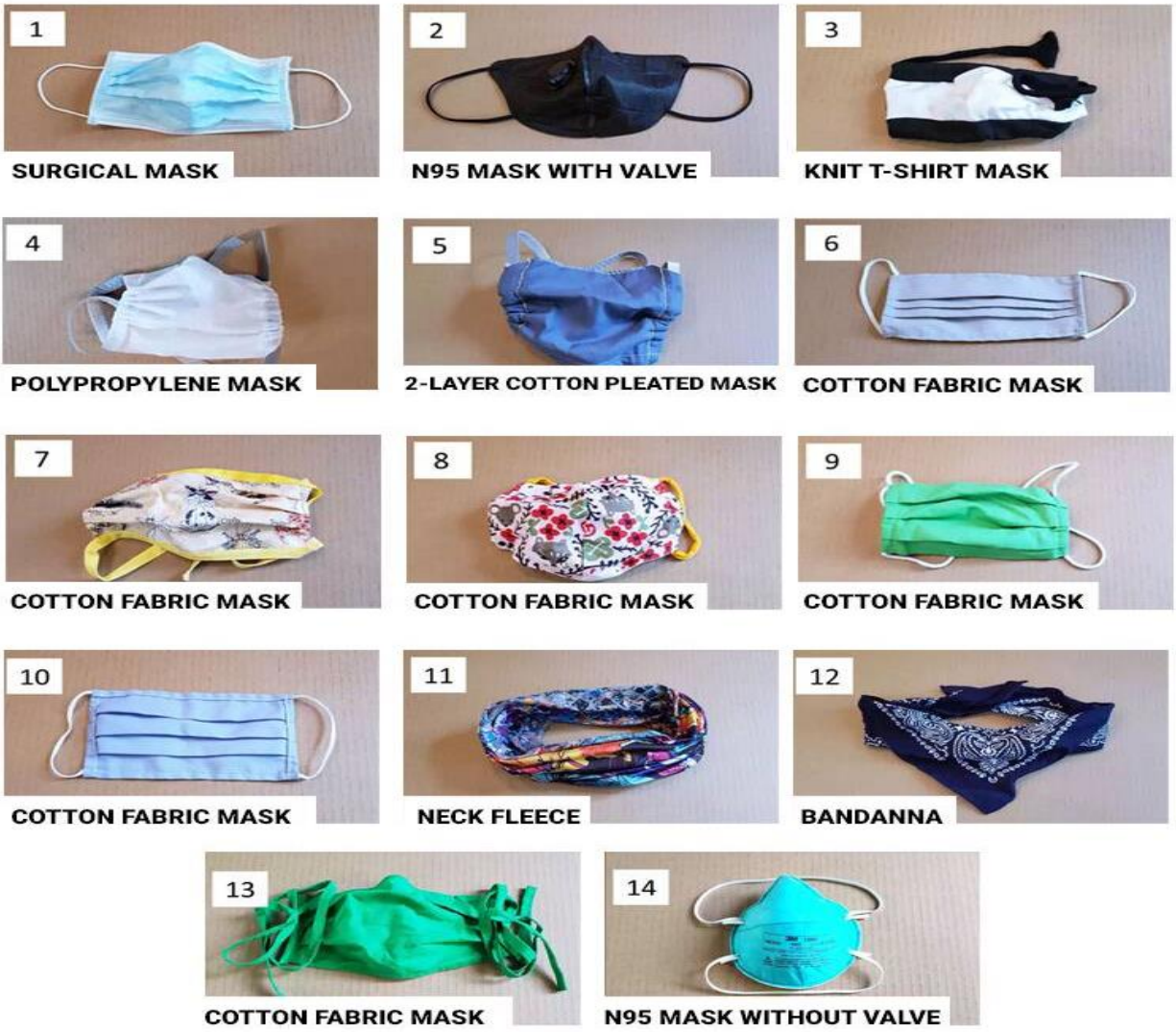
2.1.2 Natural Textile Cloth Mask

Natural cellulosic fibre like cotton, flax, hemp, etc.., have good mechanical strength ,hydrophilicity and bio comparability ,therefore they widely used in viral filters (Lebun *et al*.,2017). It observed that self-designed three layered cellulosic cotton mask could be a potential substitute for a medical mask that is mainly made of synthetic polymer .A mask made of synthetic polymer cause respiratory infection during use regularly the cotton mask is natural, non-toxic ,washable and reusable. Two layer 100% organic cotton face mask mouth mask with filter pocket was developed which is made of super soft and pure organic cotton fibre in a tightly knitted fabric structure. Hemp is another organic cotton fibre. A bilayer 100%hemp and organic cotton cloth face mask can better product our skin, nose and mouth. The mask can be cleaned and disinfected by treating inside boiling water for 30s (Schoenberg, 2020) various antiviral coating are applied on natural textile fabric to enhance the performance of mask against viral barriers and disinfection. The coated fabric antiviral and used to prepare is antiviral mask (Tilket *et al*.., 2011).Apart from the coloration and skin safety herbal resource has various functional properties like antimicrobial, antifungal, UV Protection insect repellent, aroma finishing to the textile fabric various herbal extracts are used for the preparation of bio-degradable masks that claimed to be virus neutralizer and resist pathogens effectively (Kim *et al*.., 2020).

The herbal extracts obtained from turmeric, neem, tulsi ,black pepper ,sandal wood ,clove, and saffron were prepared on non- woven ,nano fibre filter media to prepare biodegradable and bio based facemask .The mask showed properties such as antiviral, antibacterial, bio-degradable, super hydrophobic outer layer hydrophilic inner layer ,top and bottom layer of mask are made of cotton fabric hydrophobic, hydrophilic respectively middle layer is a Nano web made of biodegrable 100%cotton cloth (double layer)is 70% effective as a surgical mask for capturing small particles which is breathable. Cotton fabric is most available in home plenty of masks attempts have been made using natural resource such as turmeric, neem, tulsi, etc.., either alone or blend to enhance the antiviral effect. In additional to cultivated plant agro processing wastes like peanut skin, pomegranate rind, walnut bark etc.., are loaded with the abundant amount of phytochemical like saponins, flavonoids, glycosides. Which provide characteristic to the textile such as antimicrobial (Jose *et al.*, 2019), Antioxidant (Pandey *et al*., 2017), Ultraviolet and deodorizing properties in addition to good colour (Pandit *et al*., 2017). Advantages of herbal resource for conventional face mask are nontoxic, eco-friendly, natural resource, easy disposal.

2.2 Types of Masks

Face mask is an important tool in preventing from air bone disease. It can offer complete protection when worn properly covering nose and mouth. In pandemic situation the mask have become mandatory, are often made from woven, knitted , Non- woven ,different type of mask are available such as clothmask,N95 mask, Reusable mask, Non-woven mask, Knitted mask, Herbal mask (Bio-filter),Surgical mask (medical mask).There are different type of design available in face mask they are, Solid colour mask, floral face mask, tie and dye, stripped ,plaid, and animal print.(Barrios *et al.*,2020).



TYPES OF MASK

- 2Ply Cloth Mask: Light weight, washable. Protection against COVID is good
- Treated Polyester Mask: Polyester blend, water and droplets repellent, breathable and washable. Protection against COVID is better
- Scrub Grade Face Masks: Polyester poplin, water and droplets repellent, tightly woven fabric, washable. Protection against COVID against best production

2. 3 Antibacterial herbal finish on textile

Micro-organisms may deteriorate the clothes in a closet, curtains, carpets, bed, bath and kitchen linens, pillows, and mattresses. Several microorganisms also thrive on the skin, while dust mites live on skin cells sheded on sheets, towels, and clothing. A hospital houses an immense amount of textiles with high volumes of traffic. Because of the constant flow of people, especially those with infectious diseases, specific finish hospital uses are required. Patients, caretakers, and hospital staff are at risk of acquiring infection as inherent properties of the textile fibers susceptible to the growth of micro-organisms.

In past, natural dyes were applied to textiles for simultaneous coloration and antibacterial finishing successfully. Finish imparted by catechu on wool was found to be effective against Escherichia coli, Staphylococcus aureus. Observed antibacterial characteristics and negligible cytotoxicity of catechu indicated the dye as a promising antibacterial agent for developing bioactive textile materials and herbal clothing Several natural, nonmetallic, and antibacterial finishes exist, and one of such antibacterial finish is chitosan, a deacetylate form of chitin, which is a main component in crustacean shells and reported to be effective against both Gram-positive and Gram-negative bacteria Many antibacterial textiles are produced with the combinations of bioactive substances to enhance the antibacterial efficacy of the finishes and counteract the negative aspects of the treatments. By combining finishes, the occurrence of drug-resistant strains arising from the finish is reduced.

Pure cotton woven/knitted fabrics treated with the selected medicinal 16 medicinal herb extracts such as neem, turmeric, holy basil, and sandal wood have been evaluated for curing seven different diseases such as allergic dermatitis, asthma, liver disorders, headache, joint pain, and sinus trouble/cold. Seven different types of garments have been developed. The antibacterial assessments of the medicinal herb extracts treated fabrics and clinical trials have confirmed the correlation between the performance and its antibacterial activity. The curative

property of the garments in all the cases was found to be significant and lasted for 10–15 washes.

Benefits of herbal textile

Although known since long for dyeing and medicinal value, the protective properties of herbal dyes have been noticed only recently. Several plants used for dye production are classified as medicinal, and some have recently been shown to possess significant antimicrobial activity. Several natural dyes have demonstrated to possess antibacterial activity like curcumin from turmeric.

These natural antibacterial agents may significantly reduce the risk of infections especially when they are used in close contact. Natural bioactive compounds present in natural dyes/pigments have also been reported as significant antibacterial agents for finishing in green dyeing procedures. It acts as a revitalizing tonic and helps in keeping the body fresh and healthy. The uses of proper herbs in the textiles have proven to cure diseases such as arthritis and fever. We breathe through our body more than we do through nose. It can improve the skin's natural ability to block and resist the harmful chemicals and toxins from entering the body, which will be beneficial to health.

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Herbal cloths have the ability to protect us from various skin diseases and provide relief from infectious diseases and mental ailments. No synthetic/chemical dye is used at any stage of herbal cloth production. For washing and cleaning purpose, the nut or nut powder of Sapindus laurifolia is recommended Medicinal herbs treated fabrics also have a lot of therapeutic value; thus, the fabric has been found very helpful for people suffering from ailments such as skin allergies, breathing problems, sleeping disorders, and blood pressure.

The health benefits of herbal clothing and its usage depend on the theory of touch. The body loses toxins when it comes in contact with herbal clothing, and this improves the

metabolism. Herbal clothing is also known to help fight against many common diseases such as diabetes, hypertension, skin allergies, asthma, and heart ailments. The human body naturally heals itself during sleep or meditation. Thus, when the body is at rest, herbal clothing will work most effectively. The skin is known as the largest organ of the body. Not only it acts as a fence and protects the body, but it can also be the channel for outside germs and toxins to enter into the body. Herbal clothing guards against the harmful toxins trying to enter the body through the skin

Herbal textiles are mainly used in making sleepwear, undergarments, bed coverings, towels, meditation clothing, and so on, which remain close to the skin absorbing all the benefits it gives out. Herbal textiles are also used in home textile products such as mattresses, coir mats, doormats, bath towels, bedspreads, and carpets. Some of the herbal constituents are antiallergens and hence are safe for skin contact and are mostly non-hazardous to human beings. Natural dyes are usually mothproof and can replace the synthetic dyes in kids' garments. We breathe through our skin more than we do through the nose, and chemically dyed textiles having carcinogenic amines and chemicals may be allergic and dangerous to human skin. Organic clothing can help reduce the exposure to allergens and other irritants and give a comfortable feeling

2.4 Fabric for Making Mask

Material suitable for making cloth face masks such as cotton, cotton blend flannel, polyester, chiffon, silk and linen, and knitted facemask. Mostly cotton fabric is used to make a mask

2.5 Medical Herbs

Herbs at are used to cure a cold, cough, and flu such as turmeric, neem, vetiver, eucalyptus, clove, cinnamon, basil, tulsi, ginger, vasambu, betel eaves, carom seed, karpooravalli, omam.

2.5.1 Neem

Neem tree Azadirachta Indica belongs to the family Meliaceae. Neem oil is extracted from the seed of the neem tree and has medicinal properties and is used for pests' control in rice cultivation. .Neem bark and roots also have medicinal properties. Antimicrobial, Antifungal.

Develop nine products such as diaper, napkins, baby night wear, bib, gloves, masks, apron, and baby sheet (Banerjee *et al*.,2002).

2.5.2 Eucalyptus

Eucalyptus is a myrtaceae family, mainly originated from Australia comprising of more than 700species .The tree from tall open forest woodlands and occur in environments ranging from area of high rainfall to semi region and from sea level to subalpine altitude. A few species have been described as occurring outside the Australian territory. As the same time growing pulp and paper industry particular in South America and Africa (Eldridge *et al*., 1994).

2.5.3 Vetiver

Vetiver belong to poaceae family, commercials essential oil of vetiver is obtained by distillation of the roots. Vetiver mask is a herbal mask made of natural vetiver herb and pure cotton material. vetiver mask is eco-friendly and can be washed and reused several time the earthy fragrance of vetiver act as natural rejuvenator for mind and body, reusable , washable eco friendly100 % natural .Fabric made up of handloom product are comfortable, pure eco-friendly and stable in all-weather condition, vetiver has antifungal, antibacterial properties (Venugopal *et al*.,2017).

2.5.4 Cinnamon

Cinnamon is a common spice used by different culture around the world for several centuries. Cinnamon belong to lauraceae family .It act as an Ayruvedic medicine cinnamon is considered a remedy for respiratory digestive. Almost every part of the cinnamon tree such as bark, flower, leaves, fruit, and root have some medicinal properties (Andrade *et al*.,2017).

2.5.5 Ginger

Ginger belong to zingiberaceae family and commonly consumed as a spice and an herbal medicine for long time. Ginger root is used to treat several common disease such as headache, cold, nausea, etc.., properties Antioxidant, anti-inflammatory, and antimicrobial, anticancer. Prevent several diseases such as neurodegenerative, cardiovascular disease, obesity, diabetes, respiratory disorder (Madhulika singh *et al*., 2006).

2.5.6 Tulsi

Tulsi belong to the labiate's family. Tulsi is also called holy basil. plant is cultivated for medicinal purpose and for its essential oil tulsi is aromatic plant Lamiaceaeeae family tulsi is quite helpful in curing bronchitis, influenza, and asthma. It highly beneficial in treating diseases such as heart disease, headache, stomach disorder hepatitisies, malaria, tuberculosis,

and dengue. Essential oil and tulsi leaf powder are useful for dental health and, health gum. Essential presents in the tulsi is responsible for its antiviral and antibacterial properties (Sushil *et al*., 2017)

2.5.7 Vasambu

Vasambu or *Acorous calamus* belongs to *Araceae*, vasambu is used to treat cough fever pain and the powder vasambu is mixed with honey to treat cough, The rhizome is burnt and the ashes are mixed with coconut oil and applied over the lower abdomen flatulence *Acorous calamus* is a natural plant source, it is non–toxic, non-allergic, bio-degradable cost-effective easily available material. It smells pleasant and is non-irritation to human beings. Fresh and dry leaf and dry rhizome extract have been found to possess antimicrobial character due to the presence of chemical component (Kumaran *et al*., 2010).

2.5.8 Betel Leaves

Piper Betel belongs to Piperaceae and it is been used longer in the Indian local system of medicine. In ancient India. Betel leaves are considered auspicious. It helps in reducing the difficulty in breathing for people suffering from asthma the leaves are nutritive and contain anti-carcinogens and are used for manufacturing of a blood cancer drug. The leaves are used to treat cough, foul-smelling in mouth, bronchitis and clears throat (Chakraborty *et al*., 2011).

2.5.9 Turmeric

Turmeric is a flowering plant, belong to the curcuma longa of the ginger family *Zingiberaceae*. Turmeric is used to cure various human diseases such as Arthritis, heartburn (dyspepsia), joint pain, stomach pain, crohn's disease and ulcerative colitis, diarrhoea intestinal gas, jaundice, liver problem, high cholesterol, skin inflammation from radiation treatment and fatigue. Effective for hay fever, depression, osteoarthritis, Itching Alzheimer's disease, eye inflammation, and colorectal cancer. (Bhowmik *et al*.,2009)

2.5.10 Athimathuram

Liquorice is a common name of Glycyrrhiza glabra, a flowering plant that belongs to the Fabaceace family, Licorice roots are directly consumed to get relief from cough and sore throat. It is also beneficial in managing gastric problems like stomach ulcers, and heart bun due to its antiulcer, antioxidant, and anti-inflammatory properties. Athimadhuram is a rich antioxidant to improve immunity power effectively, Athimaduram for skin disease the powder of dried athimathuram roots can be used for many skin diseases like psoriasis, itching, eczema, and dermatitis. Rashes can also be cured with lotion. Medicinally it is used internally for addisons disease, asthma, bronchitis, peptic ulcer, arthritis and allergies (Chopra *et al*., 2013).

2.5.11 Karpooravalli

Coleus amboinicus belong to *Lamiaceae* family it is highly aromatic perennial herbs with a lot of health benefits and medicinal uses and it is mainly used to treating cough and cold and also used to treat asthma, fever, aiding weight loss and it has antifungal properties used as treatment for skin infection, mouth ulcer, indigestion. And it is therapeutic herb, antioxidant, antimicrobial activity. *Coleus aromatic* is helpful to cure cough, cold and respiratory infections the juice of leave is applied on the affected part of the skin in cases of insect's bites, allergic skin thickening, itching and skin irritation, it is a folk bric medicinal plant used to treat malarial fever, hepatopathy, renal and vesical calculi, cough, chronic, asthma, high cough, bronchitis **(**Prajapati *et al*., 2003)

2.6 Properties of Herbs

Properties of lemon grass are Natural decolourized, skin health, hair health, kills bacteria, fever reducer, boost the immunity, heals cold and flu, effective antiseptic agent, and removes harmful toxic wastes. Properties of vetiver Act as antiseptic, act as antimicrobial agent, and act as anti-inflammatory, boost immune system, keeps body cool, refreshing aroma. Properties of neem are Anti- microbial properties, Antifungal properties. Properties of turmeric are Arthristic, heart bun, joint pain, stomach pain, Headache, bronchitis, colds, lung infection, hay fever, itchy skin

2.7 Benefits of Wearing Mask

Masks act as a physical barrier to protect and others from viral and bacterial particulates. It cuts down the breathing that sends the virus up to six feet away at the home

- Reserved for frontline healthcare workers
- N95 masks with a valve will not filter out the virus

Should be saved for medical professional disposable face mask, and it is single-use after use disposed of (disposal face mask). N95 respirators filter at least 95% of airborn particles if fitted and worn properly. Medical grade masks are preferred. Non-medical grade N95 mask during an outbreak if medical alternatives are unavailable. Surgical mask normally worn in the operating room to protect patients and medical staff against large droplets, Losser fit, less protection than N95, doesn't protect against small air-bone particles

Refreshing Ayurvedic mask with cotton envelope Health Benefits: Enhance enriches, rejuvenates mind and body keeps your body cool, Refresh aroma, Boost immune system, Anti-inflammatory, Antimicrobials. (Luciano Bubbico *et al.*,2021)

METHODOLOGY

3. METHODOLOGY

The experimental procedure adopted for the study on **Antibacterial Efficiency of face masks treated with selected herbal extract** was discussed under the following headings.

3.1 Selection of fabric

3.1.1 Pre-treatment

3.1.2De sizing

3.2 Preparation of Herbal Extract

3.2.1 Selection of herbal source

3.2.2 Herbal Extraction

3.2.3 Herbal finishing of selected Fabric

3.2.4 Fabrication of face Mask

3.3 Fabric Evaluation

3.3.1 Antibacterial Assessment

3.3.2 Fabric weight

3.3.3 Fabric Thickness

3.3.4 Fabric Strength

3.3.5 Fabric Elongation

3.3.6 Fabric Stiffness

3.3.7 Absorbency Test

3.3.8 Fabric Sinking

3.3.9 Fabric Wicking

3.3.10 Wash durability

3.1 Selection of fabric

The natural fibre issued for dyeing. Cotton fabric is preferable for dyeing as it is cellulosic. Cotton fabric is soft, fluffy and, breathable. It is comfortable to wear and its absorbency is good. Cotton fabric is used for medicinal uses such as surgical or cleaning the wound. Cotton absorbs approximately 25 times its weight of water, which makes it an easy fabric to dye. The fibers breathe by quickly soaking up and releasing moisture. Mercerized cotton dyes more brilliantly than un mercerized cotton, because the mercerization process removes small imperfections in the surface that scatter light, causing the color of the fiber to appear lighter and less intense. So, mercerized cotton is than regular cotton. Hence, cotton was selected for the present study.

3.1.1 Pre-Treatment

Pre-treatment is the process that is used to remove impurities from fibers or fabric to make it dyeable or printable. Natural fibers and synthetic fibers contain primary impurities that are contained naturally and secondary impurities that are added during spinning, knitting, and weaving processes. Textile pre-treatment is a series of cleaning operations. All impurities, which causes adverse effect during dyeing and printing, are removed in the pre-treatment process (Shovon, 2020). Pre-treatment remove all the natural impurities present in the fabric, improve the moisture absorbency of the fabric. Remove all the immature fibers present in the fabric and improve the degree of whiteness.

3.1.2 De-sizing

The de-sizing process is applicable in cases where the fabric contains size materials like starch, binder, softener, etc. If the fabric doesn't have size materials, the sizing process is not applied during the pre-treatment of the fabric. The process of removal of starch, gum, and lubricants (softener) from the fabric is called as de sizing. Desizing is carried out by treating the fabric with dilute Hydrochloric acid. Desizing, irrespective of the de-sizing agent, involves impregnating the fabric with the desizing agent, allowing the de-sizing agent to degrade or solubilize the size material, and finally wash out the degradation products. The selected cotton fabric was desized with the following recipe.

Recipe for desizing:

Table 1

Material	Weight
M:L ratio	1:20
Detergent	3%
Soap oil	2%
Time and temperature	100°C / 1hr

PLATE I

De sizing

3.1.3 Scouring

Raw cotton must be free of non-cellulosic impurities before further processing into dyed and finished products. Traditionally scouring is performed with hot aqueous alkali. Environmental friendly bio scouring using suitable enzymes instead of alkali is gaining more acceptance. The selected fabric was scoured with the following recipe

Table 2

Material	Weight
M:L ratio	1:30
Detergent	1%
H_2O_2	3%
NaOH	2%
Fabric weight	5gm
Time	1 hr
Temperature	100°C

3.2 Selection of Herbal Source

Herbs are used to cure cold, flu and cough. Herbs such as neem, turmeric, basil, spearmint, garlic, ginger, clove, cinnamon, eucalyptus, carom seed, omam, vetiver and karpooravalli are used to cure cold, cough and flu. Neem possess anti-bacterial, anti-fungal, and anti-septic properties. It is used to cure asthma, treat ulcer, control diabetics, maintain oral hygiene and health, increase blood circulation and helps to cure leprosy, Vetiver is a used to cure cold cough and flu and it also have medicinal properties. The ayurvedic literature mentioned that vetiver plant is used as digestive, antiashmatic antigout, antimicrobial and diuretic agent (Naikwadi *et al.*, 2019). Based on Antimicrobial Properties Neem and vetiver were selected for the present study.

PLATE I I

a. NEEM – *Azadirachta indica*

b. Crushed neem into a powder

PLATE III

a. VETIVER - *Chrysopogon zizaniooides*

b. Crushed vetiver into a powder

3.2.1 Herbal Extraction

Herbal extraction was done by taking 10% of Neem and vetiver separately in water. The solution was boiled for 30min at 100°c .The extracted solution was filtered and used for finishing the cotton fabric.

Herbal Extraction

TABLE 3

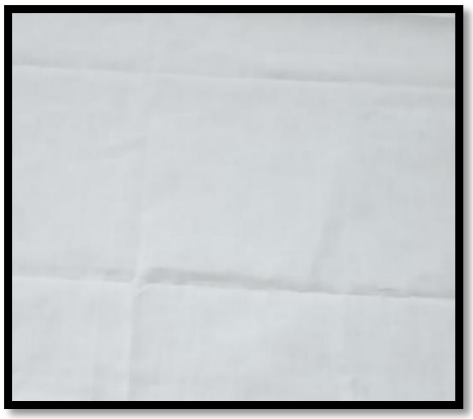
Herbal powder	10 grams
Water	100 ml
Time	30 min
Temperature	Boiling point

3.2.2 Herbal Finishing of Selected fabric

The selected cotton fabric was finished with the extracted Neem and vetiver solution separately by taking material liquor ratio of 1:30 and boiled for 30min at 100°C.The cotton fabric was also finished Neem ; vetiver blend in the ratio of 50:50.The finished fabric were rinsed with clean water and shade dried.

Table 4

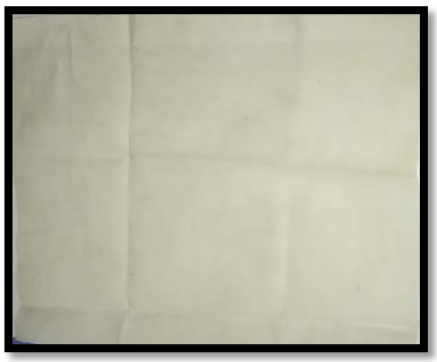
Sample 1	Fabric finished with neem
Sample 2	Fabric finished with vetiver
Sample 3	Fabric finished with neem and vetiver



a. COTTON FABRIC

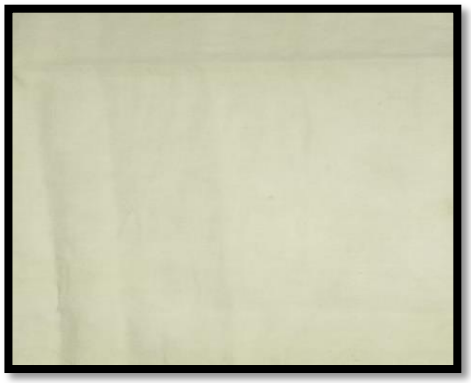
b. DE SIZING

c. DESIZED FABRIC



d. VETIVER DYED FABRIC

e. NEEM AND VETIVER FINISHED FABRIC



f. NEEM FINISHEDFABRIC

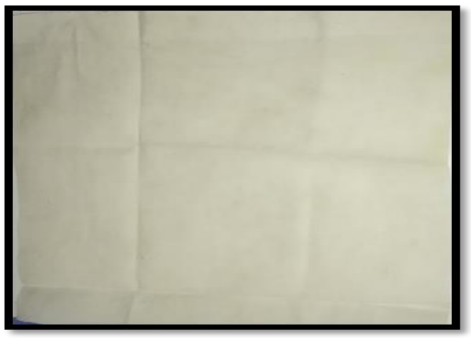
PLATE IV

Finishing of cotton fabrics

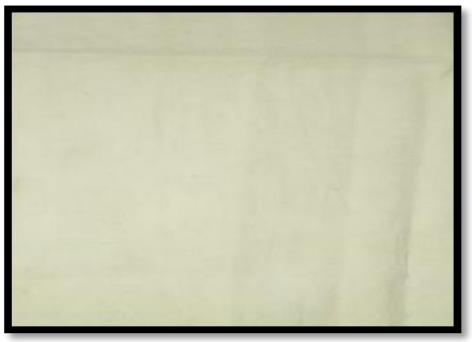
3.2.3 Fabrication of Face mask

Cotton fabric was selected for making a pleated mask with a fabric loop. Samples were individually cut from each of the finished fabric patterns used for a mask given on the plate. The construction procedure followed for mask making is presented below

- Spreading the finished fabric without a crease
- Marking was done on the dyed fabric as per the measurement
- Sample was cut with seam allowances of 5cm and loops were cut to the measurement of 33cm
- As per style 3pleats were stitched and ironed neatly loops were finished with a row of machine stitch
- Seam lines of the mask were sewn and a loop is attached to either side of the mask
- Completed mask was ironed neatly to remove crease



a. VETIVER FINISHED CUT



b. NEEM FINISHED CUT FABRIC 33cm

c. NEEM /VETIVER FINISHED CUT FABRIC 33cm

d. NEEM FINISHED HERBAL MASK

e. VETIVER FINISHED HERBAL MASK

f. NEEM / VETIVER FINISHED HERBAL MASK

PLATE V

Finishing of herbal face mask

3.3 Fabric Evaluation

3.3.1 Antibacterial Assessment Test

Procedure

The test specimens (Herbal finished fabrics – 1, 2 3) were cut into pieces (20mm in diameter) separately. Sterile AATCC bacteriostatic agar plates were prepared. Using a sterile 4mm inoculating loop, one loop full of culture (Escherichia coli and Staphylococcus aureus) was transferred by swabbing all around the surface of the agar plate and also covering the central area of the Petri dish.20mm fabric disc was placed over the inoculated surface. In parallel unfinished fabric was also placed in the same plate. The protocol was performed separately for each fabric and each test bacteria. All the plates were incubated at 37˚C for 24 hours. The inoculated plates were examined for the interruption of growth along with the swabs of inoculum beneath the fabric and for a clear zone of inhibition beyond the fabric edge. The average width of the zone of inhibition around the test specimen was calculate-millimetres metre.

Assessment of physical properties

Antibacterial finishing of textile is one of the functional properties that resist the growth of the bacteria on the fabric surface. The antibacterial activity of the treated fabric was assessed by AATTCC147 test method used for determining the antibacterial activity of the treated sample.

3.3.2 Fabric Weight

Weight measurement of a fabric is often prerequisite for subsequent test of other fabric properties, Weight can be determined by a mass per unit area or mass per length of fabric. Specimen of known dimension are taken by a cutting device (GSM cutter) or a template, to obtain a consistent specimen size .It is a device to cut circular specimen of 100 square centimetres of a fabric very accurately. It has 4blades that cut the fabric, when the hand wheel is rotated by applying light pressure .Five specimen were selected from each fabric sample. Specimen selection should avoid taking sample from the fabric selvedge or close to the end of the fabric piece .Care should be taken to avoid the loss of fibre or threads during weighing. Each specimen were weighted on an electronic balance as per standard of ASTM D3377-96.The samples were weighed for five times.

Fabric weight

PLATE VI

3.3.3 Fabric Thickness

The thickness of a fabric is one of its basic properties, giving information on its warmth, weight and stiffness. Thickness measurements are very sensitive to the pressure and sample size used in the measurement (Raul, 2005). Fabric thickness is defined as the distance between lower and upper surface of the material measured under a standard pressure, using Shirley's thickness tester with an accuracy of 0.01mm. Fabric thickness gauge was used to measure thickness of the sample. It has 2 parts the anvil and pressure foot. Pressure was given at the foot to make the gauge zero. The sample was placed between the cleaned pressure foot and anvil. The reading shown by the dial was noted. For each sample, thickness was determined at 5 different places away from 2 inch of the selvedge.

Fabric thickness by thickness guage

PLATE VII

3.3.4 Fabric Strength

The strength of the fabric is important for all textile users. Measurement of tensile stress-strain properties is the most common mechanical measurement on fabrics. It is used to determine the behaviour of a sample while under an axial stretching load. The tensile properties measured are generally considered arbitrary rather than absolute. Results depends on specimen geometry, the fibre type and arrangement, as well as the fabric structure. The original and dyed fabrics were tested for tensile strength using Eureka Cloth tensile strength tester. 12 inch x 2 inch specimen from each samples were cut both in warp and weft direction of the fabric, 2 inches apart from selvedge. The specimen was placed between the upper and lower clamp. The dial reading was set to zero by adjusting the pendulum over the quadrant scale. The elongation pointer was checked for its position in zero. Before starting the machine the pendulum lock was released and machine was switched to run. At certain point the fabric starts to break, the machine was switched off and the dial reading in kg was noted and recorded.

3.3.5 Fabric Elongation

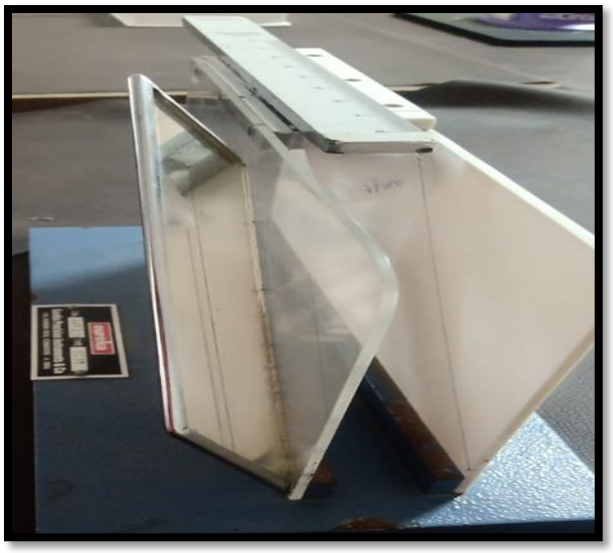
Elongation is defined as the change in length of a material due to stretching .When a fabric of original length is stressed along its axis ,it extends an amount .strain is dimensionless quantity, often reported as a percentage .Elongation at load is amount ,that a fabric stretches in length after a fixed load is applied. This is commonly used to define the level of stretch within the fabric. The elongation is noted as the increase in inches elongation measure the extent of deformation along the axis of a material under a tensile stress, and expressed in units of length of the fabric when loaded. Elongation reading was noted from the elongation scale when the strength of the fabric is tested. The specimen was removed and the machine positioned back to original and the five specimens of both direction from each sample were tested and reading were noted. (Rubelmiah 2021)

Fabric Strength and Elongation

PLATE VIII

3.3.6 Fabric Stiffness

A stiffness test measure the severity of the flexing action of material. The bending length is a measure of the interaction between fabric weight and fabric stiffness in which fabric bends under the force of gravity and is one component of drape. Thus bending length is called drape stiffness. The Shirley's stiffness tester, a rectangular strip of fabric 6inch ×1 inch is mounted on a horizontal platform in such a way that is overlays, like a cantilever and bends downwards. The length of the fabric that will bend under its own weight to a definite extent. The sample was placed on the platform with the temperature at the top of it, so that the leading edges coincide. Both were slowly pushed forward until the leading edges of the sample and the template project beyond the edge of the platform. The sliding of the sample was stopped when it cut both the index lines. Then the bending length of the sample read from the scale opposite a datum line engraved on the side of the platform. Four reading were taken for sample. A mean values of the bending length in warp and weft wise direction was calculated. Similarly, other samples were determined (Mazharul Islam Kiron, 2012).



Fabric Stiffness by Stiffness tester

PLATE IX

3.3.7 Absorbency Test

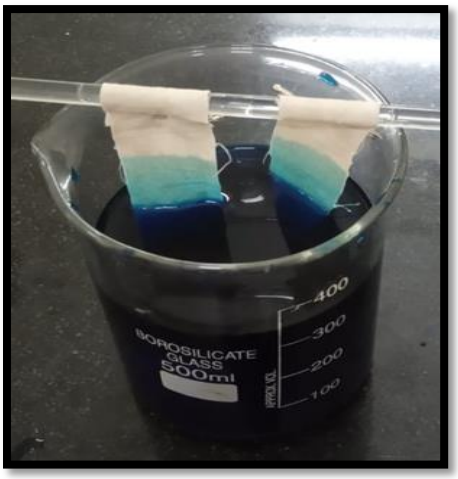
The pressure required to force water through a fabric may be determined and the information used is the assessment of the fabric ability to do a particular job.

3.3.8 Fabric Sinking

This involves a simple test of test of wettability of fabric. In this test, a small square specimen about 1inch ×1 inch was cut and dropped in to the surface of water in a beaker. The time taken for the specimen to sink below the surface was observed. The shorter the time, the greater the wettability (Kavitha, 2011).

3.3.9 Fabric Wicking

The wicking is method measure the rapidity of absorption. Five pieces of a sample were cut measuring 15cm length and 2.5 cm width .one end of the same stripe was pasted with a glass rod which was placed on heavy wooden blocks and, at the other end two grams weight was attached to keep the sample straight .At the weighed end 2 cm of the sample was allowed to immerse in a tray of distilled water. The rise of the water level in the strip was noted by keeping time as constant (1minute). The same procedure was repeated for all the samples and the mean value was calculated and recorded (Patnaik *et al.,* 2010).



Fabric Wicking Test

PLATE X

3.3.10 Wash Durability

It was found that directly applied herbal extract sample does not retain the antibacterial activity after 10 washes. This is because that the extracts were coated only on the surface without any firm bonding. The neem extract retained the antimicrobial activity effectively up to 25wash cycle. This may due to entanglement of the fibre very strongly .It was reported by (Krishna Bala *et al*., 2007) that the fabric treated with neem extract alone do not show much activity after 10washes.

RESULTS AND DISCUSSIONS

4. RESULTSAND DISCUSSION

The results and discussion of the work entitled **Antibacterial Efficiency of Face Mask Treated with Selected Herbal Extract** is discussed under the following headings

4.1 Antibacterial Assessment

4.2 Evaluation of Anti- bacterial finished fabric

4.2.1 Fabric Weight

4.2.2 Fabric Thickness

4.2.3 Fabric Strength and Elongation

4.2.4 Fabric Stiffness

4.2.5 Fabric Wicking Test

4.2.6 Fabric Sinking Test

4.2.7 Wash Durability

4.1 Anti-Bacterial Assessment

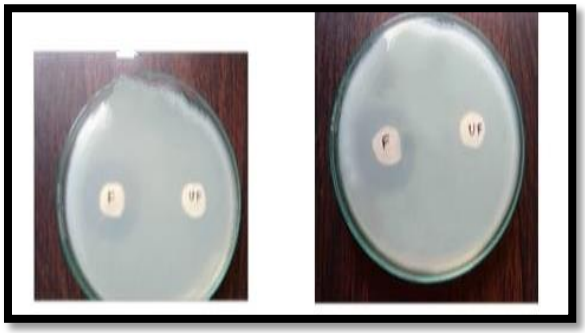
Antibacterial finishing of textile is one of the functional properties that resist the growth of the bacteria on the fabric surface. Antibacterial activity of the treated fabrics was assessed by AATTCC147test method and the results are presented in Table V.

Table V Antibacterial activity of herbal finished fabrics

Fabric samples	Zone of Inhibition (mm)	
	Escherichia coli	*Staphylococcus aureus*
Neem	36	35
Vetiver	35	34
Neem /Vetiver	37	36

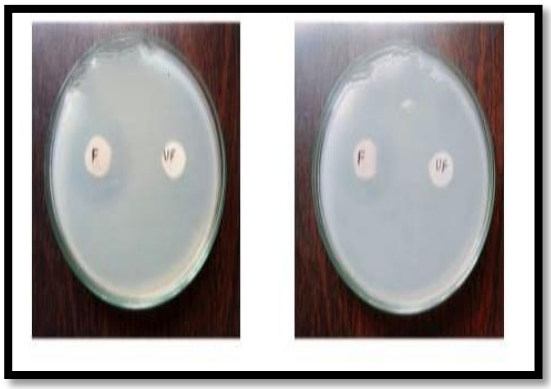
PLATE XI Antibacterial activity of herbal extract finished fabric

SAMPLE 1



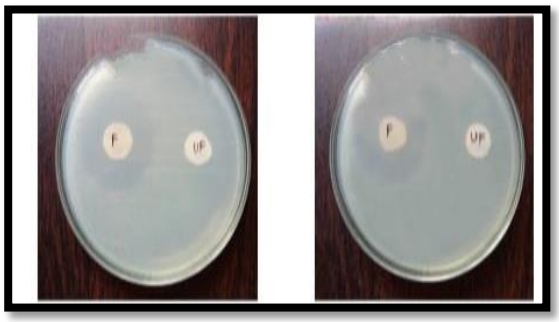
E-coli | Staphylococcus aureus

SAMPLE 2



E-coli | *Staphylococcus aureus*

SAMPLE 3



E- coli | *Staphylococcus*

All the three test fabrics (1, 2, and 3) finished with respective herbal extracts showed excellent antibacterial activity; but unfinished fabric does not showed antibacterial activity.

Fabric finished with neem extract exhibited antibacterial inhibitory zone size of about 36mm against Escherichia coli and 35mm against Staphylococcus aureus. Fabric finished with vetiver exhibited antibacterial inhibitory zone size of about 35mm against Escherichia coli and 34mm against Staphylococcus aureus. Fabric finished with neem and vetiver exhibited antibacterial inhibitory zone size of about 37mm against Escherichia coli and 36mm against Staphylococcus aureus.

4.2 Evaluation of Antibacterial finished fabric

4.2.1 Fabric Weight:

The fabric weight of the control and herbal finished fabric samples were analysed and the results are presented in Table VI and Figure 1

Table VI

Fabric Weight

S.no	Samples	Mean (GSM)	Loss /Gain	Loss /Gain %
1	Fabric finished with neem extract	0.946	0.011	1.18%
2	Fabric finished with vetiver extract	0.978	0.043	4.6%
3	Fabric finished with neem/Vetiver extract	0.951	0.016	1.71%
4	Cotton fabric	0.935	-	-

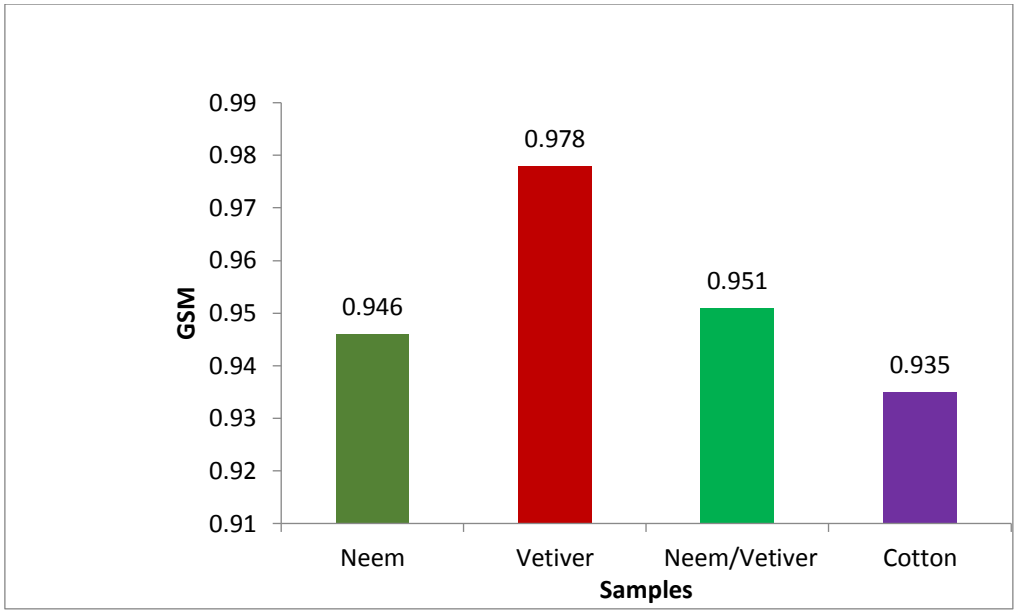


Figure 1 Fabric weight

From Table VI and Figure 2, it is evident that weight of all the treated fabric samples increased when compared to the control. Increasing weight might be due to application of herbal solution.

4.2.2 Fabric Thickness

The Fabric thickness of the control are herbal finished fabric samples were analysed and the results are presented in Table VII and Figure 2.

Table VII

Fabric Thickness

S.no	Samples	Mean Thickness(mm)	Gain or loss over original	Gain or loss over original%
1	Fabric finished with neem extract	0.33	0.03	10%
2	Fabric finished with vetiver extract	0.32	0.02	6.67%
3	Fabric finished with neem/vetiver	0.32	0.02	6.67%
4	Cotton fabric	0.3	-	-

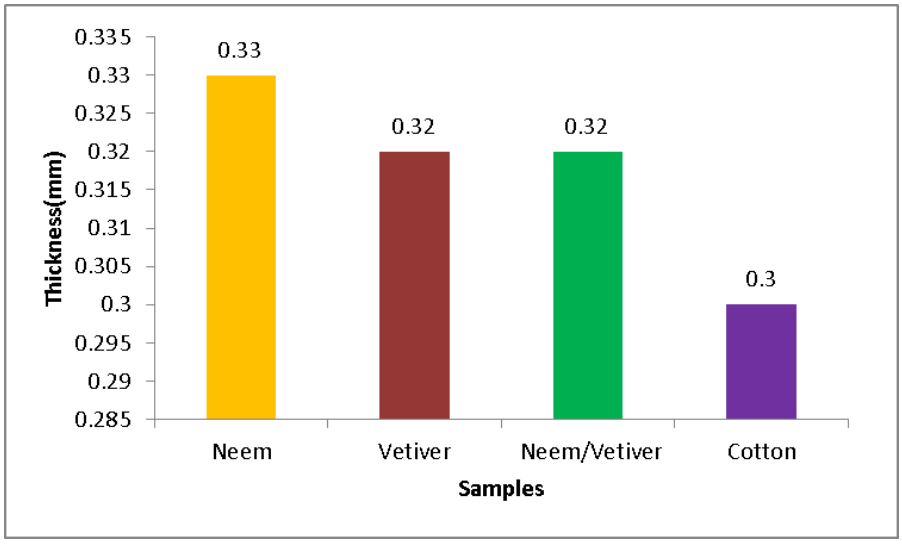


Figure 2 – Fabric Thickness

From Table VII and Figure 2, it is evident that the thickness of all the herbal finished fabric sample increased when compared to the control. An increased in thickness might be due to application of herbal solution.

4.2.3 Fabric Strength and Elongation

The Fabric strength and elongation of the control and herbal finished fabric samples were analysed and the results are presented in Table VIII and Figure 3.

Table VIII

Fabric strength and Elongation

Samples	Breaking load		% of Elongation		Gain or loss over original		Gain or loss over original %	
	Warp	Weft	Warp	Weft	warp	weft	Warp	Weft
Fabric finished with neem	33.6	26.3	6.93%	5.23%	21	9.6	16%	78%
Fabric finished with vetiver	18.3	20.3	0.48%	0.52%	5.7	8	45.2%	65%
Fabric finished with neem/vetiver	32.0	23.6	0.57%	0.49%	19.4	11.3	15%	91%
Cotton fabric	12.6	12.3	0.38%	0.39%	-	-	-	-

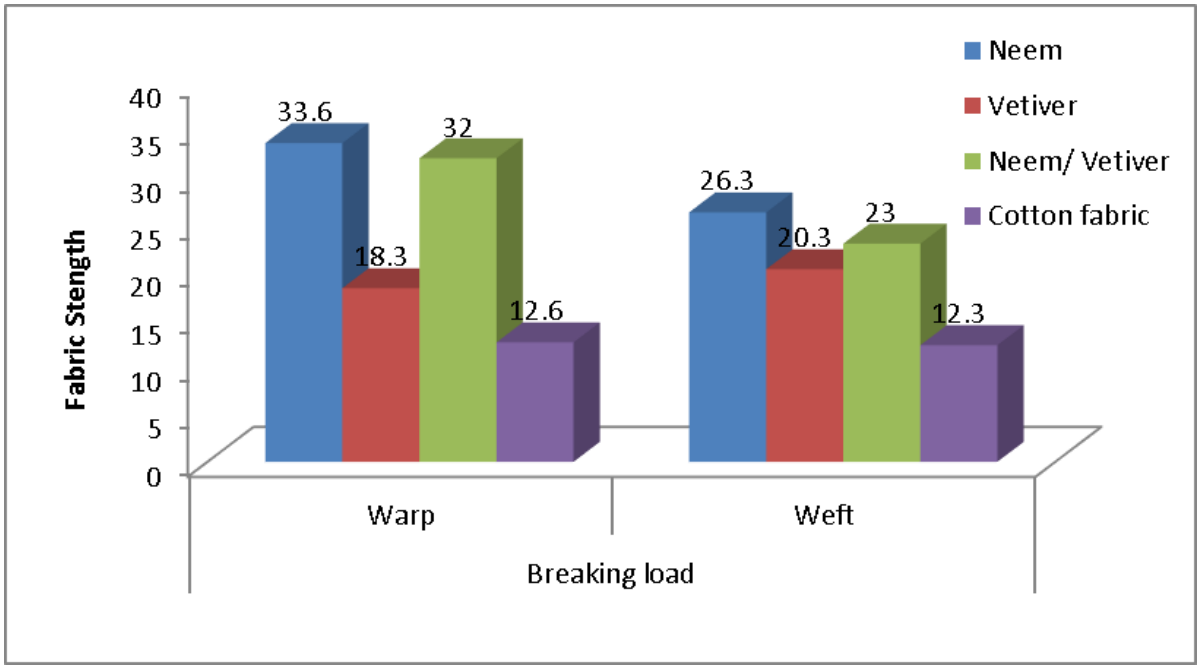


Figure 3a: Fabric Strength

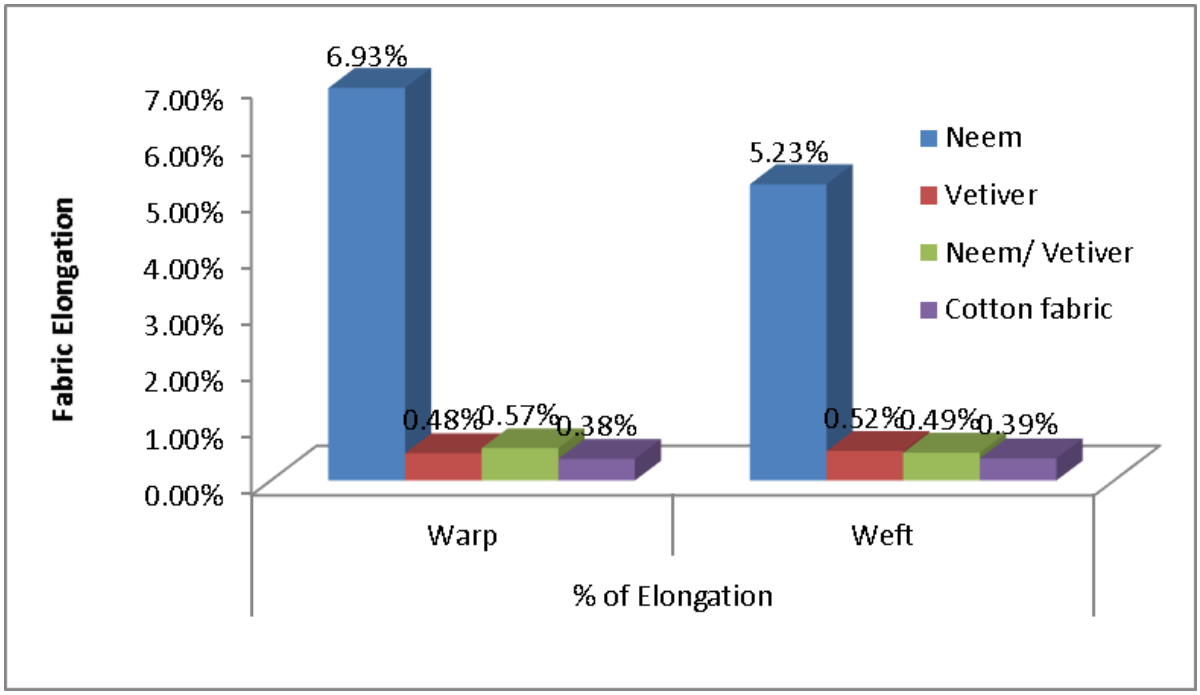


Figure 3b: Fabric elongation

From the Table VIII and Figure 3(a), 3(b), it is evident that strength and elongation of all the herbal finished fabric samples increased when compared to the control. Maximum increase was found in fabric finished with neem extract.

4.2.4 Fabric Stiffness

The fabric stiffness of the control and herbal finished fabric samples were analysed and the results are presented in Table IX and Figure 4.

Table -IX

Fabric Stiffness

Samples	Mean (Bending Length)		Mean (% Flexural Rigidity)		Gain or loss over original		Gain or loss over original%	
	Warp	**Weft**	**Warp**	**Weft**	**warp**	**weft**	**warp**	**weft**
Fabric finished with neem extract	1.7	5.86	0.576%	0.826%	3.43	3.17	66%	11%
Fabric finished with vetiver	4.9	2.67	0.822%	0.44%	0.23	0.02	4.48%	7%
Fabric finished with neem/vetiver	5.23	5.13	0.846%	0.738%	0.1	2.44	1.94%	9%
Cotton fabric	5.13	2.69	0.69%	0.36%	-	-	-	-

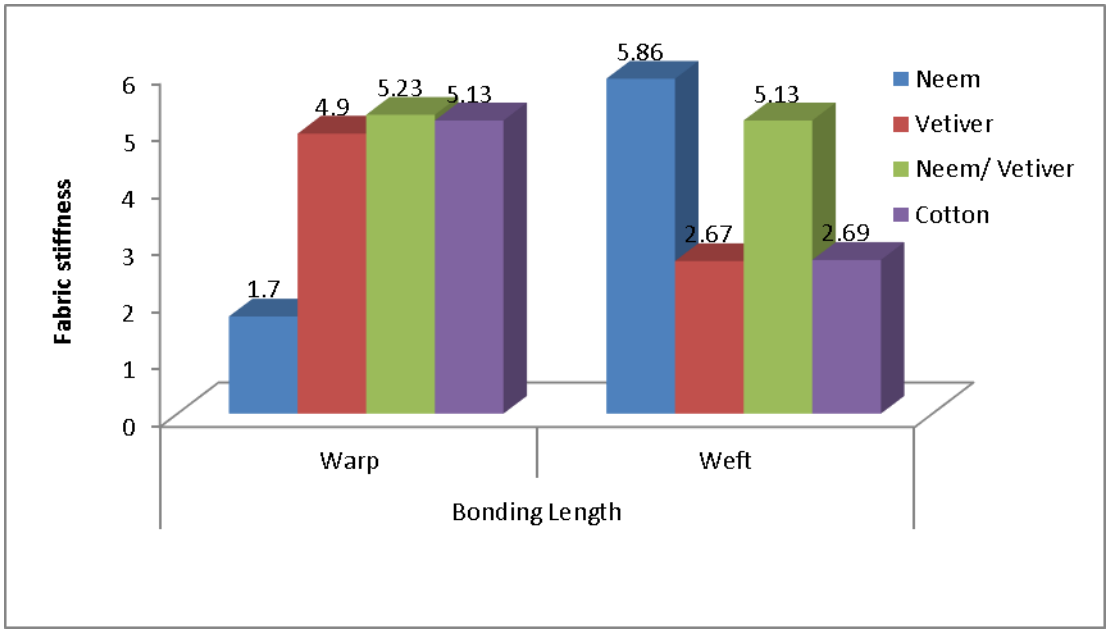


Figure 4a Fabric Stiffness

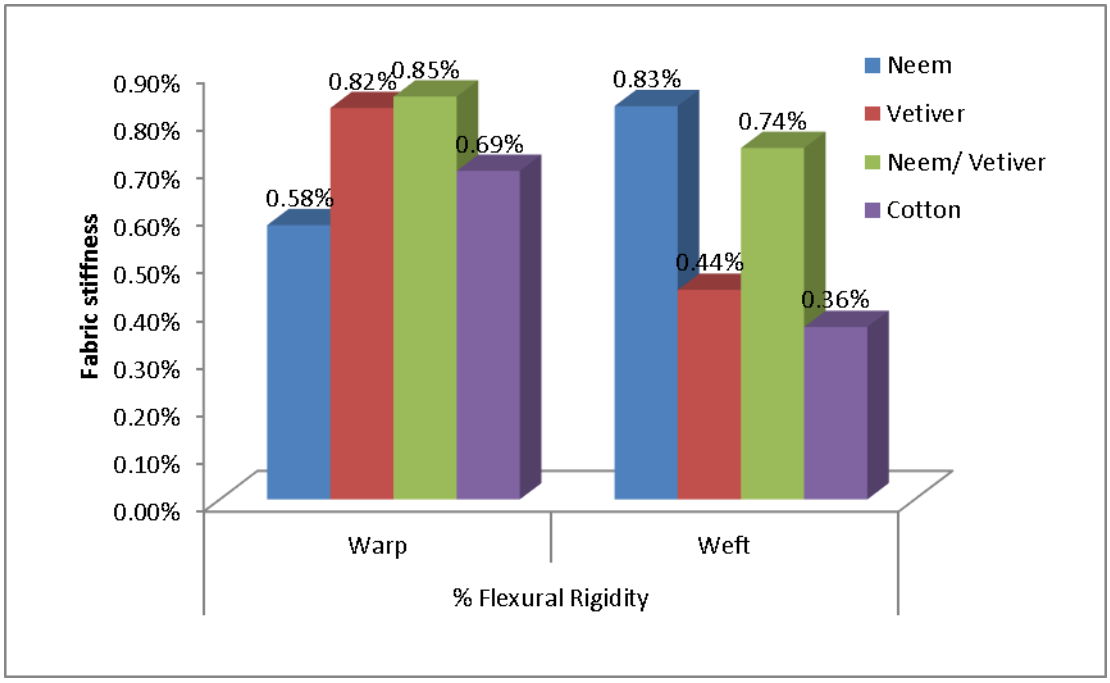


Figure 4b Fabric Stiffness

From Table IX and Figures 4(a), and 4(b), it is evident that the stiffness of all the herbal finished fabric samples increased when compared to the control. Increasing stiffness might be due to the uptake of herbal solutions. Maximum stiffness was found in fabric finished with neem/vetiver extract.

4.2.5 Wicking Test

The Fabric wicking of the control and herbal finished samples were analysed and the results are presented in Table X and Figure 5.

Table X

Fabric Wicking

S.no	Samples	Mean Wickability(cm)	Gain or loss over original	Gain or loss over original
1	Fabric finished with neem extract	2.92cm	0.42	16.8%
2	Fabric finished with vetiver	2.78cm	0.28	11.2%
3	Fabric finished with neem/vetiver	2.62cm	0.12	4.8%
4	Cotton	2.50cm	-	-

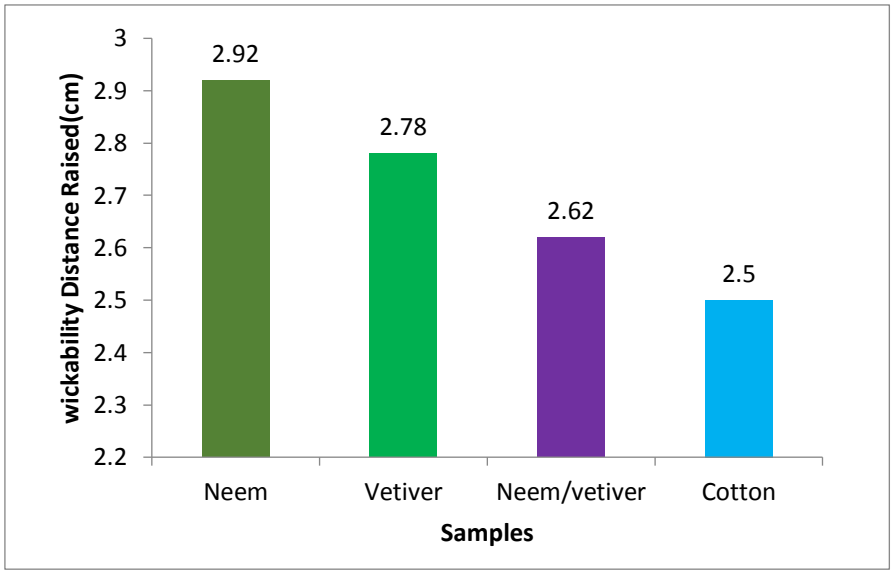


Figure 5 Fabric Wicking

From Table X and Figure 5, it is evident that the wicking time of all the herbal finished fabric samples is increased when compared to the control. Fabric walkability was found to be maximum in neem extract finished fabric.

4.2.6 Sinking Test

The Fabric sinking time of the control and herbal finished fabric sample was analysed and the results are presented in Table XI and Figure 6.

Table XI

Fabric Sinking

S.no	Samples	Sinking time(Sec)	Gain or loss over original	Gain or loss over original %
1	Fabric finished with neem extract	58	17	22.67%
2	Fabric finished with vetiver	58	17	22.67%
3	Fabric finished with neem/vetiver	73	2	22.67%
4	Cotton	75	-	-

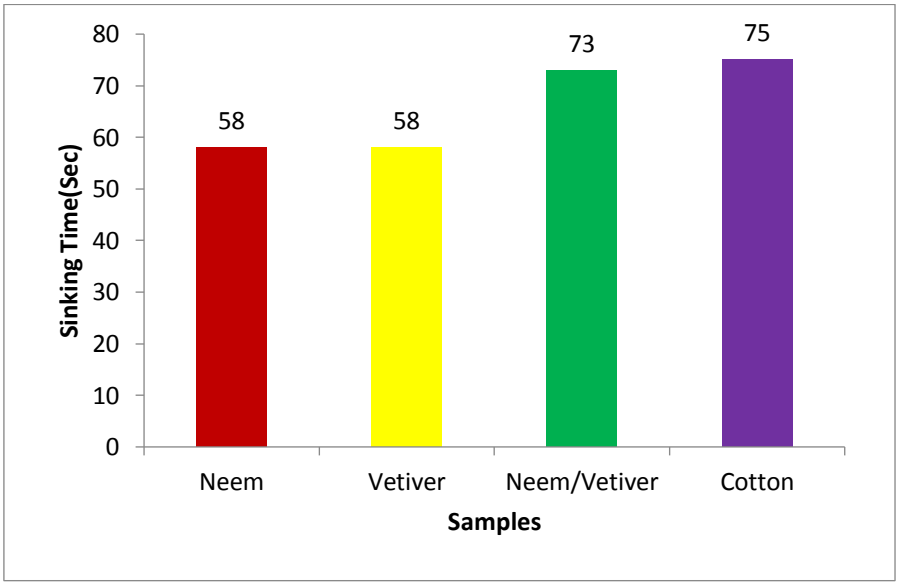


Figure 6 Fabric sinking

From the Table XI and Figure 6, it is evident that sinking time of all the herbal finished fabric samples are increased when compared to the control. The results indicate that absorbency was increased in finished samples.

4.2.7 Wash Durability

Wash durability of the herbal finished samples were carried out to assess the antibacterial durability of the herbal finish fabric and the result are present in Table XII.

Table XII

Wash durability After 5 wash

Fabric	Escherichia coli	Staphylococcus aureus
Neem	21	20
Vetiver	15	15
Neem /Vetiver	23	24

After 10 Wash

Sample	Escherichia Coli	Staphylococcus aureus
Neem	6	5
Vetiver	4	4
Neem /Vetiver	7	6

From the Table XII, it is clear that the wash durability of antibacterial finished sample has reduced after 5^{th} and 10^{th} washes. Among the three-sample neem and vetiver finished samples exhibited 23mm Zone of inhibition whereas neem and vetiver exhibited 21- and 18-mm Zone of inhibition against E-coli after 5 washes. When treated samples tested against staphylococcus aureus, neem /vetiver exhibited 24mm zone of inhibition after 5 washes while neem and vetiver exhibit 20 and 18 mm respectively

The antibacterial effect of all the finished sample after 10washes has drastically reduced to 4, 6 and 7 as for neem, vetiver and neem/vetiver respectively when listed against Escherichia coli. Samples tested against staphylococcus aureus exhibited very poor result after 10 washes. Therefore the finished samples could be used only for limited period

SUMMARY AND CONCLUSION

5. Summary and Conclusion:

Common cold can be caused by many different types of viruses. Antibiotics do not cure or shorten the duration of the illness .common cold is viral infection of nose and throat ,many type of viruses can cause a common cold .To recover the common cold it will take a week or 10 days to cure.

The virus is usually transmitted from person to person through droplets formed due to coughing, talking, sneezing, etc.., and contact transmission such as contacting with oral, and eye mucous membrane (Lepelltier *et.al*.,2020). Natural textile based face masks are designed and produced by integrating smart bio-structure, chemical, or technologies into the textile materials to provide more functionality such as comfort and protection to the wearer or patient .Modern medical textile have superior properties such as antibacterial, antifungal, prevent allergies cross – contamination, and odour, durable, with more benefits. In cloth mask , finishes are given like herbal finishes such as neem, tulsi, aloe Vera, turmeric, Antimicrobial textiles with improved functionality finds a variety of applications such as health and hygiene products, specially the garments worn close to the skin and several medical applications, such as infection control and barrier material. Herbal antimicrobial finish is one of the special finishes which can be applied to the textile material to protect the skin of the wearer. In cloth mask various herbal finishing are added in order to have antibacterial properties. Herbs such as neem, vetiver, tulsi, turmeric, lemongrass, eucalyptus are being used for finishing on textiles.

Azadirachta indica, commonly known as neem. Neem has been extensively used in Ayurveda. All parts of the neem –tree, leaves, flower, seed, fruit, root and bark have been used traditionally for the treatment of inflammation, infection, fever, skin disease and dental disorders. Neem leaf and its constituents have been demonstrated to exhibit anti-inflammatory, anti-ulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant properties. Vetiver khus is a tall perennial grass the dry aromatic roots are also used to make curtains, mats etc.., vetiver act as antiseptic, antimicrobial agent, anti-inflammatory, boost immune system, and keeps body cool.

Therefore, the investigator has taken up a study on antibacterial efficiency of face mask treated with selected herbal extracts with the following objectives

- To finish the selected fabric with herbal extracts
- To develop a herbal finished face mask
- To determine the antibacterial activity of herbal extract finished face masks
- To evaluate the antibacterial durability of the face mask

Experimental Procedure

For the present study, cotton was used. The selected fabric was desized thoroughly to remove the starch and scouring was done to remove impurities. Herbal source such as neem and vetiver were selected to finish the cotton fabric.10% concentration was used to finish the fabric. Three combination of extracts were prepared with neem, vetiver and neem / vetiver combinations.

Herbal finished samples were subjected to antibacterial assessment the species selected for the assessment were Escherichia coli and staphylococcus aureus. AATTCC 147test method was followed for determining antibacterial activity The herbal finished samples were tested for antibacterial activity after 5 and 10 washes. In addition finished fabrics were tested for weight, thickness, strength and elongation, stiffness, wettability and absorbency. The herbal finished fabric was converted to pleated face mask. Designing, drafting, and sewing were done as per the standard measurement and procedure.

Findings

- In this study cotton fabric was selected for finishing a fabric using herbal extracts. Antibacterial neem and vetiver
- Antibacterial activity were assessed for the treated fabric. Fabric were treated with neem, vetiver, neem and vetiver blend. The herbal extract finished samples showed excellent antibacterial properties but unfinished fabric doesn't show antibacterial activity
- Results for the physical properties of finishing fabric using herbal extract weight of all the treated fabric samples increased when compared to the control. Increasing weight might be due to application of herbal extracts.

- Thickness of all the herbal finished fabric sample increased when compared to the control. Increase in thickness might be due to application of herbal solution.
- Strength and elongation of all the herbal finished fabric samples increased when compared to the control. Maximum increase was found in fabric finished with neem extract
- Stiffness of all the herbal finished fabric samples increased when compared to the control. Increasing stiffness might be due to uptake of herbal solution. Maximum stiffness was found in fabric finished with neem / vetiver extract.
- Wicking time of all the herbal finished fabric samples are increased when compared to the control. The results indicate that absorbency was increased in finished samples.
- Sinking time of all the herbal finished fabric samples are increased when compared to the control. The results indicate that absorbency was increased in finished samples.
- Among the three sample neem and vetiver finished samples exhibited 23mm Zone of inhibition whereas neem and vetiver exhibited 21 and 18 mm Zone of inhibition against E-coli after 5 washes.
- When treated samples tested against staphylococcus aureus, neem /vetiver exhibited 24mm zone of inhibition after 5 washes while neem and vetiver exhibit 20 and 18 mm respectively
- The antibacterial effect of all the finished sample after 10washes has drastically reduced to 4, 6 and 7 as for neem, vetiver and neem/vetiver respectively when listed against Escherichia coli. Samples tested against staphylococcus aureus exhibited very poor result after 10 washes.

Conclusion:

From the study, it can be concluded that Neem and vetiver can be used as a natural extract to finish cotton fabric. The selected natural extract possesses excellent antibacterial activity against Escherichia coli and staphylococcus aureus 10 % (percent) concentration used for finishing the cotton fabric has shown excellent activity while washing has diminished the activity to a certain excellent. A trial was also made to convert the herbal finished fabric into a facemask. Though there was a declining antibacterial effect after washing the mask can be restored with the natural extract. A pouch containing herbal powder can be provided along with a face mask to enhance the antibacterial activity. Thus, the herbal-treated face mask can be promoted as an eco-friendly product.

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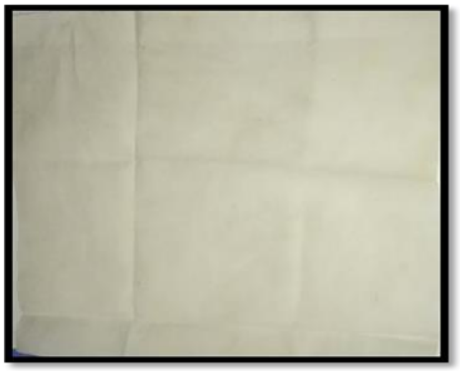
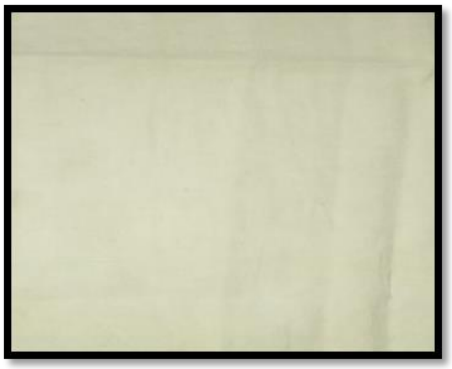
APPENDICES

APPENDICES

De sized fabric



Vetiver finished fabric



Neem finished fabric

Vetiver /Neem finished fabric