TEXPLORER

TEXTILE RESEARCH MAGAZINE

Exploring Innovators In Textiles

The Institution of Engineers (India)
Coimbatore Local Centre

Department of Textile Technology
Kumaraguru College of Technology
Coimbatore

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ABOUT KUMARAGURU COLLEGE OF TECHNOLOGY (KCT)

Kumaraguru College of Technology (KCT), Coimbatore is a private Engineering College started in 1984 under the auspices of Ramanandha Adigalar Foundation, a charitable educational trust of Sakthi Group. Situated in a sprawling 156-acre campus in the IT corridor of Coimbatore, KCT is an autonomous institution affiliated to the Anna University, Chennai and approved by All India Council for Technical Education (AICTE). KCT has been accredited by National Assessment and Accreditation Council (NAAC) with Grade 'A' and all the eligible UG programs have also been accredited by National Board of Accreditation (NBA).

Under the able guidance and adept administration of Dr. B. K. Krishnaraj Vanavarayar, Chairman, Sri. M.Balasubramaniam, Correspondent and Sri. Shankar Vanavarayar, Joint Correspondent, the college has developed excellent facilities and resources such as spacious classrooms, seminar halls, well-equipped laboratories, excellent sporting facilities, dedicated high speed internet connectivity (broadband) and well-qualified faculty. Five academic Blocks house the different departments. The administrative building "Dr.Mahalingam Vigyan Bhavan" is an architectural beauty and a land mark in Coimbatore.

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ABOUT DEPARTMENT

Department of Textile Technology was started in the year 1995 with the Objective of imparting comprehensive knowledge in all the faces of Textile Manufacture to students through UG & PG programmes. Professionally well qualified, highly experienced faculty members and well equipped laboratory with modern facilities provide ample opportunity to the students to pursue their education with excellence. Students are provided with good industrial exposure taking full advantage of college location in the Textile City, Coimbatore. The accreditation status has been awarded to the B.Tech Textile Technology undergraduate programme by National Board of Accreditation, AICTE, New Delhi for Three Years with effect from September 2019.

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EDITORIAL MESSAGE

Dr.V.Ramesh Babu, Head & Professor

April,2021

On behalf of the editorial staff and students, it is my pleasure to introduce the issue of TEXPLORER, yearly magazine of Department of Textile Technology that showcases technical papers of students and faculty in textile domain and its allied field This new magazine is envisioned and found to represent the technical as well as cultural skill of the students. Its mission is to become a voice of the textile student's community, addressing faculty, industry persons and alumni from various fields of Textile Technology. This volume comprises of technical papers from fibre, yarn, fabric, fashion technical textiles and few new innovations in machinery and textile products. It is our hope that this fine collection of articles will be a valuable resource for Textile Technology. I would also like to thank the faculty members who worked with the students. Students from various colleges submitted their papers and presented the projects using the platform provided exchanged ideas which will enhance further advancement in thrust areas of research. Much appreciation is also due to all the faculty members and students of the editorial team. Finally, I would like to express my appreciation to the students who contributed their writing and to the students who have done a great job in putting this research magazine together. I hope you will enjoy reading these papers, and if you are textile/fashion technology student or faculty or industry expert consider submitting your own writing to be published in next year's TEXPLORER Research magazine.

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Intelligent Functional Clothing

Swapnil Kulshrestha, Btech Textile Technology, VJTI, Maharashtra, India
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ABSTRACT

Textile is a term which is mainstream connected to clothing but relating to Fashion and Garmenting only is an understatement. Functional clothing comes into existence when garments do more than just fashion and perform a function to fulfill a particular purpose. Out of the four types classified based on the purpose they are used for, Meditech or Medical Functional Clothing tends to help in saving many lives and making it better for the others. For the direct interaction of the body with its medical analysis through textile, Intelligent Functional Clothing comes into action; where technology meets medical textile to make medication continuous, direct and faster. The manufacturing of Intelligent Functional Clothing is done by connecting hair like thin electrodes and microprocessors which are sensitive enough to monitor even the slightest movement with the appropriate textile. Currently an external source of energy is used for its working. But this adds a tedious task of removing and attaching this source for recharging and for washing; it breaks the monitoring flow. So, for overcoming this, there's a need for an inbuilt washable medium to generate energy. Intelligent Functional Clothing, hence, is a part of smart fabric and interactive textile (SFIT). In the busy running lifestyle of this era and the growing rate of diseases, people still tend to miss out on routine checkups. So, making Intelligent functional Clothing for personal health records and making it user-friendly enough comes out as a solution. But with these pros, there can be cons like, safety concerns, flexibility, breathability, comfort, etc., which were all overcome by the advancement in the field of Intelligent Functional Clothing. But the biggest challenge it is facing is its sustainability and the problems in the marketing sector that is, making it accessible, acceptable and cost efficient. By working on these issues and gaining the trust of the customers on this product, the sector of Intelligent Functional Clothing is bound to flourish.[1]

Keyword: - *Intelligent Functional Clothing, IFC, Medical Textiles, and Textile Technology.*

1.INTRODUCTION

For the direct interaction of the body with its medical analysis through textile, Intelligent Functional Clothing comes into action; where technology meets medical textile to make medication continuous, direct and faster. In this paper, the main focus is on

- Why is there a need to personalise the use of IFCs?
- What are the advancements needed in the current market production of IFCs?
- How can advancement be done in IFCs?
- How can the market of IFCs be broadened?

1.1 WHYdoweneedIFCs?

In this busy running lifestyle, the rates of diseases, heart attacks and sudden deaths have increased rapidly. Cardiovascular disease is a leading cause of global mortality, accounting for almost 17 million deaths annually or 30%of all global mortality. In developing countries, it causes twice as many deaths as HIV, malaria and TB combined. It is estimated that about 40- 50% of all cardiovascular deaths are sudden cardiac deaths (SCDs) and about 80% of theseare caused by ventricular tachyarrhythmias. Therefore, about 6 million sudden cardiac deaths occur annually due to ventricular tachyarrhythmias. The survival rate from sudden cardiac arrest is less than 1% worldwide and close to 5%in the US. And the main risk factors behind this increasing death rate are lack of exercise, inappropriate diet, stressed lifestyle and smoking. It is suggested that after a certain age, one should go for routine checkups, but a survey by the International Journal of Technical Research and Application shows that only 22% of the population goes for routine checkups.

Now, to solve this problem, imagine if one does not have to go to the doctor physically, but the medical reports of the heart patient is sent to the doctor virtually. But again, people are not ready to accept this, so the idea is to basically fit the measuring devices in a normal breathable fitted t-shirt which never goes out of fashion. When people start accepting these Wearable Health Checkup Tees (WH T-Shirts), the market would be ready to accept the Full Body Monitoring suits (FBM Suit) strictly for medical purposes and having much more functions and monitoring than the WH T-shirts.

1.2 WHY do we need an advancement in the field of IFC?

Although there is an existing market of IFCs, we need some advancements as the current IFCs are facing some issues. There is a need for a new development and a plan as well to overcome the problem faced by IFCs like:

1. Design and technical difficulties:

Many creative ideas are difficult to achieve because of fabric constraints and technological backwardness. Transfer of theory to practical application is difficult itself.

2. Cost efficiency.

As we go into more advanced and efficient levels of integration and the use of more tiny and microprocessor implants, the cost increases. At the same time, making it more fashion forward and comfortable are two aspects which themselves need attention.

3. Security issues.

Since the system works on processors, apps, programming-based systems, it could leak information to unwanted sources if not programmed properly. Technology always has its loopholes but must be covered on the basis of the application it is used for.

4. Lack of trust of people.

Gaining the trust of the people is the key requirement for any product to expand its market. But people prefer going to the doctors physically rather than trusting some device left to monitor all by itself. And with an issue like monitoring health, people do not like taking risks.

5. Difficult to promote in the market.

For any new product to become familiar with people, it takes years and ages. Marketing also becomes difficult when it is a new product and it has hell lot of competition with lack of trust on the product itself.

6. Lack of fashion-oriented designing.

Since, the main objective here is to achieve a certain function, the fashion aspect is usually overlooked and not paid attention to. Also, because of the functional integration, there are a lot of design limitations for the product development.

Figure-1: Problems faced by IFC

Since, the problem exists more in the acceptance in the market and the restrictions while manufacturing the IFC itself, the idea is to come up with something effective which is acceptable to the people and is efficient in its working too. But, there are multiple aspects that need to be considered while manufacturing an IFC.

2. MANUFACTURING OF IFCs:

The evolution of technical textiles takes cues from the electronics and photonics industries. The integration of sensor arrays and plastic optical fiber (POF) creates an extension of functional fabrics commonly known as smart textiles.

At its core, technical textile manufacturing is a vast landscape of advanced yarn systems combined with textile formation techniques. The completed construction can be further transformed through lamination, coatings and composite methods.

Depending on their use, smart fabrics are created by fusing together fibers and technology. These fibers include conductive yarns and polymers, shape memory polymers, encapsulated phase change materials, fiber optics, and other small electronics. They may also use external additions, such as:

- Sensors
- Chemical treatments
- Thermochromic dyes

These materials interact with one another along with external stimuli — such as temperature, light or pressure — creating a transfer of energy. Once activated, the functional fabric responds depending upon the textile's function.

According to Textile Institute (2006c), smart clothing is located in the intersectional province of design research, physiology, and textile technology.

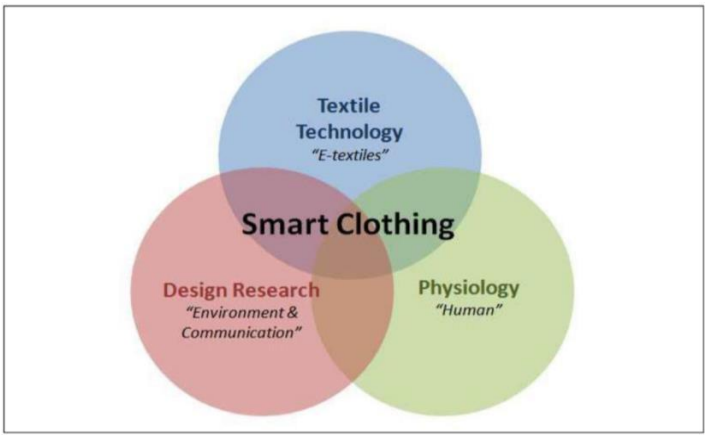

Figure -2: Multidisciplinary Approach to Smart Clothing

2.1 RESEARCH ASPECTS:

There are some aspects to be studied while making of the IFCs:

2.1.1 Design Research

Design research focuses on product development issues and includes the objectives of environment and communication. The product development process is important because redesign costs become higher as the process goes closer to production, while costs to change designs remain lower in development stages.

There are some factors to be considered when Design Research for any IFC is done:

1. Product development -

It takes seven steps to identify users' needs and develop a product to meet identified needs. Functional clothing development process is in contrast with conventional clothing development in terms of the location of core stages. Generally, clothing products start with market needs and go through product- oriented processes where critical decisions are made in the design and evaluation phase. The overall process for

functional clothing is not very distinguishable from the typical clothing design framework. However, the information-gathering stage focusing on the needs and preferences of the target customer has much more emphasis in functional design.

2. Thermal comfort -

The body constantly generates heat from the metabolism and loses this heat to the environment. A balance must be maintained between the rates of heat production and heat loss. Discomfort becomes apparent when the body feels too hot or too cold. Thermal balance is closely related to the transport or conservation of heat and moisture throughout the garment system.

3. Tactile material -

The interaction between fabric and human skin will stimulate various sensory receptors on the skin and may cause uncomfortable feelings such as tickle, itch, prickle, and abrasion of the skin. For the clothing, overall tactile feeling is related more to pressure comfort which includes heaviness and tightness rather than prickliness, itchiness, and roughness.

4. Mobile comfort -

The ease of movement is dependent on garment design and the relative size between body and clothing. High stretch fabrics have provided opportunities for the functional clothing to accommodate both tight-fitting and body movement. Mobility within clothing is reduced as technological function increases. If wearabletechnology incorporates bulky and stiff areas, they must be situated at specific locations on the body in orderto avoid the abrasion and preserve mobility.

5. Fashion -

The apparel is one of the products highly appealing to the aesthetic preference of the user. Aesthetically pleasing design is an integral part of the success in the fashion and apparel industry. Although technical aspects have strong influences in smart clothing development, we cannot expect the fashion industry to adapt itself to technology. Before we start designing smart clothing, we must ask ourselves which should be a decisive factor, form (style or fashion) or function (technical performance or technology).

6. Degree of technological integration -

Until every part of technology can be made out of textile material without any functional limitation, technical components cannot be completely integrated into the clothes. To empower the appearance, technology must be simplified and invisible as much as it can. If technology is not invisible, it should have an attractive appearance and become fashionable accessories of the clothing such as a button or a zipper.

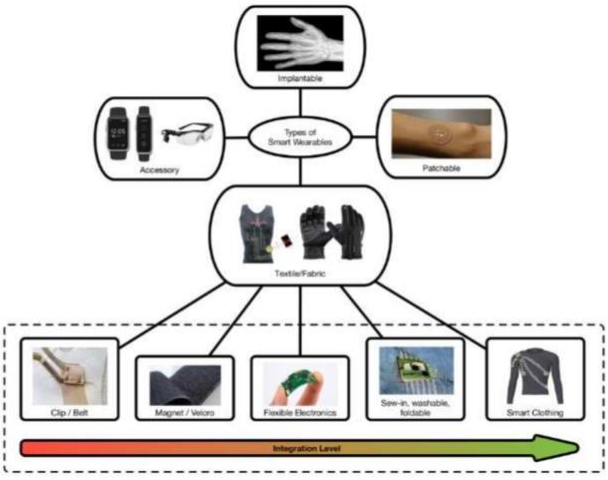

Figure -3: Degree of integration

2.1.2 Physiology

Since these IFC's are to analyze and monitor the human body, there is a need to know about the human body. Only then it is possible to design wearable tech in order to gather the required data from the places to be analyzed (For e.g., An EKG vest needs to collect data from particularly 12 points on the chest and the back). Also, it is necessary to study

about the radiations and the ill effects caused by the electronics used on the body, since it will be held very close to the skin. Hence, it becomes important to study about the human body and the data that must be collected in order to understand what all parameters are to be measured for knowing about any abnormal body behavior.

2.1.3 Textile Technology

Textile Technology, the word itself suggests two parts:

a) The textile material to be used:

1) Whether the material to be used composes of:
- A single type of yarn
- A plied yarn with 2 or more textile yarns.
- A plied yarn with non-conductive and conductive thin wire.

2) The type of fabric to be used (Knitted, Woven, Non-woven)

Technology used behind manufacturing the IFCs and the electronic devices or chips or implants used for measuringthe dfferent body parameters.

Table 1: Technology used, its function and Integration

	TECHNOLOGY	**FUNCTION**	**INTEGRATION**
1.	Optical Fibre	Signal Transfer	Woven
2.	Processor	Data Transfer	Pocket
3.	Electrode	Cardiopulmonary Signal	Implanted
4.	Piezoresistive Sensors	Respiratory Data and Body Movement	Pocket
5.	Temperature Sensors	Skin Temperature	Sewn on lining
6.	Repiband	Respiratory Data	Sandwiched in between linings

2.2 ENERGY SOURCES:

Currently the energy sources used majorly are external sources such as batteries and cells which are to be recharged and removed while washing. This hinders the continuous body monitoring process. Also, this adds a negative point to the IFC and obstructs it from using it in a daily routine busy lifestyle. Hence, we need some inbuilt energy source.

There are 2 inbuilt sources which can be used:

1) Kinetic Energy: Kinetic energy will be produced by the rubbing of the inner side of the cloth with the body when it is in motion or any movement is done. Sensors will sense the movement 8 and the heat produced due to rubbing and that heat energy will be converted to electrical energy.

2) Thermal Energy: Thermal energy will be produced by the thermal gradient between the body temperature and environment. The temperature sensors will sense the heat and convert this thermal energy into electrical energy.[3]

2.3 MATERIALS AND METHODS:

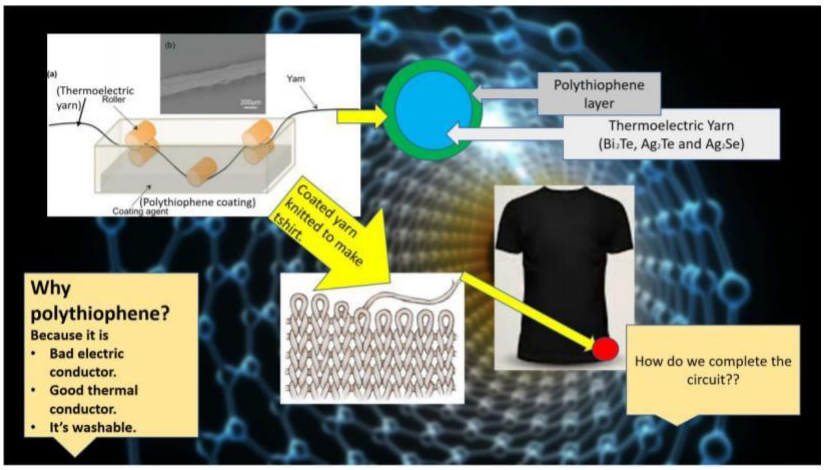

Figure-4: Making of Fabric

Since, the need is a material which can convert thermal energy to electrical energy, it is required to use a Thermoelectric material-based yarn (which are also made from **Bi2Te3** or **Ag2Te** or **Ag2Se**)[4]. But this if worn directly against the skin, will transfer current to the body as well. Hence, it is needed to coat the thermoelectric yarn with a material which allows heat transfer but is a bad conductor of electricity. Such a material is Polythiophene witha melting point of 350 degree Celsius. The main advantage being it is washable. Then, polythiophene coated thermoelectric yarn is knitted to make a body fitting t-shirt. This would be a t-shirt which would convert thermal energy to electrical energy, but where will this electrical energy be transferred?

The micro sensors or chips are embedded with pocket integration and are joined to the hem of the shirt with straight flexible Silver yarns.

Why Silver yarns?

Because it is highly conductive. It is used for obtaining small distance accuracy in all the electronic devices. It is highly conductive on low voltages and also is crisp when it comes to low current transmission.]

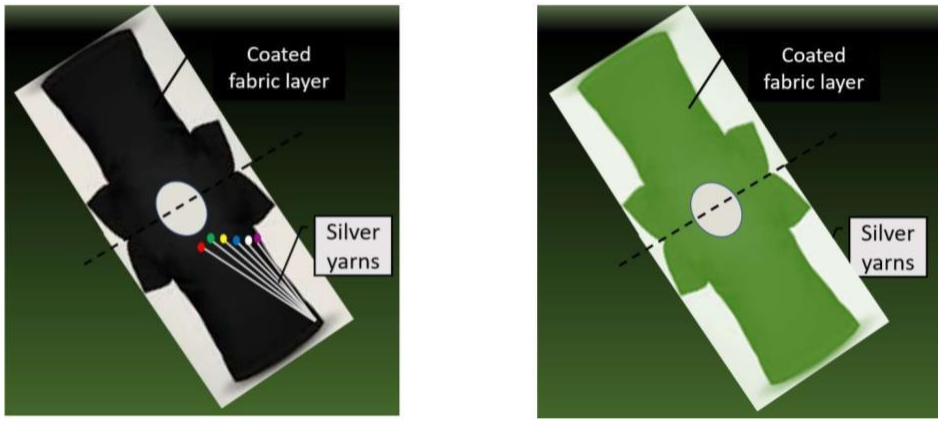

Figure-5: Making of garment

The Sensors receive data, it transmits the data to the hem of the t-shirt. The hem of the t-shirt will be connected to a transmitter which sends the data to the app which sends signals and notifications if anything abnormal is seen. It also will send timed reports for routine checkup to the concerned doctor. The key sensors used for the WH T-Shirts are:

- **3 AXIS ACCELEROMETER**

a) Heart Rhythm.

b) Breathing Pattern.

- **Breathing Sensors**

a) Expansion and contraction of Ribcage.

b) Stress level.

History of Wearable Technology:

- Comfortably worn on the body for extended periods of time
- Independently powered and use sensors or microcomputers to process information 10 In addition to the notable reduction of size of the wearables device over time, from the Sony Walkman's 0.5 lb. to the 0.3 ounce Fitbit Zip, the "smart" component of wearables.

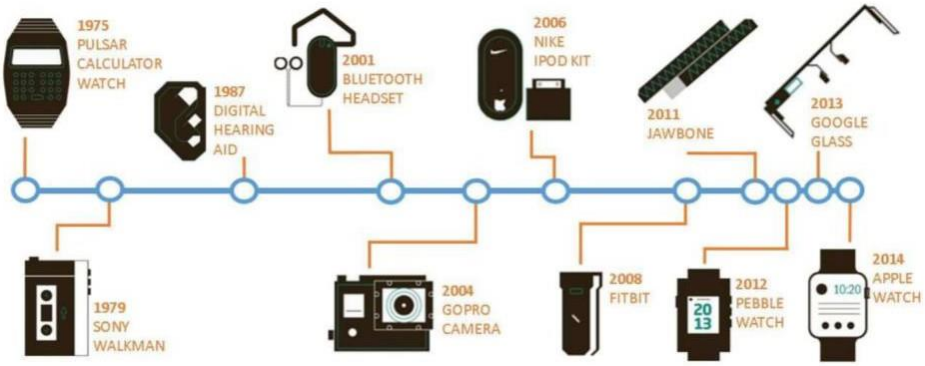

Figure 6: Evolution of the Wearable Market Industry

In the last 10 years, "smart" wearables have advanced in two primary areas:

- The ability to collect personal data (Nike iPod, GoPro)
- The ability to provide Real Time data insights to users (Fitbit, Jawbone, Pebble) These advancements, coupled with the ubiquity of smartphones, have primed the market for smart, wearable, personal devices such as the Apple Watch. However, notable missing from the current timeline are smart clothing products. Until recently, technology, cultural, and market conditions have not been aligned to support the adoption of smart clothing.

3.2 Smart Clothing Market Size:

The 2015 global smartphone market is an impressive $399 billion, but pales in comparison to the clothing market with $1.2 trillion in garment sales. For 2019, this gap is predicted to widen to $520 billion smartphone sales and a whopping $2.2 trillion in garment sales.[6]

"Clothes will always outsell phones." ~ Dr. Michael Burrows, Dupont. Given the pervasiveness and continual growth of the clothing market, you would assume that merger of wearable technology with clothing would be an obvious area for market expansion. However, growth in this area is predicted to be slow with smart clothing account for less than 1% of the market.

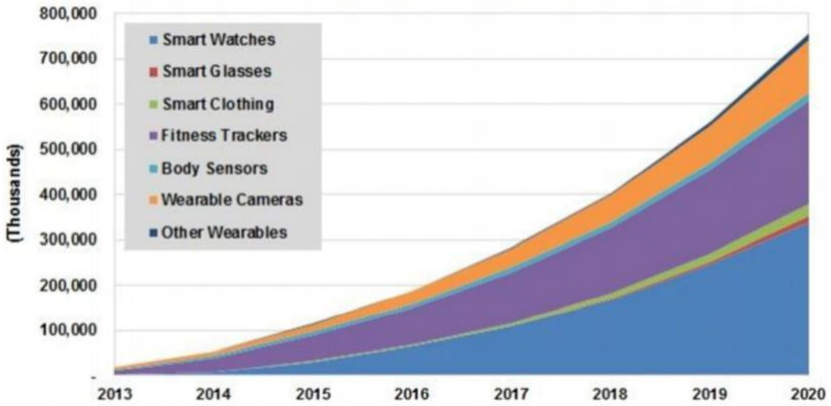

Figure 7: Cumulative Wearable Device Shipments by Device Category, World Market: 2013-2020

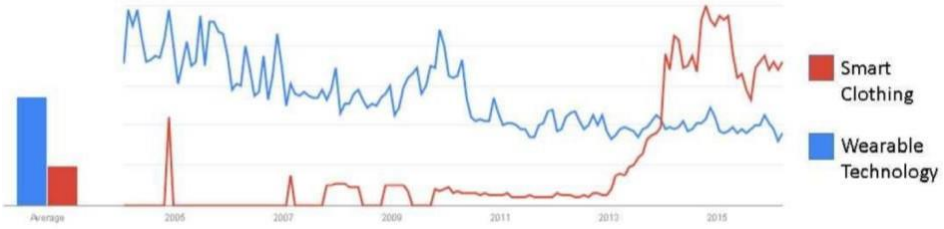

Figure 8: Growing trend of Smart Clothing over Wearable Technology from 2005-2015

According to a recent survey of 2,407 consumers in developed and emerging markets, of wearable technologies, people are least of smart clothing and e-textile products. There is low awareness of E-Textiles of about only 20% when compared to other wearable technology products.

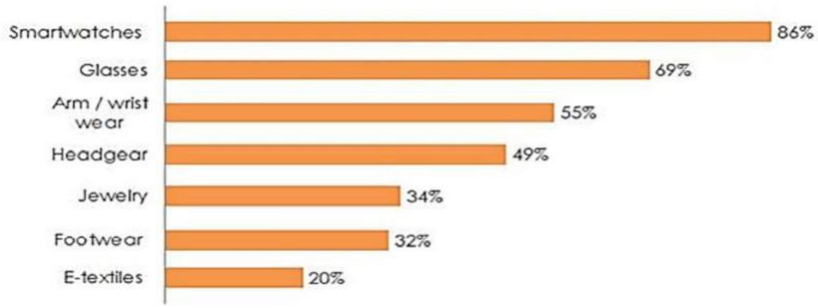

Figure 9: Awareness of wearable technology products

3. CONCLUSIONS

The idea shown above will succeed in increasing the market of Intelligent Functional Clothing as it takes care of the market issues existing currently and customer needs by focusing on:

1. Comfort:

Create the right partnerships with sensor companies. This will be crucial because clothing sensors have unique requirements such as waterproof, wash ability, and comfort. Hence, using polythiophene for wash ability and waterproof ability and knitted structure for comfort is necessary. If the IFC's are not comfortable against the skin, people will reject it after the first use and the market won't grow. Hence, comfort plays a vital role in the acceptance of the clothing.

2. Energy Source:

Create partnerships with clothing designers and manufacturers to develop a truly wearable product. Plugging in the clothing into the wall will not be an option for charging. The clothing will need to be treated like clothing and not like a piece of electronic equipment. Here's where the inbuilt energy sources like kinetic and thermal sources can be used.

3. Fashion:

Usually the smart clothing is functional but not fashionable, which gives it a minus edge in the marketing sector. Hence, working on the design of the FBM suits and the WH tees and making it fashion forward is the need of the hour.

4. Accuracy:

Only if these IFC's are accurate, they can be used in the Medical sector. Also making it accurate will help in gaining the trust of the customers.

5. Cost Efficient:

A well-made product is never successful if it is out of the customers reach, as it can become a **Dream** of a normal wage customer but never a **Need** in their daily lives. So, making it cost efficient is the first step to growing business.

Ultimately, the design and versatility of the big data processing platform from connectivity of clothing, integration of

environmental sensors and the analytics capabilities that are custom made for each domain will determine market success.

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DETAILED PROJECT REPORT ON WASTE/ USED CLOTHS MANAGEMENT IN TEXTILE INDUSTRIES

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ABSTRACT

Food, shelter, and clothing are the basic necessities for mankind. Clothing is the most necessary basic thing to maintain his/her social status. The recycling of textiles is continuing and various designs of easy to recycle are predominating. The waste generated while processing natural, synthetic fibres, finished yarn, fabric and apparel production, technical textiles, nonwovens, fashionable accessories and trimmings are grouped in this category. Post-consumer wastes are household articles of textiles and garments that the consumer does not require anymore. Enormous dyes, printing pastes, finishing agents and auxiliary chemicals are used to colour and finishing of Textile and Garments to make fashionable products. A survey tools were prepared and interview was conducted for consumers and industries to gather information about utilization and recycling of textile waste and used clothes in different Taluks of Mysore District. Consumers were selected randomly in different places of Mysore. Interview with vendors revealed that high percentage of them burn the textile waste as a fuel for hot water at home which is very economical and harmful. Consumers in Mysore district, mostly all donate and reuse the unused cloths, and a few throw away and few burn it which is not economic. "Waste dumped all around, with respect to textile and used cloths is a sign of inefficiency of a system. All the textile and apparel industries should try to optimize processes and eliminate waste to zero level. In the current situation of a globalized economy, companies with zero waste strategies are more likely to survive in the long term. Brainstorming meetings and discussions with textile and apparel industries revealed that they all are concerned and giving first priority for disposal of their industrial waste. The present project survey has given an in-depth information on the methods followed for handling of Textile and Garment Industry waste in the pre and post production stages. Respondents of the survey from all taluks of Mysore district felt that proper segregation and processing plan to be carried out for used clothes, accessories and fashion products. For executing this a policy from the governmental level will be beneficial.

Keyword- *Recycling1, Mysore District2, Textile and Garment Industry3, and Feasibility4 etc….*

1.INTRODUCTION

Food, shelter, and clothing are the basic necessities for mankind. Clothing is the most necessary basic thing to maintain his/her social status. Everyone spends on clothing irrespective of his/her financial status. Globally Textile Industry covers all aspects of apparel, furnishings, textiles, non – wearable, etc. All inputs and outputs must be considered for all the phases of the life cycle. Collection and handling of textile waste in an eco-friendly way all our cities helps to maintain the hyegiencity of place and environment. Clean and dry textiles can be resold or donated by every citizen. Current day's textiles are high in demand and raw materials are becoming more and more expensive and the source is declining. The recycling of textiles is continuing and various designs of easy to recycle are predominating.

Textiles are all around us. The waste generated while processing natural, synthetic fibres, finished yarn, fabric

and apparel production, technical textiles, nonwovens, fashionable accessories and trimmings are grouped in this category. The scale of textile waste generated is unknown since it is difficult to measure or track. Textile wastes can be classified into two categories- Pre-consumer (Production level). Another one is Post-Consumer, here waste originates from consumers and worn - out textiles goods. We don't see the factory's cutting waste, which has been estimated to be 10-30% of the fabric, we don't realize its existence or the problem face in it. Pre - consumer textile wastes can be sourced from fiber, yarn and fabric processing, Sewn products manufacture, disc textile, and cutting waste at the manufacturing level. With the expansion of the fashion industry, the quantity of industrial pre-consumer textile waste has increased. It is estimated that approximately 10-30% of textiles are wasted during garment manufacture. As textiles are almost 100% recyclable, in an ideal world, nothing in the textile and apparel industry should be wasted. Textile and used clothes recycling benefits humanity for financial improvement, Conservation of Resources, Community Building, Energy Saving, job creation, Strong economy, and Environmental Protection.

Post-consumer wastes are household articles of textiles and garments that the consumer does not require anymore. Post-consumer textile and apparel waste includes damaged, out of fashion, and old clothing. Post-consumer textile waste is either given to their family members, friends, or Charities for further use as secondhand clothing or collected to recycle or up cycled for different products. Post-consumer Textile and Apparel waste is discarded as domestic waste in most of the developing & underdeveloped countries. Post-consumer Textile wastes are collected and recycled in developed countries. The products produced from the recycled materials cannot be recycled further and it goes to land-fill resulting in pollution. Most of the fabrics produced for apparel are synthetic and synthetic blended. Post-consumer Synthetic blended garments can be recycled mechanically for making other products. After using of used post-consumer goods are not further recyclable. It is not economical to recycle further. Ultimately it goes for land fill or to the land or rivers. And finally goes to the ocean. There are many treatment methods available for recycling and reuse of the fashion- related products. It is a known fact that, still there is no proper economical procedure for disposable of post-consumer waste and finally it goes for land -fill.

Enormous dyes, printing pastes, finishing agents and auxiliary chemicals are used to colour and finishing of Textile and Garments to make fashionable products. The waste from industries such as filtration, conveyor belting, carpets, etc. has contamination. Council for Textile Recycling (2014), estimates that only 5% of the 15% of the total is recycled. Wool and organic fibres produce large amounts of ammonia which is highly toxic for the entire eco- system. Viscose and natural textiles degrade faster than synthetics. Organized recovery of textile, apparel, and fashion post-consumer products is been undertaken by many charities, private operators in Australia.

1.1 Aim of the Project:

The aim of the Detailed Project Report is to conduct survey related to utilization and processing of textile waste and used clothes from various resources as industries, households and entrepreneurs and find out the feasibility for establishment of recycling unit and recommend alternative measures or technological steps which can be adapted for textile waste utilization by taking Mysore as a pilot District.

1.2 Objectives of the Project:

Objectives of the detailed project work are as follows:

- To conduct survey by using questionnaire and Interview schedule for the Textile/ Apparel Industries/ People/ Authorities of Govt and private sector of Mysore district.
- To compile the collected data, analyze and discuss the outcomes of the survey.
- To analyze the SWOT for overall project qualitatively and Quantitatively
- To find out the feasibility for establishment of recycling unit and recommend alternative measures or technological steps which can be adapted for textile waste utilization.

2.Methodology

A survey tools were prepared and interview was conducted for consumers and industries to gather information about utilization and recycling of textile waste and used clothes in different Taluks of Mysore District. Consumers were

selected randomly in different places of Mysore.

Table: 2.1 Taluks Wise Details of Textile industries Covered - Overall Survey

Groups	Dates	Taluks	Textile Industries covered- Overall Survey
1	7th Nov 2019 8th Nov 2019	• Nanjanagud • Heggadadevanakote	• Reid and Taylor • Zenith Textiles • Consumers • Retailers • Fashion Boutiques
2	7th Nov 2019 8th Nov 2019	• Hunsur • Periyapattana • KRS	• Maris Spinners Limited Industry • Consumers • Retailers • Fashion Boutiques
3	7th Nov 2019 8th Nov 2019	• Mysore • T. Narasipura	• Karnataka Silk Industries Corporation (KSIC) • KSIC Filature • A.N. Garments • Chamundi Textiles • Consumers • Retailers • Fashion Boutiques

Figure 2.1 Industry Survey Photographs

Figure 2.2 Consumer and Shops Survey Photographs

3.SURVEY RESULTS

3.1 Vendors:

Interview with vendors revealed that high percentage of them burn the textile waste as a fuel for hot water at home which is very economical and harmful. A few others use it economically to make pillow cushions and mats and others throw away. They don't have an idea if the municipal is going to come and collect the waste or not. Whereas one of the tailors told that he is throwing the fabric small cut pieces in nearby drainage canal. Only a few of the retailors send it to Municipal collection vehicles.

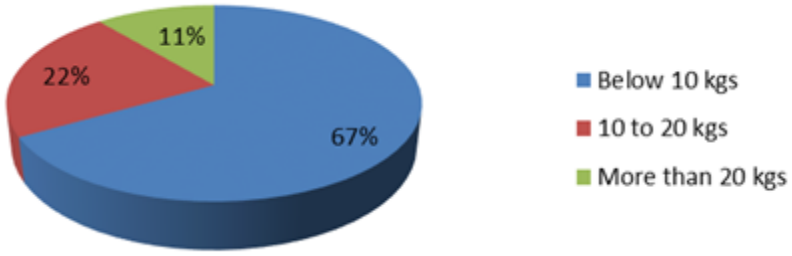

Figure 3.1 Average Waste Produced Per Month

Talking about waste produced in petty shops and retail outlets, it's about the cut pieces and the fabric that has major defect. When asked about it, cut piece is the major contributor to the waste produced in this sector.

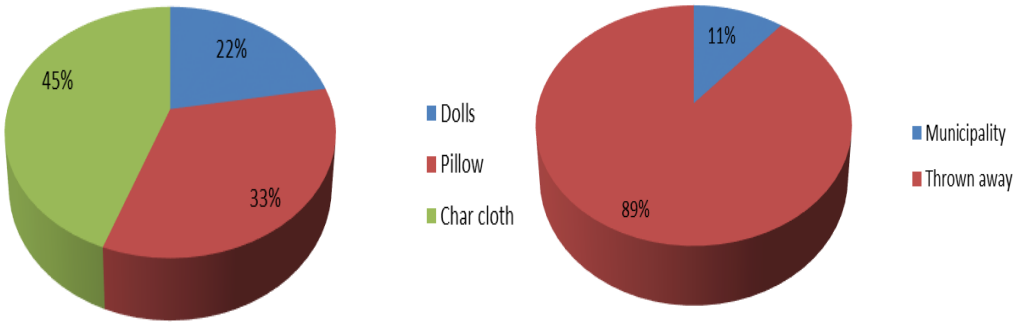

Figure 3.2 Waste Utilization per Month and Collection Method

Cut pieces and other waste obtained are not being used productively by many. People in the locality have scarce knowledge about it. But are still when asked, it was evident that major population used it as char cloth and secondly, they are being used as the stuffing material for dolls and pillows. Major population throws it away as there is no proper body to carry out the operations for waste collection at the locality. They dump it on the roads in form of heaps. They have scarce knowledge on how this would affect the environment.

3.2 Consumers:

Consumers in Mysore district, mostly all donate and reuse the unused cloths, and a few throw away and few burn it which is not economic. A few others use it economically to make pillow cushions and mats. Some of the consumers told that the used clothes will be donated to Anatha Ashrams or given to servants. Few consumers told that the used clothes are used for mopping the floor, kitchen and other cleaning process. Through the study it is noted that some of the used clothes were reused for new garment construction. Old Saree were quilted and used as bed sheets, few also use for drying of food grains and others. Consumers told that, used Sarees were beautifully decorated and used as decorative curtains, upholstery etc.

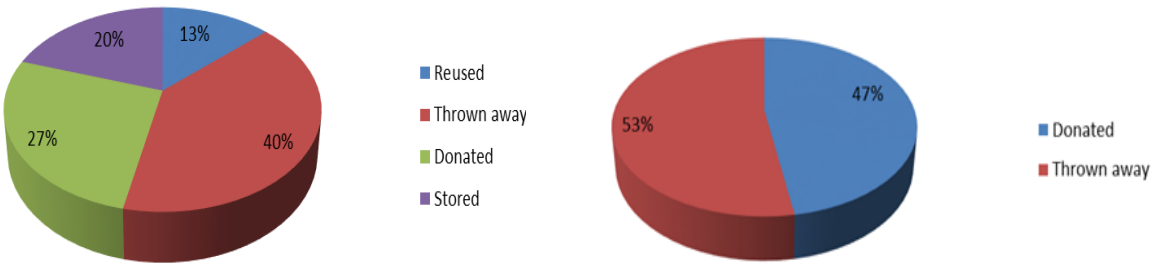

Figure 3.3 Unused Clothes Process and Clothes Discarding Process

When asked about the unused clothes, we understood that not many are ready to use someone's clothes and that is the

reason behind them throwing away clothes. Still, there are substantial number of people who donate it. The percentage of people who reuse it is scanty. There is an insignificant difference in the way of disposal. Percentage at which clothes are thrown away is quite alarming and people have various psychological reasons to justify their way of disposing the clothes.

3.3 Financial and Industrial Feasibility Study:

Mysore is the second largest city in Karnataka, after Bangalore and has an excellent door to door garbage collection system, a good segregation and recycling system which makes it one of the best managers of municipal solid waste in the country. Mysore City Corporation has managed to put in successful waste management systems. It is one of the cities that has made a significant leap forward in transforming their waste into resources and become models of zero waste for the country according to NDTV report Oct 2017. But the recent rapid expansion of Mysore, growing urbanization could cause the amount of textile and used cloths waste to increase four-fold by 2030. At present there is no separate collection system for textile and used cloths. There is a need to separate collection urgently. Of the 402 tons of waste Mysore produces each day, close to a quarter is processed by the centers of local residents or non-government organizations and about half is treated at the compost plant. Presently in Mysore districts, bio- degradable solid waste is collected on daily basis and dry wastes are collected on Saturday. Presently plant at Vidyaranyapuram is processing 150-200 tons of solid waste per month. As the rapidly increasing population and urbanization of the city now, dumps double the quantity of waste being processed. So establishment of categorized processing unit is most essential. Also, establishment of power generating plant helps to tackle these issues. The central government under Prime Minister Narendra Modi has also made it mandatory for the electricity board to buy power from the country's seven existing waste-to-energy plants.

"Waste dumped all around, with respect to textile and used cloths is a sign of inefficiency of a system. All the textile and apparel industries should try to optimize processes and eliminate waste to zero level. In the current situation of a globalized economy, companies with zero waste strategies are more likely to survive in the long term. Brainstorming meetings and discussions with textile and apparel industries revealed that they all are concerned and giving first priority for disposal of their industrial waste. Mysore city Corporation has 10 lakhs population, and generates 402 TPD of Municipal solid waste. Mysore City Corporation, has divided all 65 wards into 9 zones and in each of these 9 zones they have established the segregation and processing plants, out of which 8 are operational. Mysore Municipal Corporation faces resource constraints, and is unable to bear the cost of collection, transportation and disposal of waste resulting in neglect of waste management. Treatment and disposal cost of unsegregated waste is more expensive compared to that of segregated waste.

4.CONCLUSIONS:

The present project survey has given an in-depth information on the methods followed for handling of Textile and Garment Industry waste in the pre and post production stages. Respondents of the survey from all taluks of Mysore district felt that proper segregation and processing plan to be carried out for used clothes, accessories and fashion products. For executing this a policy from the governmental level will be beneficial. The participation of private sector could play a vital role in solving the many challenges while disposal and recycling of textile and used cloths waste. A partnership with well-known private sector like Goonj or others will be better. This type of collaborative initiation may resolve the technical issues, disseminate the information to the public and creates awareness for handling textile pre and post-consumer waste. As the statement given by the Task force on waste to energy 2014, "It is recognized that any waste processing plant, small or big, which produces biogas, syngas, ethanol, electricity, liquid fuel or any other fuel is in fact a Waste to Energy plant and should be deemed eligible for support." These types of activity will also help in revenue generation, improves the quality of life and resolves the environmental issues. Both Municipal solid waste management and textile and used cloths management should work together.

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MICROFIBER POLLUTION: A STUDY ON INFLUENCING FABRIC PROPERTIES AND PARAMETERS

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ABSTRACT

Microfiber shedding from Synthetic Textiles is found to be the major contributor to microplastic pollution. The modification of synthetic textile materials to reduce microfiber shedding can be a potential step to reduce its contribution to microplastic pollution. The project aims to analyse different textile parameters that can possibly influence the microfiber shedding along with few washing parameters (mechanical agitation, water volume, the addition of softener). 100% polyester knitted fabrics of different structures and GSM were analysed. The analysis of the influence of certain washing parameters has resulted in the finding that the increased mechanical agitation, water volume can increase the fiber shedding whereas the shedding is reduced while adding softener. While estimating the influencing fabric properties, it has been noted that more fibers are released from the edges than the surface. The increased stitch density and tightness factor have a positive impact in reducing microfiber shedding. Further, the increased yarn count and thickness increase shedding as the number of fibers per unit area will be higher. The fabrics with higher abrasion resistance and bursting strength are noted to have higher microfiber shedding. The fabric pilling resistance has been found to have no impact on microfiber shedding.

Keyword: - *Microfiber Shedding, Polyester Fabrics, Fabric Areal Density, Abrasion Resistance, Fabric Structure, Pilling Resistance, Bursting Strength*

1. INTRODUCTION

Microplastics are plastics that are less than 5 mm in size which needs to be addressed because of its ubiquitous nature [1]. The emission of microplastics into the environment was accelerated with the increased usage of plastics in the past few decades. The global market size of plastics in the year 2019 is 568.9 billion USD [2]. The potential sources of microplastics can include abrasion of tyres, synthetic textiles, marine coating, road marking, personal care products like cosmetics and plastic pellets [3].

Among different sources of microplastics, Synthetic Textiles are the dominant source of microplastic emission. They can contribute to microplastics in the form of short fibers. The use of synthetic textiles has become inevitable because of its ultimate properties. The fast fashion system fuels the demand of synthetic textiles and the problem get serious with low quality synthetic textiles. Synthetic textiles correspond to 25 – 30% of microplastics in the marine environment [4]. It has been estimated that around 0.19 million tonnes of microfibers are entering the marine environment every year [5]. It is estimated to be raised to 22 million tonnes by the year 2050 [6]. Synthetic microfibers are found in different levels of environment including coastal region [7], surface water [8], sea ice [9], and even in atmosphere [10]. The analysis of samples collected from different coastal regions across six continents has proven that the contamination of coastal region with synthetic fibers which resembles those used in the apparels [7]. The other researcher found microplastics in sea ice in arctic region where rayon (54%) was predominant followed by polyester (21%) and nylon (16%) [9]. Around 300 million individual microfibers were found to be discharge long the surface of Hudson River, USA [8]. Similarly, in Saigon River, a huge proportion of synthetic fibers are found to contribute to microfibers present. And polyester accounts for 70% of total synthetic fibers found [11]. The analysis of sewage effluent has reported that flake hold a huge proportion of 67.3 % which is followed by fibrous particles (18.5%). Among various fibrous materials, polyester and polyamide were dominant by contributing 28% and 20% respectively [12]. Microfibers are being found in the air we are inhaling

[13]. A study on the analysis of microfibre presence in the indoor and outdoor air samples have reported around 1.0 – 60.0 fibers per cubic meter [14]. Through various studies on microplastics prevalence in the environment, it is confirmed that the synthetic textiles that are shedding microfibers are one of the major contributors of microplastic pollution. This raises the need for a detailed analysis of textiles throughout their lifetime to understand their potentiality of releasing short fibers which can add on to the microplastic load in the environment. Since the microplastic pollution is of environmental concern, various researches were done from the environmentalists. As a precautionary measure, the researchers analysed the various laundry parameters as most of the microfiber release is happening during the washing of synthetic textiles. The researchers have found that the controlling of few washing parameters can result in reduction of fiber release from the textile materials. The lowered washing temperature [15], use of liquid detergent over powdered detergent [16], can reduce the release of microfibers during washing. However, synthetic textiles being the major contributor of microplastics, the research from the side of textile engineering is very limited. The modification of textile parameters along with the control of domestic laundry parameters can potentially reduce the microfiber release from the textile materials into the environment. Hence this project mainly aims to (i) analyse the shedding behaviour of synthetic textiles under different washing conditions (varied mechanical agitation, varied water volume, use of softeners, number of washes, type of washing (hand wash and machine wash)) and (ii) analyse the impact of textile parameters (Fabric Structure, GSM, yarn count, Thickness, Stitch Density, Tightness Factor) and textile properties (Abrasion Resistance, Bursting Strength, Pilling Resistance) in the shedding behaviour of synthetic textiles to identify the influencing parameter.

2. MATERIALS AND METHODS

2.1 Fabrics

100 % polyester knitted fabrics with different GSM, Structure, and yarn count were sourced from a retail fabric store in Tirupur. The fabrics specifications are provided in Table 1.

Table -1: Fabric Specifications

Fabric	Structure	GSM	Yarn Count (denier)	CPI	WPI	Thickness (mm)	Loop Length (mm)	Tightness Factor
1	1 X 1 Interlock	210	148	38	72	0.534	2.625	1.54
2	1 X 1 Interlock	280	126	50	61	0.682	2.2716	1.65
3	Single Jersey	220	84	69	47	0.49	1.5614	1.95
4	1 X 1 Rib	230	190	53	53	0.879	2.4192	1.89
5	1 X 1 Interlock	140	110	50	63	0.488	2.1096	1.66
6	1 X 1 Interlock	190	102	47	76	0.589	2.0498	1.64

2.2 Sample Preparation and Washing Procedure

The samples are prepared by cutting the fabric into rectangular pieces of size 15 cm x 15 cm. The edges were double folded and secured with single needle lockstitch. To understand fiber release from edges, the edges were kept unfinished for one set of analysis. The washing is carried out using Launder-o-meter which is used to replicate domestic laundry of textile materials. For each test, 2 replicates were made. For all the tests, the water volume, detergent concentration, number of steel balls, washing time, and washing temperature were kept constant as 150 mL, 4 gpl, 10, 45 minutes, and 30 ^{o}C respectively. For the analysis of washing parameters, the washing parameters such as number of steel balls (5, 10, 15), water volume (50 mL, 100 mL, 150 mL, 200 mL), use of softeners (1 mL, 3 mL, 5 mL) are varied whereas the temperature, time and detergent concentration were kept constant.

2.3 Microfiber Shedding Quantification

After washing, the wash effluents are filtered using Grade 1 Whatman Filter paper of pore size 11 µm (Grade 1). After filtration, the filter papers were collected and the microfibers in the filters are counted manually. Each filter paper is gridded with a scale of 2 mm x 2 mm. 30 squares are chosen along the diagonal of the filter paper and the number of fibers in each square is counted manually and the average of microfibers in 30 squares is taken as the number of microfibers in one square. Figure 1 a) shows the squares chosen along the diagonal to find the average number of fibers

in each square. The total number of fibers in the filter paper is estimated by multiplying the average number of fibers in one square with the total effective area of the filter with microfibers. Equation 1 represents the formula to estimate the microfiber in the filter paper as reported by Napper et al. Equation 2 and 3 gives the number of fibers released per square meter and per kilogram of fabric respectively.

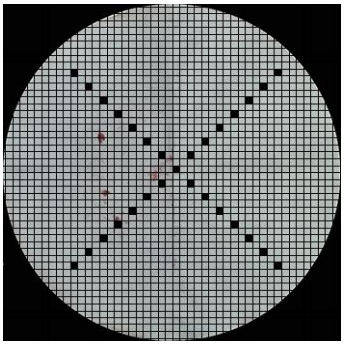
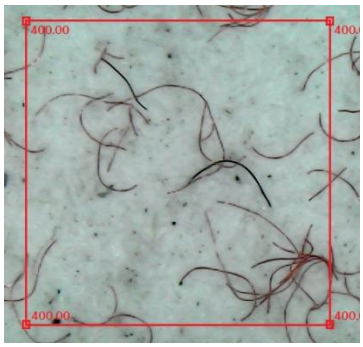
a)  b) 

Figure -1: a) Chosen squares along the diagonals of filter paper; b) Microscopic image of fibers in the filter paper

Number of microfibers (N) in each filter = Average number of microfibers in 1 square x Number of squares in the filter paper having microfibers --- (1)

Number of microfibers released per square meter of fabric = (N X 100 X 100)/(15 x 15) --- (2)

Number of microfibers released per kilogram of fabric = (N x 10000)/(15 x 15 x GSM) x 1000 --- (3)

With the number of fibers counted, the mass of the microfibers captured in the filters is estimated by the method proposed by Napper et al. [8] The length and diameter of the fibers are measured using ImageJ software by analysing the microscopic images of the filter paper with fibers. The average length and average diameter are measured by taking the average values of 15 microfibers in each filter paper. Then the mass of the microfibers in the filters are calculated using the formula provided in equation 4:

Mass of the microfibers (m) in mg = N x d x π x (D/2)2 x l --- (4)
where N is the total number of fibers in the filter paper; d is the density of polyester fibers in g/cm3; D is the average diameter of the fibers in mm and l is the average length of the fibers mm.

The mass of microfibers shed per square meter and per kilogram of fabric is estimated using the following formula provided in equations (5) and (6) respectively:

Mass of Fiber released from 1 square meter of fabric = (m X 100 X 100)/(15 x 15) --- (5)

Mass of microfibers (mg) shed per kg of fabric = (m x 10000)/(15 x 15 x GSM) x 1000 --- (6)

2.4 Physical Property Analysis

The physical properties such as pilling resistance, abrasion resistance (dry and wet) and bursting strength are assessed. The pilling resistance of the fabric is assessed using ICI pill box as per standard ISO 12945. The abrasion test was done using Martindale Abrasion Tester as per the standard ASTM D 4966 and ASTM D 4158 for dry and wet respectively. The abrasion of the fabric against silicon carbide sheets has been examined using silicon carbide sheets of different grits (400 grit and 600 grit). The bursting strength of the fabric was determined as per the standard ASTM D 3786.

2.5 Statistical Analysis

The variation in the microfiber shedding with respect to different process parameters were analysed using one way ANOVA to understand the statistical significance. Pearson correlation coefficient (r) analysis is also performed to estimate the correlation and multivariable regression analysis (r^2) to find the inter relationship between the microfiber shedding and the fabric parameter. All the analyses are performed using Microsoft Excel.

3. RESULTS AND DISCUSSION

3.1 Analysis of Washing Parameters

Effect of Mechanical Agitation

The effect of mechanical action during laundry on the quantity of shedding is analysed. It has been analysed by varying the mechanical agitation by increasing the number of steel balls inside the canister while washing. The microfiber shedding is noted to increase while increasing the number of steel balls in the canister (Strong positive correlation of 83 – 99 % is noted).

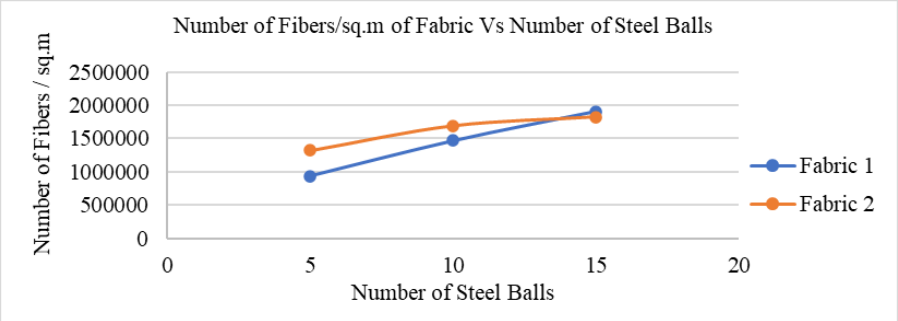


Figure -2: Effect of Mechanical agitation on Microfiber shedding

This significant increase in number of microfibers shed ($p < 0.05$) from the fabric while increasing the number of steel balls shows that the increased mechanical action will result in increased shedding. Figure 2 shows the relationship between mechanical action and microfiber shedding. The increased mechanical actions can cause more damage to the fibers and so increase in microfiber shedding. From this, it is clear that harsh wash cycles can cause more microfiber release than the mild delicate wash cycles.

Effect of Water Volume

The effect of fabric to liquid ratio during washing was examined. For this, the fabrics are washed with different water volumes (50 mL, 100 mL, 150 mL, 200 mL) without altering other washing parameters. Increase in shedding is noted with increased water volume. Figure 3 illustrates the increase in shedding with increased water volume. It is evident by a strong positive correlation (95 – 97%) between the water volume and microfibers released. A significant difference ($p < 0.05$) is noted in the microfiber shedding in terms of quantifications namely number of fibers/sq.m, number of fibers/kg, mass (mg) of fibers/sq.m and mass (mg) of fibers/kg.

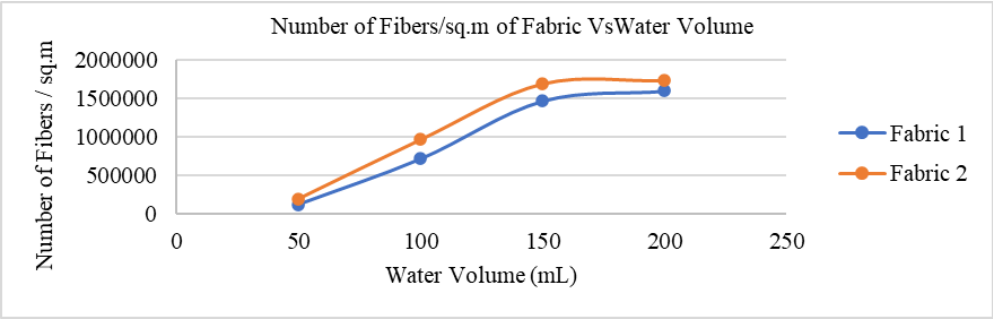


Figure -3: Effect of Water volume on microfiber shedding

Effect of Softeners

The effect of use of softener during the laundry is analysed by comparing the shedding behaviour of fabrics that are washed with addition of different quantity of softener. A significant reduction ($p < 0.05$) in the shedding is noted while increasing the amount of softener in the washing. Figure 4 shows the reduction in shedding in terms of count and weight respectively against softener volume.

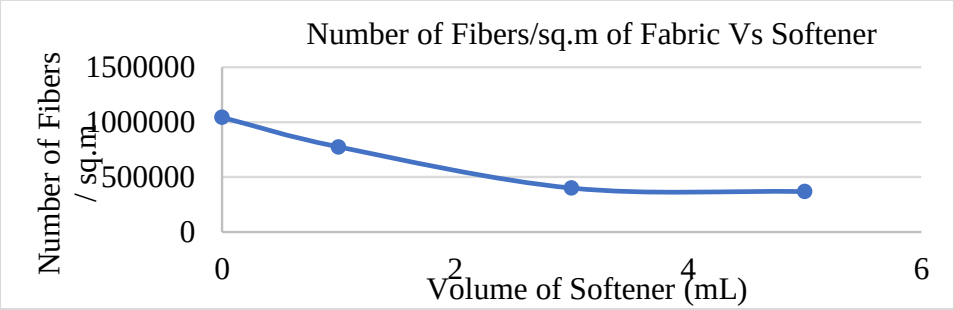


Figure -4: Effect of Softener Concentration on Microfiber shedding

Effect of Repeated Washing

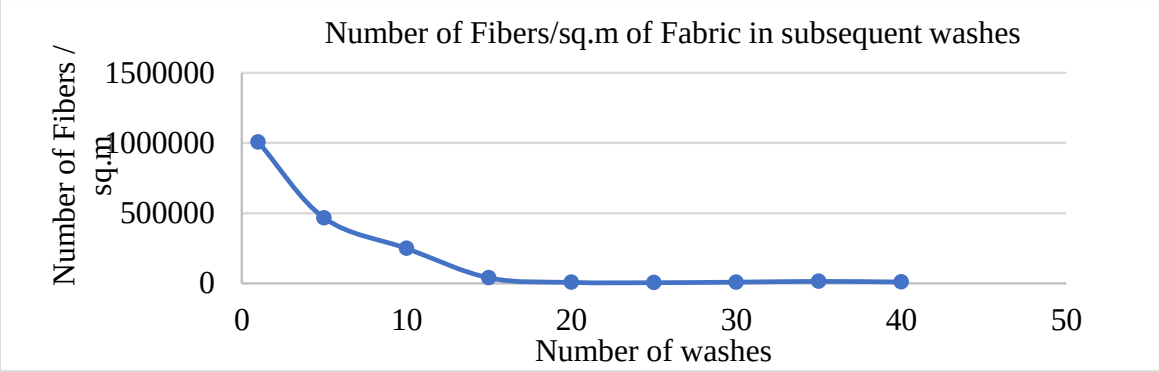


Figure -5: Effect of Repeated washes on Microfiber shedding

Since the apparels are subjected to washing regularly in the usage phase, the effect of subsequent washes on the shedding was also analysed. The fabrics were washed repeatedly upto 40 washes and the microfiber shedding is quantified at an interval of 5 washes. A significant reduction ($p < 0.05$) in the shedding is noted for the first 15 washes. After 15 washes, no significant change ($p > 0.05$) in the microfiber shedding is noted. Figure 5 shows the microfiber shedding in subsequent wash cycles (1 to 45 washes).

From these analyses, it is very clear that the variation in washing parameters can affect the shedding. The increased mechanical agitation and water volume increases the shedding whereas the use of softeners during laundry reduced the shedding. The repeated laundry reduces the shedding upto certain washes (15 washes) and the shedding got stabilised after that.

3.2 Effect of Textile Parameters

Effect of Edge Finishing

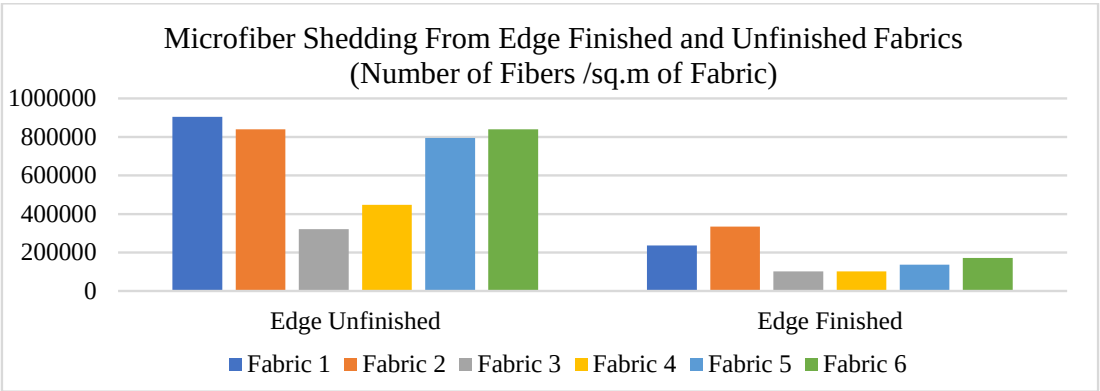


Figure -6: Comparison of Edge finished and Unfinished samples for microfiber shedding

A significant difference ($p < 0.05$) is between the microfibers shed from edge finished and unfinished fabrics. When the fabric edges are finished, shedding is reduced by 77%. Figure 6 shows the microfiber shedding behaviour of edge finished and unfinished samples.

Effect of Stitch Density

While there is an increase in stitch density, a decrease in the shedding has been noted. It is confirmed by the correlation between stitch density and number of fibers shed per sq.m of fabric (-0.64 and -0.43 for edge unfinished and finished samples respectively). The increase in stitch density increases the compactness of the structure and so the shedding got reduced. Figure 7 illustrates the effect of stitch density on microfiber shedding.

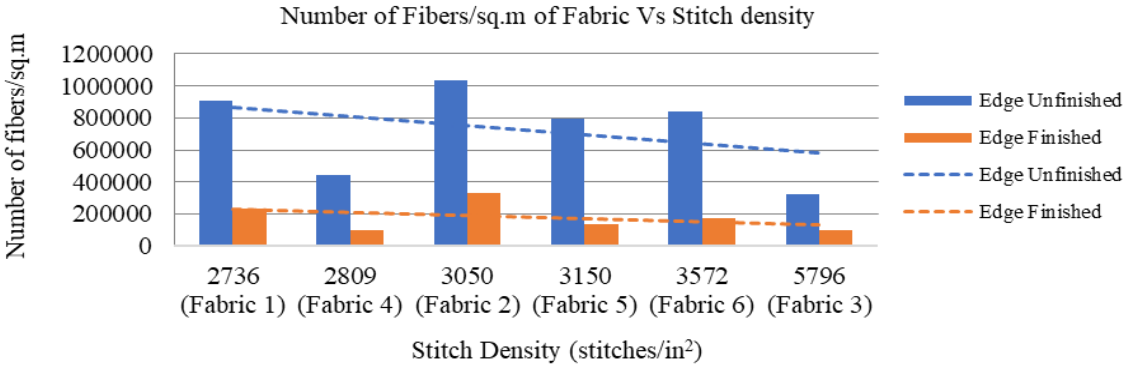


Figure -7: Effect of Stitch Density on Microfiber Shedding

Effect of Tightness Factor

Whenever the tightness factor (√Tex/Loop length) of the fabric increases, the microfiber shedding is reduced (A negative correlation of -0.93 and -0.67 for edge unfinished and finished samples respectively). The increase in the tightness of the structure restricts the fibers to disentangle from the surface by holding them in the structure. Figure 8 illustrates the effect of stitch density on microfiber shedding.

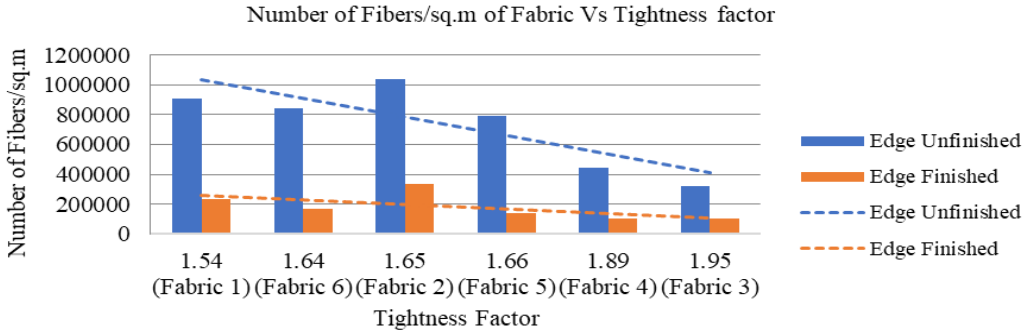


Figure -8: Effect of Tightness factor on Microfiber Shedding

Effect of Yarn Count

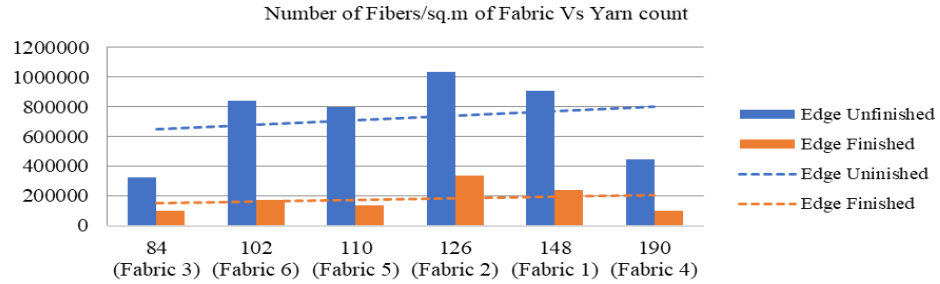


Figure -9: Effect of yarn count on Microfiber Shedding

While comparing the microfiber shedding characteristic of the fabrics with the yarn count (denier), there noted a significant correlation between filament denier and mass (mg) of microfiber shedding per sq.m of fabric (0.76 and 0.89 for edge unfinished and finished samples respectively). Figure 9 shows the effect of yarn count on microfiber shedding of polyester fabrics. This positive correlation between filament denier and shedding shows that coarser count sheds more fibers than the finer count. This is attributed to the fact that fibers in unit area will be more for coarser count than the

finer count. From this, it is clear that higher the amount of fibers in unit area higher will be the shedding.

Effect of Thickness

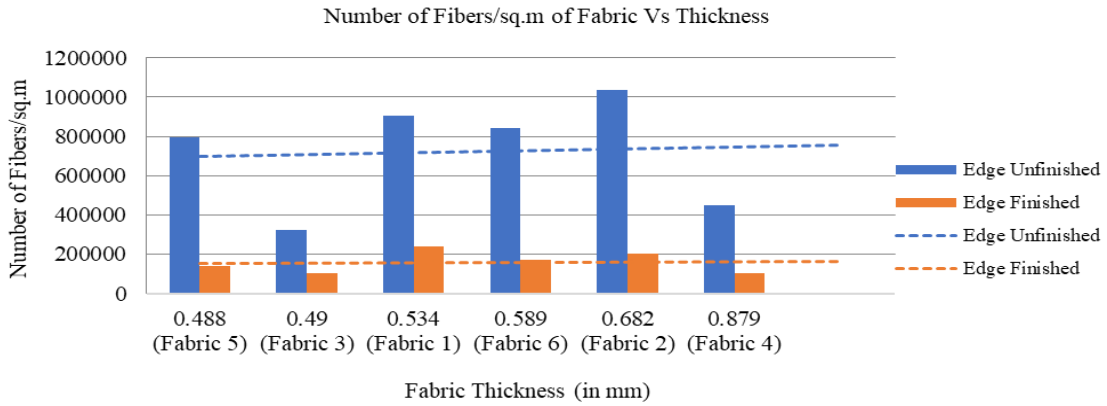


Figure -10: Effect of Fabric Thickness on Microfiber Shedding

The increase in thickness of the fabric results in increased microfiber release. This is evident from the positive correlation (0.81) between the fabric thickness (mm) and the mass (mg) of microfiber released from the fabric. This is also due to the fact that the fabric with higher thickness will have more amount of fibers in unit area than the fabric of lower thickness. Figure 10 shows the relationship between microfiber shedding and fabric thickness.

Effect of Fabric Areal Density

The effect of fabric areal density (grams per square meter) on the shedding behaviour has been analysed by examining the shedding behaviour of fabrics of same structure and different GSM. Figure 11 shows the number of fibers shed per square meter of fabric. An increase in shedding is noted with fabrics of higher GSM. This is attributed to the fabric parameters that is responsible for increasing the GSM. GSM of a fabric can be generally increased by increasing the stitch density, yarn count or thickness. Yet, these factors have different impact on the shedding and hence the relationship between the GSM of the fabric and these parameters are analysed. In the case of samples used in the study, the GSM of the fabrics are related to the yarn count and thickness. The increase in yarn count and thickness increased the GSM. As the increased yarn count and thickness increases the shedding, the fabrics with higher GSM showed increased shedding.

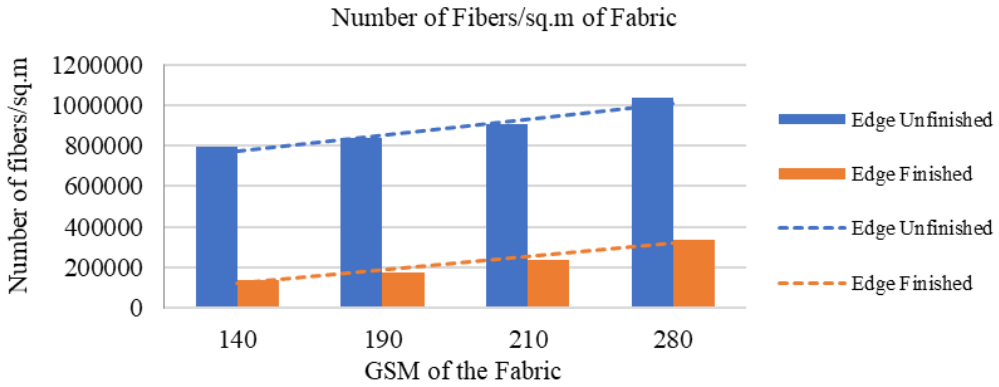


Figure -11: Effect of fabric areal density on Microfiber Shedding

Effect of Structure

To understand the effect of fabric structure on shedding, 3 different knit fabric structures (Single Jersey, 1x1 Rib and 1x1 Interlock) of similar GSM are analysed. A higher shedding is noted with Interlock structure followed by Rib and Single Jersey. This were again attributed to the fabric basic parameters like stitch density, yarn count, thickness and

tightness factor. The effect of fabric structure on the shedding could not be analysed as the fabric parameters except GSM were not kept constant. The influence of these parameters overtook the influence of fabric structure. Figure 12 shows the microfiber release per square meter of fabric of different structures.

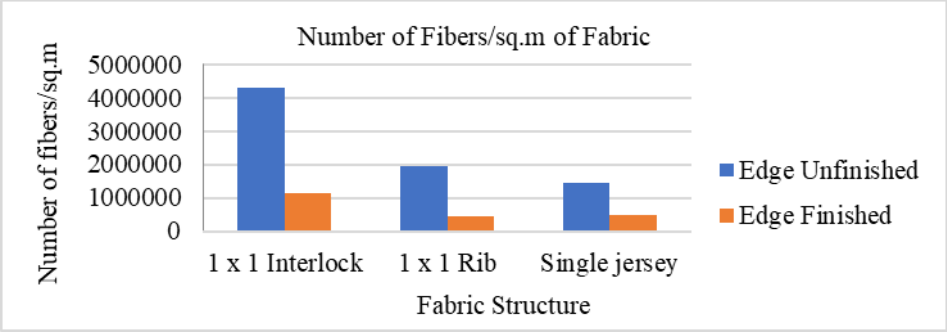


Figure -12: Effect of Fabric Structure on Microfiber Shedding

3.3 Effect of Fabric Physical Properties

Abrasion Resistance

The abrasion resistance of fabrics was analysed in both dry and wet states and also against different abradants. The correlation between the microfiber shedding and fabric abrasion resistance in all methods are tabulated in Table 2.

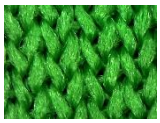
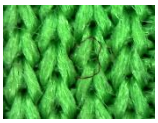
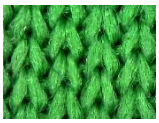
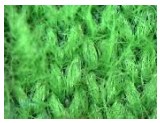
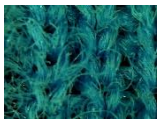
Table -2: Correlation between Abrasion Resistance and Microfiber Shedding

Fabric	Weight Loss % (Fabric to Fabric)/End cycles (Fabric to Silicon Carbide Sheet)	Correlation between shedding and Weight loss %			
		Number of fibers/sq.m of (Edge Unfinished Fabric)	Number of fibers/sq.m of (Edge Finished Fabric)	Mass of fibers (mg)/sq.m of (Edge Unfinished Fabric)	Mass of fibers (mg)/sq.m of (Edge Finished Fabric)
Fabric to Fabric (Dry) - 30,000 cycles					
Fabric 1	-0.4765	0.1027	-0.5321	-0.2455	-0.6003
Fabric 2	-1.021				
Fabric 3	-0.3632				
Fabric 4	0				
Fabric 5	1.8286				
Fabric 6	0.3596				
Fabric to Fabric (Wet) – 13,000 cycles					
Fabric 1	-0.5867	-0.0905	-0.7352	-0.4878	-0.5422
Fabric 2	-6.8453				
Fabric 3	-0.3956				
Fabric 4	-0.9406				
Fabric 5	0.9459				
Fabric 6	2.1916				
Fabric to Silicon Carbide Sheet (400 grit) – End Cycles					
Fabric 1	110	0.0906	0.7262	0.3794	0.3011
Fabric 2	1000				
Fabric 3	320				
Fabric 4	200				
Fabric 5	50				
Fabric 6	190				
Fabric to Silicon Carbide Sheet (600 grit) – End Cycles					
Fabric 1	170	0.2722	0.8256	0.4886	0.3372
Fabric 2	2550				
Fabric 3	210				
Fabric 4	200				
Fabric 5	50				

Fabric 6	195				

The negative correlation between weight loss % and microfiber shedding and the positive correlation between show that the fabrics with higher abrasion resistance shed more than the fabrics with lower abrasion resistance. This is attributed to the higher thickness of the fabrics which are having good abrasion resistance. Table 3 shows the damage/changes in the surface of the fabrics after subjected to different abrasion.

Table -3: Microscopic Images of fabrics before and after subjected to Abrasion against different Abradants

Fabric Sample	Before Abrasion	After Abrasion			
		Fabric to Fabric (Dry – 30000 cycles)	Fabric to Fabric (Wet – 13000 cycles)	Fabric to Silicon carbide sheet 400 grit)	Fabric to Silicon carbide sheet (600 grit)
1					
2					
3					
4					
5					
6					

Bursting Strength

The shedding behaviour of the fabrics are compared with the bursting strength of the fabrics. Figure 13 shows the relationship between bursting strength and microfiber shedding of fabrics. Reduction in bursting strength reduces the microfiber shedding. This is due to the increase in loop length and GSM. The increased loop length gives extensibility to the fabric which increases the bursting strength. However, increase in loop length reduces stitch density and the reduced stitch density increases the shedding. Moreover, increased tightness factor reduces the bursting strength whereas increases the shedding. Overall, the factors that increase the bursting strength also increases the shedding. Hence, the fabrics with higher bursting strength are found to have higher microfiber shedding.

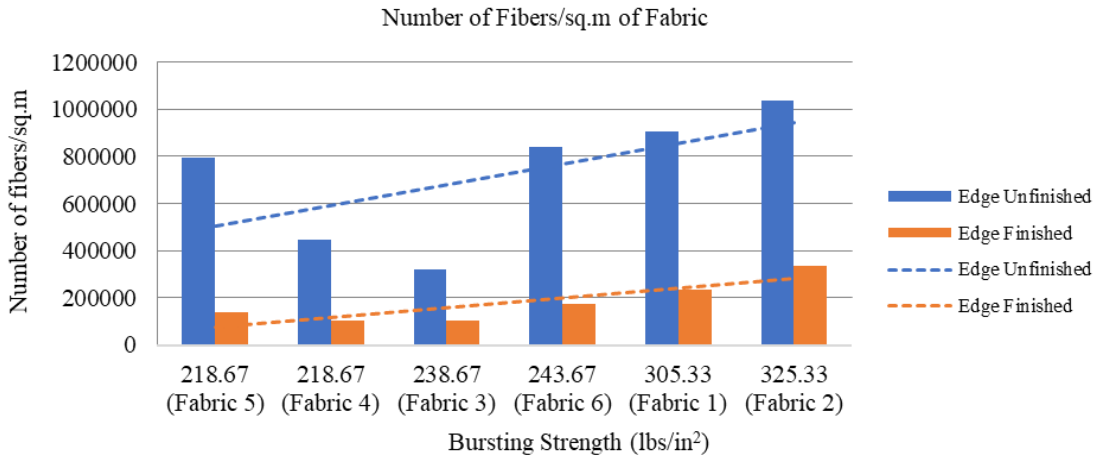
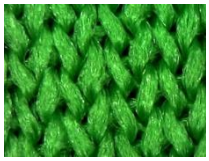
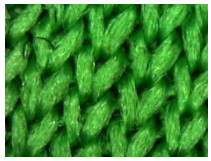
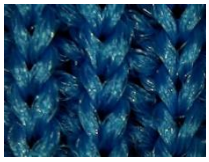
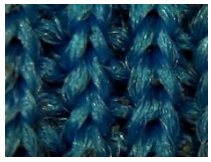


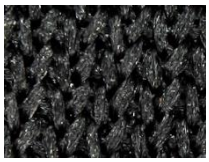
Figure -13: Effect of Bursting Strength on Microfiber Shedding

Pilling Resistance

For all the fabric samples analysed, the pilling grade was noted 5 after 25,000 cycles in ICI pill box. Table 4 shows the microscopic images of fabrics before and after pilling. Even though, the pilling resistance of the fabrics are noted good and similar, there are changes in the shedding behaviour of the fabrics. Hence, the pilling resistance of the fabrics are not found to have significant impact on the shedding behaviour of the textile materials.

Table -4: Microscopic Images of fabrics before and after Pilling

Fabric Sample	Before Pilling	After Pilling
1		
2		
3		
4		

5		
6		

Different textile parameters as well as the properties of the polyester fabrics are analysed and they are correlated with the shedding behaviour of textile materials. The fabric basic parameters like yarn count and thickness have positive correlation with shedding whereas stitch density and tightness factor have negative correlation. While comparing the fabric physical properties, the shedding increases for the fabrics with higher bursting strength and good abrasion resistance which is again attributed to the basic parameters.

4. CONCLUSIONS

Since microfibers shedding from the synthetic textiles has become the major source of textile materials and the analysis of effect of textile parameters on shedding and modification of textile material can be the long-term solution for reducing microfiber shedding, this project aims in analysing the shedding of synthetic textiles from textile domain. The preliminary study on certain washing parameters (which are not clearly studied before) are also done. The following findings are obtained about the effect of washing parameters on shedding:

i. Increase in the mechanical agitation damages the fabric and thereby increases the microfiber shedding.
ii. Increasing the water volume in the washing also increases the microfiber shedding.
iii. The use of softeners during washing can reduce shedding as it reduces the friction and reduces the fabric damage.
iv. On subsequent washes, shedding got reduced and after certain washes, the shedding got stabilized.

While considering the textile parameters, the basic textile parameters are found have more effect on shedding. The physical properties also have impact, however, it again depends on the fabric basic parameters which determine the particular physical property. The findings regarding the textile parameters are summarized as:

i. Increase in the stitch density increases the structure compactness and decreases microfiber shedding.
ii. Increase in the tightness factor reduces the microfiber shedding.
iii. Increase in yarn count and thickness increases the amount of fibers per unit area and thereby increases the shedding.
iv. Increase in GSM increases the shedding if the GSM is increased by means of increasing yarn count and thickness and a different trend may be noted if the GSM is increased by increasing stitch density.
v. The fabrics with good abrasion resistance and higher bursting strength are found to shed more fibers which is attributed to the basic parameters that influences the properties (Increased thickness – good abrasion resistance; Increased GSM and loop length – Good bursting Strength).

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THE ART OF HERBAL CLOTHING

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ABSTRACT

This articles says about the neem (Azadirachta indica) extracts, which is widely used by Indian farmers to protect cotton crop from pests and fungi, have potential as antibacterial agents for textiles. Cotton fabric was treated with Neem fiber taken from its stemby undergoing traditional method called retting process for about 15 days.then fiber is taken by giving it in a rolling machine and then it has been softened and both cotton and neem fiber has been treated equally and formed cotton with neem blended fabric. these fabrics showed high antibacterial activity compared to the control sample. The washing durability, crease recovery angle, tensile strength, and tearing strength of these finished fabrics were evaluated. Stem -extract treated fabric retained antibacterial activity for up to five machine washes, while activity for the bark-extract treatment decreased sharply with prolonged washing. Crease recovery decreased after both treatments with no significant change in tensile strength and a slight improvement in tearing strength.also they have good air permeability and thermal conductivity properties

Keyword : *Antimicrobial textiles , Achyranthus aspera , Azadirachta indica , Bacteriostasis , Ocimumbasilicum Punica granatum*

1.INTRODUCTION

Nonwoven is a term used to designate fabrics that are neither knitted nor woven. They are materials with similar characteristics and useful properties of fabrics, wherein the fibers are bonded with each other chemically, mechanically, through heat or solvent treatment[1]. These fabrics are permeable sheets directly made from fibers or melted plastic, which does not require transforming fibers into yarn.Nonwovens used for technical textiles are chiefly synthetic polymer based fibers because of their strength and flexibility. Generally, nonwoven fabrics are made from some amount of recycled fabrics and oil based materials. The amount of recycled fabric depends upon the strength required for a specific purpose. Moreover, some nonwoven fabrics can be recycled after use with the help of correct treatments.

One of the outstanding qualities of nonwovens is that they can be extremely durable, if that's what's needed, or single-use, limited-life fabrics. Beyond this, nonwovens possess limitlessly versatile qualities like super absorbency, resilience, liquid repellency, stretchability, strength, softness, flame retardancy, cushning, washability, bacterial barriers, filtering and sterility[2]. These properties are often combined to create fabrics suited for specific jobs while achieving a good balance between product use-life and cost. They can mimic the appearance, texture and strength of a woven fabric, and can be as bulky as the thickest paddings.

1.1Spun lace non woven

Spunlace process is the application of high pressure water jet to one layer or multi-layer of fiber web, entangling the fibers with each other, thereby reinforcing the web to some extent. It is well-known for its great uses as facial mask fabric, medical non woven fabric, wet wipe fabric, non woven filter fabric and etc.

If you are seeking spunlace fabric for wet wipes, I recommend you to read our 30gsm to 65gsm Quality Formaldehyde-Free Spunlace Nonwoven Fabric for Wet Wipes before making a purchase as it features superior softness, high water absorbency and high security

1.2 Heat bonded non woven

This type of non-woven fabric is mainly manufactured in several processes: adding fibrous or sticky reinforcement material into the fiber network, and then reinforcing the network into cloth via heating and cooling. two or more fibers intersect, they can be heated to melt to each other. When they cool they will be bonded, which imparts

strength to the fabric. These fabrics can be very lightweight and thin, or very heavy and thick, and can also fall somewhere in-between. They are used in many applications, including hygiene products (diapers and feminine pads), insulation (sound and heat), padding or cushioning (mattresses, furniture), and other products as well.
The thermal bonding process begins by taking fibers (thermoplastic fibers alone or blends with non-thermoplastic fibers such as cotton) and forming them into a fiber batt using either carding or air-laying machines.

2.MATERIALS AND METHODS (RETTING METHODS)

The neem twigs were identified and collected which is about 20-30 cm long and 1.5-3 cm in diameter. The fibers from neem twigs were extracted by the process of Retting which is one of the most important and traditional process of fiber extraction.The extraction of natural fibers by the process of retting from plants and their uses for production of fabrics and other woven or constructed textile materials has played major role in textile development. the neem twigs were retted by normal pool stagnant water retting process. Dew retting method were also tried but the neem twigs were not suitable for exposing in the sun and rain as the neem twigs became dried, hard and brittle which is unable to extract fiber.

Figure-1 retting method

The process was carried out for 17 days. During this, certain bacteria acts on the process by entering through the stomata to break the pectins present in the neem twigs. The twigs were beaten by wooden hammer to become loose for the fibers to separate easily. In the water retting process , it was observed that the fibers were separated from the inner layer of the twigs After the water retting process, the proper separation of the fiber was done by manual process. Then, the separated fibers were dried in the shade for 24 hours at room temperature.

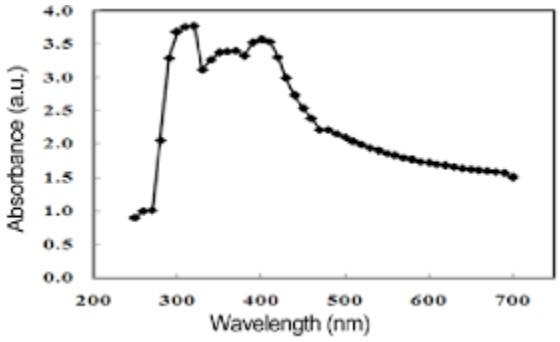

Figure-1 : aqueous extraction of neem

2.1 Web bonding

Different technologies to achieve specific features Bonding plays an important role when manufacturing nonwovens: the loose cohesion of the fibers is treated -in one or more steps- to form a more solid type of web, the nonwoven[2]. Generally speaking we distinguish between three different technologies, thermal, chemical and mechanicalenables the nonwoven to bond easily without needing binders, thermal bonding is becoming increasingly important. A prerequisite for this web bonding process is heat sensitive components. The bonding agent may be a fusible

fiber, a combination of fusible and matrix fibers, a bicomponent fiber with two different component melting temperatures, or a powder

- Thermal bonding

2.2Turmeric dyeing

Turmeric has been mentioned in the Vedas, the ancient Hindu sacred texts. It was associated with purity and cleansing. Even today, orthodox Hindu households will use turmeric water to purify everything from themselves, to objects in the house, to the house itself before a religious event. Along the same lines, Hindu brides and bridegrooms have a ceremony called 'haldi' (the Hindi word for turmeric and also the name of the ceremony), just before their wedding day.

This yellow-orange rhizome (that is a relative of ginger) is also credited with tons of medicinal uses. It is used as an antiseptic and an anti-inflammatory agent[4]. When a classmate in school cut her finger during a cooking class, a well-meaning friend promptly threw some turmeric on her finger. Good move as far as providing an antiseptic, but bad for the bleeding. As it turns out, turmeric is also an anti-coagulant. curcumin, the main flavoring compound in turmeric, is also an anti-oxidant.

3.Result and discussion

3.1 Heat F1low Measurement

The HFM-100 Heat Flow Meter method is an **easy-to-use rapid technique** for thermal conductivity measurement and thermal resistance testing of insulation products, construction materials, packaging, and assemblies. A measurement of thermal conductivity is an indicator of the ability of a material to conduct heat and can be critical for defining energy efficiency and thermal performance in materials. The Thermtest HFM has been designed and engineered to combine the f**highest accuracy, repeatability, widest temperature range,** and **industry-leading performance**, all at an exceptional value. Follows international standards: **ASTM C518, ISO 8301,** and **EN 12667.**

S.No.	Sample Description	Mean Temp (Deg C)	Delta Temp (Deg C)	Thermal conductivity W/m-k	Thermal resistance M^2 *k/w	Thermal conductivity (Clo/ Inch)	Thermal resistance (Clo)	Temperature Gradient (*k/m)
1.	NEEM + COTTON BLEND(NONWOVEN WITH TWO LAYERS)	40.00	10.00	0.030107	0.260406	5.451370	1.682637	1183.98

Figure-2 : temperature gradient

3.2 Air Permeability test

The air permeability behaviour of needle-punched nonwovens produced from a blend of polypropylene and jute fibres has been reported (Debnath *et al.*, 2000b). The air permeability of the nonwovens was predicted with the help of ANN and empirical models. An empirical model of the second-order polynomial was fitted to predict the air permeability from the experimental results. The predicted values from the models were compared with the experimental values.

TEST METHOD : CUTOMIZED

TESTING PRESSURE :125 Pa

TESTING AREA :38 cmsq

Sample specification	Air permeability (ft3/ft2/min)	C.V (%)
Neem and cotton blend	**69.7**	**12.3**

Table-1 : air permeability in %

3.3 Antimicrobial test

Antimicrobial fabric treatments can be applied during normal textile finishing processes, meaning no special equipment or processing steps are required.
When applying by coating, padding, exhaustion, or foaming, the antimicrobial additive can typically be used in combination with other common auxiliaries such as softeners, moisture management systems, fluorocarbon, or resins..

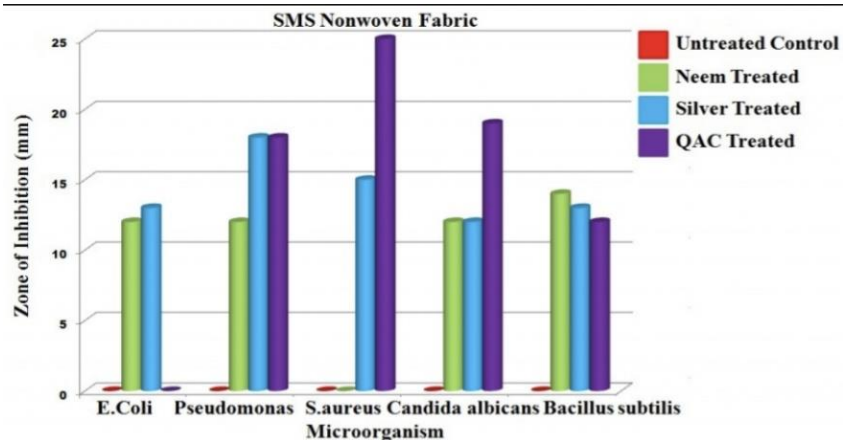

Table-1 : Antimicrobial activity on nonwoven fabrics

- The graph above shows the antimicrobial acitivity that takes place in a non woven fabric
- The graph shows the testing with 5 basic types of micro organism and their zone of inhibition.the fabric has been treated with neem ,silver ,QAC and untreated control
- The silver QAC and neem reacted well on fabric .the QAC treated fabric react well on S.Aurcus micro organism
- Finally neem treated fabric react well on Bacillus subtills while comparing with QAC treated and silver reacted fabric

4.CONCLUSION

The Neem tree is medicinally rich and is used extensively in Ayurvedic treatments. It is a common folk medicine used for general well-being. The golden yellow made from Neem carries its 'all-healing' multipurpose properties onto the fabric. The extract from the leaves serves as a detoxifier and a calming agent.thus the fabric produced using this neem and turmeric gives a best cooling effect and act as a sweat absorbent also gives a better antimicrobial activity gives a excellent comfort for the wearer

5.ACKNOWLEDGEMENT

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In performing our project, we had to take the help and guideline of some respected persons, who deserve our greatest gratitude. The completion of this project gives us much Pleasure

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Dyeing of Textile Materials with Supercritical Fluid Carbon Dioxide

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ABSTRACT

Supercritical fluid dyeing by carbon dioxide has emerged as a sustainable alternative to the conventional aqueous process because of its environmental benefits. Water pollution is caused on a large scale by textile dyeing which has several hazardous effects on the environment. Apart from the water pollution caused by textile dyeing, finding a quality water source to run the dye houses has become an issue. To provide one kilogram of dyed material it required up to 100 liters of water even by the most economical way of consumption of water.

Supercritical fluid dyeing by carbon dioxide is a waterless way of dyeing. Particularly carbon dioxide (CO2) is very attractive as it is non-toxic, cheap and non-flammable. Also its critical point temperature (Tc) is 31.1°c, Critical point pressure (Pc) 73.7 bar which is lower than many other fluids. Supercritical carbon dioxides dissolving power towards disperse dyes as well as the plasticization and the swelling action towards hydrophobic polymers makes this fluid suitable for dyeing Polyethylene Terephthalate (PET) and other synthetic textiles. Natural fibres such as Wool, Cotton and Silk can also be dyed with extreme difficulty. CO2 is incapable of swelling and promoting the diffusion of dyes into the interior of polar natural fibres is one of the main hurdles.

This dyestuff is homogeneously distributed leading to a high degree of uniformity of fabric dyeing quality. By the use of Supercritical CO2 dyeing, dyeing time is reduced up to 3 hours in case of Fluorotriazine dyed cotton. Very small amount of water is placed in the dyeing liquor/vessel or sprayed on the fabric, shorter time for preparing Supercritical Fluid Carbon Dioxide solutions, conducted at a temperature of 333 to 415 K which is low compared to conventional dyeing. The cloth produced by the Supercritical CO2 dyeing is predominantly or totally dry, thus saving additional drying charges. Even the purchase cost of a supercritical dyeing machine is higher than that of an aqueous one, the operation cost is lower and this results in a 50% lower overall cost for the Supercritical process.

The low polarity of Supercritical CO2 on one hand has various advantages in the coloration of hydrophobic textiles but on the other hand is a clear hindrance towards the dyeing of polar hydrophobic fibres. This is probably one of the reasons for non-commercialization of this technology in the textile industry. However, several advancements in the Supercritical CO2 dyeing of hydrophobic fibres have taken place. Apart from having potential to solve major dyeing industry wastewater treatment issues which are a global pollution problem, Supercritical Fluid dyeing process are also energy efficient. One of the major problems in gaining widespread industrial acceptance of Supercritical CO2 dyeing procedures appear to stem from initial high investment to construct production scale to Supercritical CO2 dyeing plant. However, pilot scale Supercritical CO2 dyeing plants are currently available from several vendors in order to pave the way forward.

KEYWORDS:

Carbon Dioxide, Dyeing, Pollution,
Supercritical fluid, Supercritical Carbon Dioxide

1.Introduction

In order to decrease the duration of the dyeing period as well as the emission of the dyestuff materials into water, the textile industry is continuously searching for the alternative ecological dyeing techniques [3]. Also, large-scale water

pollution caused by the textile dyeing industry is a global problem. Apart from significant wastewater generated there is the initial problem of obtaining or creating a water supply of acceptable quality since the water may be too hard and there may not be sufficient suitable water supply to establish dyeing houses. The most remarkable technique of waterless dyeing is using supercritical fluids instead of water as the dyeing medium which was introduced firstly by Prof. E. Scholl Meyer in 1988 in Krefeld, Germany [14]. Supercritical fluid dyeing is a waterless dyeing that exploits various unique properties of supercritical fluids [14]. Environmentally benign carbon dioxide offers significant potential in its supercritical fluid phase to replace current heavy reliance on a range of hazardous, relatively expensive and environmentally damaging organic solvents that are used extensively on global basis [13]. Carbon Dioxide collected from industrial combustion, fermentation processes, ammonia synthesis and mineral springs, is the most widely used solvent in supercritical dyeing because of its wide availability, low cost, environmentally friendly , chemically benign nature and its critical point temperature and pressure is 31.1^{o}C and 73.7 bar respectively, which is lower than that of many other fluids [3][14]. In supercritical state, the diffusivity and viscosity of Carbon Dioxide are like that of a gas while its density is near to that of a liquid, with a solvent strength that can easily be tuned by the variation of pressure and/or temperature. Also, the non-polar characteristics of carbon dioxide makes this fluid fit for the coloration of synthetic as well as natural fibers as supercritical carbon dioxide offers the dissolving power towards dyes. After the dyeing process is done, a simple depressurization and/or cooling step allow the supercritical carbon dioxide to be gasified into carbon dioxide and the excess dyes to be separated out and reused. Furthermore, the rinsing as well as dyeing steps is also eliminated, which further reduces carbon dioxide emission and energy consumption. Also, there is no irritating odor generated due to sealed dyeing conditions [3].

2.Advantages of supercritical carbon dioxide dyeing and scope

Apart, from the unquestionable advantage of the environment impact in relation to pollution and water consumption, $scCO_2$ has other advantages such as simpler dye formulations, elimination of dyeing step, shorter dyeing time etc. [14]. Also, shorter time is required to heat and prepare $scCO_2$ dyeing solution.Dyeing with $scCO_2$ causes swelling of the fibers leading to increased dye solution impregnation. As well, it is noted that since a quasi-type of gaseous phase is formed, the dyestuff is homogeneously distributed leading to a very high degree of evenness in case of fabric dyeing. $scCO_2$ dyeing doesn't need any kind of dispersants to solubilize the dye, solubility of the dyes can be controlled by selecting appropriate $scCO_2$ density, pressure and temperature. At the end of the dyeing the carbon dioxide and the remaining dye can be recycled and used again. Fabrics that have been successfully dyed with $scCO_2$ include nylon, polyester, cotton, silk and wool [13]. Apart, from providing a potential to solve major dyeing industrial waste water treatment issues that are significant on global level, $scCO_2$ dyeing process is also energy efficient. The major problem in gaining popularity appears to stem from the initial high investment cost to construct production scale $scCO_2$ dyeing plant [13]. The real challenge of $scCO_2$ dyeing is coloration of textiles made from natural fibers. The low polarity of $scCO_2$that, on the one hand has various advantages in the coloration of hydrophobic textiles while on the other hand acts as a clear hindrance to the dyeing of hydrophilic textiles. This is also one of the reasons why $scCO_2$ dyeing technology has still not been commercially adopted by textile industries [14]. However, $scCO_2$ pilot scale plants have been developed and are currently available from several vendors in order to pave the way forward [13].

3.Dyeing of various fibres/ fabircs by scCO2

As we know that since all the fibers react differently in respective condition and a treatment with $scCO_2$. So, a lot of tests have been carried out on variety of fibers to obtain best results on treating with $scCO_2$ dyeing method.

1. Treatment of flax rove in $scCO_2$[7]

In this treatment the flax rove is treated with $scCO_2$ in batch system. The flax rove is stored in a vessel. The liquefied carbon dioxide is heated at a temperature above the critical temperature and pressurized above critical pressure. The $scCO_2$ is injected in the vessel containing flax rove and treatment is carried out.

Results

- The morphological structure of flax is studied by Scanning Electronic Microscope (SEM).
  It is seen that the surface of sample becomes rough after treatment. On increasing the temperature more grooves and bulges are seen on the fabric surface.
- The chemical structure is examined using FT-IR instrument.
  It is observed that $scCO_2$ penetrates into the flax fibers that result in swelling. Due to swelling the molecules are rearranged and re-crystallized.
- The crystal structure is examined using XRD analysis.
  At the temperature between 70^{o} C to 110 ^{o} C the crystalline index is decreased but at 120^{o} C growth in the crystalline index is observed.
- The thermal properties are examined using Thermo gravimetric analysis (TGA).
  The thermal stability of flax fibers has improved after treatment with $scCO_2$. There is weight loss observed in flax

sample in 3 stages.

(a) First occurs at 30° C to 125° C due to physical damage in amorphous region.
(b) At 280° Cto 390° C weight loss is observed due to thermal degradation in crystalline region.
(c) At 390° C to 620° C weight loss is observed due to dewatering reaction.

2. Eco friendly reactive dyeing of cellulose fabrics using $scCO_2$ fluid with different humidity [8]

In order to test the color strength (K/S) of the $scCO_2$dyed cotton fabric after washing, a range of 350-720nm by employing a color-eye 7000 Angstrom spectrophotometer equation derived is

$$\frac{K}{S} = \frac{\{(1-Rmin)^2\}}{2Rmin} \quad (1)$$

K is absorbance coefficient of cotton fabric
S is scattering coefficient of cotton fabric
R_{min} is minimum spectral reflectance ratio
Factors affecting K/S ratio

- As the dyeing temperature is increased it promotes activity of macromolecular chains of cotton. It forms big pores and large channels which accelerate the dye penetration and diffusion. But if the temperature is further increased than the K/S value of dyed cotton fabric decrease slightly.
- As the dyeing pressure increases the K/S value of the cotton fabric increases. Due to high water pressure in CO_2 it acts as important plasticizing agent to infiltrate into cotton fiber and dilate then, so more dye molecules penetrate into the amorphous region of cotton fiber hence K/S value is high. But if the pressure is much higher than there will be less fixation reaction due to poor nucleophilicity of hydroxyl functional group of cotton fiber.
- Effect of dye concentration is evident on K/S value as the color strength of dyed cotton fabric increases from 1% to 5% by addition of water in $scCO_2$ fluid. After the dye concentration is at 5% to 7%, no increase in K/S value is noted.
- The K/S value of cotton fabric shows increase with increase in humidity of $scCO_2$ fluid. Only a small growth is observed when humidity if higher than 5%. At 5% humidity the dye molecules are able to penetrate into amorphous region of cotton fibers than increase in K/S value is visible.

3. Polyester fabric's fluorescent dyeing in $scCO_2$ [12][9]

The application of fluorescent dye in medical diagnostic and biochemical have dynamically increased. Other uses are lasers, photoelectric cells, solar batteries. They are used in fire fighter uniforms, police uniforms as well.

Results

- Effect of dyeing time on K/S value of polyester fabric:
  a) K/S value initially increases between 20min and 60min. Then it starts to decrease after 60min.
  b) Optimum dyeing time is 70min.
- Effect of dyeing temperature on K/S value of polyester
  a) The K/S value increases from 0.34 to 10.39, rises for temperature below 120° C, but at 130° C it begins to decrease.
  b) So, the optimized dyeing temperature is 120 ° C.
- Effect of pressure on K/S value of polyester fabric
  a) The density of $scCO_2$ fluid is high under high pressure given that other parameters are fixed.
  b) The color strength of dyed polyester fabric improves with pressure between 15Mpa to 25Mpa, however it decreases as the pressure is 25Mpa to 35Mpa.
  c) Optimum pressure is 25Mpa.

4.Machinery developments and applications

- Developments were also seen in the machine used for $scCO_2$ treatment of textiles. A commercially available $scCO_2$ beam dyeing machine with a capacity of 100 to 200 kg of fabric, or a fabric roll per batch in an open width form of 60 or 80 inches was produced by DyeCoo Textile System BV and FeyeCon Co. Ltd.

Fig.1 Commercial supercritical carbon dioxide beam dyeing machine.

- For the first time novel water free rope fabric dyeing machine in $scCO_2$ fluid media was designed. The results of novel rope dyeing in $scCO_2$ media were fulfilling and it was commercially acceptable with good wet, wash, rub and color fastness level and color uniformity.

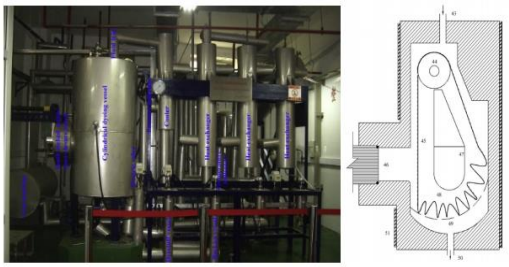

Fig. 2 The pilot scale plant for supercritical carbon dioxide rope fabric dyeing machine and profileOf the dyeing vessel

- It is well known that $scCO_2$ dyeing is waterless dyeing and is considered ecofriendly in textile industry. Due to the sustainable nature it is now applicable in pretreatment process such as scouring, desizing and different finishing applications. It saves huge amount of fresh water thus giving a massive contribution towards world sustainability. One of the uses of $scCO_2$ application is surface modification of polyester fabric as pretreatment.
- In the recent study glycerol polyglycidyl ether was impregnated as cross-linking agents into polyester fabric trough $scCO_2$. After that operations to immobilize were performed, consisting pad-dry-cure application and natural functional agents such as sericin, collagen or chitosan are used to finish the glycerol polyglycidyl ether polyester fabric. The modified polyester fabric shows improvement in surface hydrophilic, wettability moisturization efficiency and antibacterial activities.
- C.Wayet N studied the scouring possibility of polyester fibers by using $scCO_2$ as a medium. The oil removal efficiency of polyester fibers reached up to 99%. It proves that scouring is successful using $scCO_2$.
- Another development was seen by impregnating cellulose acetate films with carvacrol using $scCO_2$. The impregnation process conducted in a static region at 21Mpa pressure and temperature of 50 ^{o} C was optimized by variation of processing time and decomposition rate. The cellulose acetate films obtained after impregnation with carvacrol have a lot of application in the medical industry. They are used in wound dressing considering that they are biocompatible and biodegradable. They have good antimicrobial property as well, so they are used in food packaging industry as well.
- Further studies are required in this field.

Disperse Red 167 in $scCO_2$:

Disperse Red 167 is one of the dark trichromatic disperse dyes for textile and automotive, is a commercially important disperse dye capable of dissolving in $scCO_2$ and is used in the synthetic fiber dyeing.

Process

Disperse Red 167 is packed in dye cylinder and placed into dye vessel. Then the dye vessel is sealed and liquid CO_2 is pressuized above its critical pressure and critical tempertaure (7.3 Mpa and 31.10^{o} C) .It is injected with the help of a magnetic pump.When the requested tempertaure and pressure is attained than the magnetic pump forms a typical supercritical CO_2 cycle. After treatment CO_2 is seperated under low temperature i.e, 25 ^{o} C to 40 ^{o} C. It was seen that precipitated dyes were deposited at the bottom of the sepertaor cylinder. The recycled Disperse Red 167 is used again. The dyeing is carried out at 30Mpa pressure and 120 o C tempertaure for 70min.

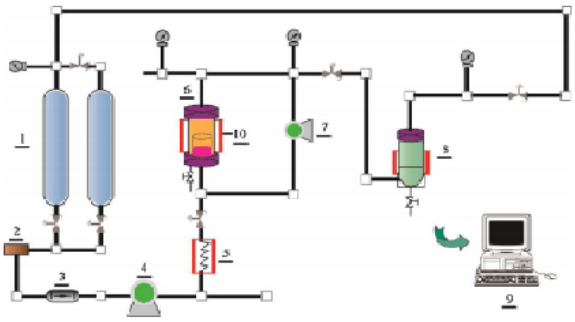

Fig. 3 Schematic diagram of the supercritical CO_2 apparatus equipped with (1) Gas cylinder, (2) Purifier, (3) Refrigerator, (4) High-pressure pump, (5) Heat exchanger, (6) Dye vessel, (7) Magnetic pump, (8) Separator, (9) Control terminal, (10) Heat compensating jacket.

Factors affecting Disperse Red 167 characteristics by CO_2

- The CO_2 affects the surface morphology melting of Disperse Red 167 at tempertaure between tempertaure 120 ° C to 160 ° C. Some disperse dye mcromolecule gather gradually in $scCO_2$ and generating dye aggregation. The melting of Disperse Red 167 was emerged in $scCO_2$ at 120 ° C.
- The difference between the intesities of the characteristic band is relatively small.
- The crystal changes from Alpha to Beta type when CO_2 temperature is more than 120 ° C.
- Thermal decomposition is shifted to a lower temperature with increasing CO_2 temperature due to transition from Alpha to Beta type.
- No significant change in color characteristics is observed.

5.Aknowledgement

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DEVELOPMENT OF BANDAGE FROM MARINE SPONGE AND SENNA AURICULATA FOR MEDI TECH

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ABSTRACT

The role of collagen in wound healing is to attract fibroblasts and encourage deposition of new collagen to the wound bed. Collagen dressing technology helps stimulates new tissue growth, while encouraging autolytic debridement, angiogenesis, and epithelialization. In this wound dressing bandage is made by Marine Sponge and Senna auriculata because Marine Sponge have properties of wound healing and cure infections with list of chemotherapy agents, antibiotics, anti-viral, anesthetics, adhesives, marine genetic products (MGPs) .this marine sponge collagen is coated as a layer on a cotton crepe bandage which relieving muscle strain and joint pain and also heals wound. Senna auriculata dried flowers and flower buds are used as a wound healing medicine in case of diabetes patients. It is also believed to improve the complexion and act as a antibacterial agent. The bandage is coated with Senna Auriculata extract as an antibacterial coating .To develop wound dressing using marine sponge collagen and the bandage is subjected to antibacterial test and wound healing test.

KEYWORDS – *Marine sponge, Senna auriculata, Bandage*

1. INTRODUCTION

Wound dressing composed of collagen, chitosan, and sodium alginate has extensive applications. Blood comprises a large amount of water. Thus, hemostatic materials should be highly absorbent. The purpose or aim of choosing a wound dressing is to protect the wound from infection, ease pain, and promote healing and to avoid maceration. Marine Sponges have the potential to provide future drugs against important diseases, such as cancer, a range of viral diseases, malaria, wound healing and inflammations. Although the molecular mode of action of most metabolites is still unclear, for a substantial number of compounds the mechanisms by which they interfere with the pathogenesis of a wide range of diseases have been reported. This knowledge is one of the key factors necessary to transform bioactive compounds into medicines. Senna Auriculata commonly known as “avaram”, is a shrub belonging to the Caesalpiniaceae family. The individual parts of the plant can be used for the treatment of various disorders in humans. Among the different parts, the plant is famous for its attractive yellow flowers which are found to contribute to the various biological activities of the plant. The plant has been reported to possess several biological properties like hepatoprotective, anticancer, antioxidant, antidiabetic, anti-inflammatory and antimicrobial properties

1.1 MARINE SPONGE

Sponges (Porifera) remain the most important phylum in the field of marine drugs discovery, since they produce a great number of novel natural products with a variety of potent pharmacological activities. Nevertheless, the transformation of marine sponge-derived active compounds into drugs has been hindered by supply limitation. It is well known that sponges are hosts for a large amount of microorganisms, demonstrating interactions such as epibiotic, symbiotic and parasitic relationships, etc.

1.2 MARINE COLLAGEN

Marine organisms are a rich source of structurally novel and biologically active compounds. To date, many biological components have been isolated from various marine resources. Marine collagen (MC)—collagen derived from marine organisms such as fish, seaweeds, sponges, and jellyfish—offers advantages over mammalian collagen, as it can be easily extracted, is water-soluble, and is safe because it is free of the risks of animal diseases and pathogens such as those mentioned earlier, has better chemical and physical durability, and is available in abundant quantities . Thus, recently, MC has attracted much attention as a mammalian collagen substitute, from biomedical researchers to the cosmetic, food, and nutraceutical industries.

1.3SENNA AURICULATA

Anti-bacterial activity of flowering stages of the cassia auriculata buds, seedling and dried stage with different solvents like DMSO, methanol, and water, it concluded that fresh flowers of the cassia auriculata have potent antibacterial activity activity.56 *In vitro* study of *C. auriculata* flower methanol extract shows antibacterial effect by using agar disc diffusion method

2. MATERIALS AND METHODS

2.1 CREPE BANDAGE

Crepe bandages are elastic bandages used in many medical conditions. They are kept in first aid boxes with other medicines and dressings.

2.2 They are available in two types:

- **Medium Weight:** This type is suitable for a type of dressing that withholds light compression and reduces the swelling.
- **Heavy Weight:** This of type is appropriate for a dressing that requires moderate compression and support.

Figure 1.1 Cotton Crepe Bandage

2.3 SELECTION OF SPONGE

Demospongiae, scalerospongiae are both phylum porifera family contains medicinal properties like wound healing, antibacterial, antimicrobial, ant inflammatory properties. The marine collagen can be extracted from this phylum porifera family.

Figure 1.2 Scalerospngiae

Figure 1.3Demospongiae

2.4 Extraction of Marine Collagen

The preparation of MC involves cleaning, separation, and size reduction of the samples, followed bya chemical pre-treatment to remove non-collagenous proteins, pigments, or fats.

Figure 1.5 Marine sponge +NAOH

Figure 1.6 Addition Butyl alcohol

Figure 1.6 Addition of EDTA (for 72 hrs.)

Figure 1.7 Addition of Acetic Acid (for 24 hrs.)

Figure 1.8 Nacl precipation

Figure 1.9 Acidic Marine Collagen

Figure 1.10 coating Marine

collagen in Bandage

2.5 Senna Auriculata

Senna. Auriculata commonly known as “avaram”, is a shrubbelonging to the Caesalpiniaceae family. The individual parts of the plant can be used for the treatment of various disorders in humans. Among the different parts, the plant is famous for its attractive yellow flowers which are found to contribute to the various biological activities of the plant. The plant has been reported to possess several biological properties like hepatoprotective, anticancer, antioxidant, antid iabetic, and anti-inflammatoryand antimicrobial properties.

Figure1.11 Senna Auriculata

2.5.1 Plant Sourcing

Senna Auriculata plant was collected from kalakadu in Tirunelveli district.

2.5.2 Preparation of Antibacterial extract

2.5.2.1.2Extract from dried flower

Methanol extract was prepared by taking 50 g of *Cassia auriculata* dried flower powder in a separate container, to this 200mL of methanol was added and kept for 24 h in a shaker. Filtered through eight layers of muslin cloth and extract was collected, the extraction process was repeated twice. The collected extracts were pooled. Ethanol extract was prepared like methanol extract. Water

Extract was prepared by taking 50 g of Cassiaauriculataflower powder in a separate container, to this 200mL of water was added and boiled for 2 h in a mild heat and kept for 24 h. Then filtered and extract was collected. The extraction process was repeated twice. Then the collected filtrates were pooled.

Figure 1.12 Dried senna flower

Figure 1.13 Dried powder (10g) +Methanol (100ml)

Figure 1.14 Filtration of extract

Figure 1.15 Antibacterial Extract Of Senna Auriculata

Figure 1.16 Antibacterial coating

Figure 1.17 drying

Figure 1.18 Finished Appearance

3. RESULT AND DISCUSSION

- **The antibacterial activity of the fabrics were assessed using standard AATCC 147 Test method**

Bandage treated fabric have the anti-bacterial activity on Pseudomonas aeruginosa. This bacteria is growth around the wound. The treated fabric controlled the growth of this bacteria. So the treated fabric controlled the bacteria growth around the wound.

- **antifungal activity**

Bandage treated fabric have the antifungal activity on Candida albicans. This bacteria causes infection of burns and wounds. Thus the treated fabric have the wound healing activity

- **Air permeability test**

This test method covers the measurement of the air permeability--the rate of air flow passing perpendicularly through a known area under a prescribed air pressure differential between the two surfaces of a material--of textile fabrics and is applicable to most fabrics including woven fabrics, air bag fabics, blankets, napped fabrics, knitted fabrics, layered fabrics, and pile fabrics

3.1 KIRBY –BAUER METHOD

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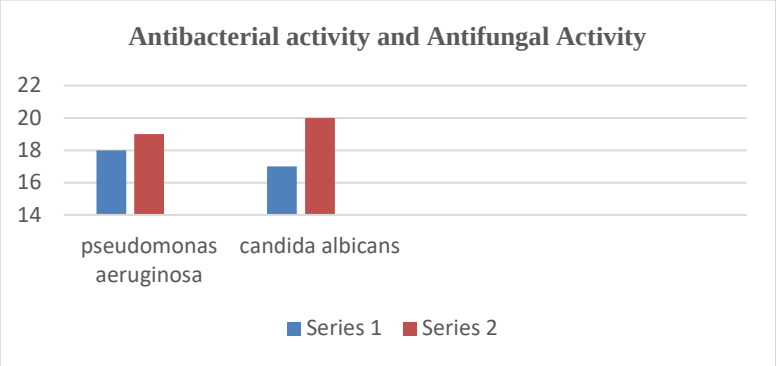

3.1.2 Reading of zones of inhibition

The diameters of zones are measured to the nearest millimeter with Vernier caliper (preferably), or a thin transparent millimeter scale. The point of abrupt diminution of growth, which in most cases corresponds with the point of complete inhibition of growth, is taken as the zone edge. In some batches of media, organisms may show a film of growth within the susceptible zone which may be ignored. Similar findings may be seen with swarming proteus spp.

3.1.1 Antibiotics discs

After the inoculums the dried, single discs are applied with force, a sharp needle or a dispense and pressed gently to ensure even contact with the medium. When fastidious organisms are to be tested, touch multiple colonies with a loop and cross streak the appropriate plate for uniform distribution.

Not more than six discs can be accommodated on an 85mm circular plate and twelve are easily accomodated on a 135mm circular plate.

Discs should be stored at +40C in sealed containers with a desiccant and should be allowed to come to room temperature before the containers are opened. Discs should be used before the expiry date on the label. If antimicrobial solution prepared in the laboratory are being used proceed as follows:

1. Pick up a 2mm loopful of the standard antibiotic solution and lower carefully onto a paper disc which, when moistened will adhere to the loop.
2. Place the moistened disc on the surface of inoculated plate in the appropriately labeled segment.
3. Repeat for each microbial agent to be used, placing the impregnated discs in their respectively labeled segments

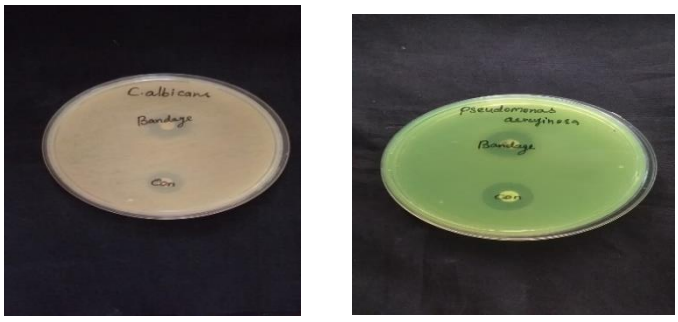

Figure 1.19 sample on Antibacterial test

3.1.2 Interpretation

ORGANISM	SAMPLE BANDAGE	CONTROL
Pseudomonas aeruginosa	**18mm**	**19mm**

Candida albicans	**17mm**	**20mm**

Table 1.1 Zone diameter

Each zone size is interpreted according to the organism by reference to the tables

4.2 AIR PERMEABILITY TEST

Table 1.2 AIR PERMIABILITY TEST

Sample Specification	**Air Permeability (ft3/ft2/min)**	**C.V (%)**
BANDAGE	**21.260 (±0.574)**	**5.3**

For a woven fabric, yarn twist is also important. As twist increase, the yarn diameter and the cover factor are decreased. This increases air permeability. Increasing yarn twist may also allow the more circular, high-density yarns to be packed closely together in a tightly woven structure with reduced air permeability

5. CONCLUSION

- In this project, Marine sponge is used to extract Marine sponge collagen which has wound healing properties and antimicrobial activity.
- This collagen is coated on the cotton crepe bandage. Senna Auriculata is widely used for Diabetic patients,it also have wound healing and antibacterial activity, so Senna Auriculata extract is coated on the marine collagen bandage.
- So this project is used especially for Diabetics patients as a wound healing bandage.
- Generally collagen degrades at room temperature hence the prepared collagen can be mixed with cyodextrins, which increase the stability of collagen.

6. ACKNOLOGEMENT

We offer our sincere appreciation for the learning opportunities provided by our respected **Chairman Dr. S. A. Joy Raja MBA., Ph.D., (USA)** who with his immense knowledge encourages us to excel in life.
We would like to express our deepest gratitude to our beloved **Principal Dr.A.Justin Diraviyam M.E., Ph.D.,** who has been an excellent supervisor and has supported us in every way through the last four years.

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DEVELOPMENT OF HERBAL TEXTILE FROM MADDER ROOT & ALKANET ROOT

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ABSTRACT

Use of natural dyes has increased several folds in the past few years due to the eco-friendly approach of the people. The toxic and allergic reactions of synthetic dyes are compelling the people to think about natural dyes. Though natural dyes are eco-friendly , protective to skin and pleasing to eye. Madder Root is highly protect the human skin. Alkanet Root can treat the wounds and relieve the skin inflammation and alkanet is an emollient that make softening the skin. The present paper report on the Dyeing the Linen fabric by using Madder Root and Alkanet Root . The dye fabric were evaluated for light fastness test , wash fastness test , rub fastness test, anti-microbial testing. Finally produce the garment.

KEYWORDS: *Natural dyes, Madder root ,Alkanet root ,Linen fabric, Anti-microbial testing.*

1. INTRODUCTION

Natural dyes are having some inherent advantages like no health hazards, easy extraction and purification, very high sustainability, mild dyeing condition, renewable sources. The present report on development of herbal textile from medicinal herbs using madder root and alkanet root to give the herbal finish to the fabric. For dyeing we can use the linen fabric. Linen fabric is best described, that is made from very fine fibers derived from flax plant. These Linen is very strong and absorbent and dries faster than cotton.

Rubia tinctorum or common madder is herbaceous perennial plant species belonging to the bed straw and coffee family rubiaceae. Madder is a plant . The root is used to medicine. People take madder by mouth for preventing and dissolving kidney stones, urinary tract disorders, blood disorders ,spleen disorders. Madder is also applied to the skin for certain skin condition and to promote wound healing. Madder is still used as a red dye in textile.

Alkanna tinctoria, the dyer's alkanet or alkanet is a herb in the borage family. The plant is also known as Spanish bugloss. It is native to the Mediterranean region. Alkanet root is quite helpful to maintain the health of heart, cure headache etc., Anti-virus and anti-bacterial features present in alkanet root are very amazing to protect your essential organs of the body, particularly skin.

1.1 OBJECTIVES

The objectives of this study are,

- To dye the fabric by using Madder root and Alkanet root
- To give the herbal finish to the garment
- The main concept of this project tells the importance of herbal textile
- Herbal clothing keeps the wearer body cool.

1.2 BENEFITS HERBAL TEXTILE

Clothing is our second skin and plays an important role in human life. Textile finished or dyed from extracts of various medicinal herbs are called herbal textiles. These treatments provide medicinal value and aroma to the garment, which enhance its value. Herbal textiles are revitalizing and help in keeping the body fresh and healthy. These fabrics also shown to have therapeutic value in ailments like skin allergies, breathing problems, sleeping disorders, and blood pressure.Textiles are susceptible to micro-organisms and their products known to cause infection and intoxication. Most textile products are meant to come in contact with the skin; hence, herbally treated fabrics are better choice as they do not harbor harmful chemicals and thus are eco-friendly.

2. HEALTH BENEFITS OF "MADDER ROOT" AND "ALKANET ROOT"

MADDER ROOT

Figure-1 Madder Root

Good for the skin : Madder root is considered very effective for healing acne, skin rashes, boils, skin irritation and other conditions of the skin.

Immuno-modulator : An immune modulator is a chemical agent that changes and response or activity of the immune system. Immuno- modulaters like madder root are effective in preventing auto immune diseases and inflammations.

Possesses Anti-Inflammatory properties : Madder root is a powerful anti-inflammatory that is effective in the treatment of inflammatory conditions related with arthritis or other joint pains.

ALKANET ROOT

Figure-2 Alkanet Root

The anti-inflammation effect found: Alkanna root can diminish the tight and slow mode of blood circulation which trigger of migraine and headache. By improving blood circulation , the headache will relieve. Alkanet root with its benefit as anti-inflammation of bones and muscles.

Maintaining skin health: Alkanet root has anti-viral and anti- bacterial effect which is useful for protecting our body , particularly skin from infection.

Antifungal and skin healing: Alkanna root has anti-fungal activity and able to heal any diseases related to skin fungi such as ringworm, eczema on your skin disorder.

2.1 DYEING PROCESS

In first step of dyeing we can take the vessels and fill the water 600 ml of water. Then put the salt for color fixation. Then next we can put the 200 g of alkanet root powder . Then next we can mix the powder into water well . Next we can put the Linen fabric into the dye bath. After one hour we can take the fabric in the dye bath and we can rinse the fabric with cold water. Then next we can dried the fabric in sunlight. Finally we can sew the Fabric as the garment.

2.2 ANTIBACTERIAL TEST

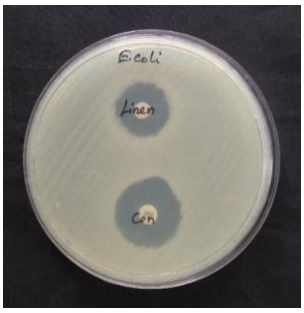

Figure 2 Antibacterial activity for Herbal Fabric

The medium is prepared and sterilized as directed by the manufacture. It may be necessary for tests on fastidious organisms, in which case the medium should be allowed to cool to 500C before 70% of blood is added . The medium should be poured into Petri dishes on a flat horizontal surface to a depyh of 4mm (25ml in an 85mm circular dish; 60ml in a 135mm circular dish). Poured plates are stored +40C and used within one week of preparation.. The pH of the medium should be checked at the time of preparation and should be 7.2 to7.4.

3. FINISHED APPEARANCE

Figure-2

3.1 Result And Disscusion

Dyed fabric have the anti-bacterial activity on Staphylococcus aurous. This bacteria is growth around the fabric. The dyed fabric controlled the growth of this bacteria. So the dyed fabric controlled the bacteria growth around the wound. The medicinal herbs treated fabric have the antibacterial activity on E.Coli. Thus the treated fabric have Antibacterial activity.

Organism	Sample B	Control
E.Coli	10mm	26mm
C.albicans	9mm	21mm

Table-1 Zone diameter

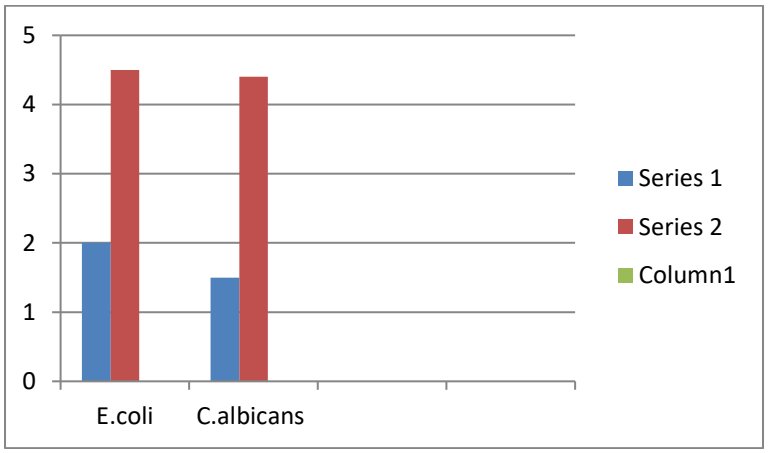

Figure-2 Antibacterial Activity on Herbal Fabrics

4.CONCLUSION

In this project we used Alkanet root and Madder root to extract a medicinal dye on a fabric to make a herbal Textile. This dyed Fabric have antibacterial properties . Flax can be dyed successfully in absence of mordant in different hues and tones at various concentration levels. Using flax fabric because of its durability and linen is considered to be strongest of all natural fibres and also naturally insect repelling . Herbal textile have tremendous scope in world textile market and may become a major textile product in future .The blend of herbs and textiles to achieve the health in an ecofriendly manner is the great way of adopting the healthy life.

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DEVELOPMENT OF COMPOSITE BOARD USING NATURAL FIBRES

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ABSTRACT

Composites are combination of at least two distinctly different materials, which combined together and provide an engineering performance that far exceeds those of the individual component. It is the quality of the interface between the components that determine the mechanical and chemical performance of the composites. There is an increasing awareness among scientists and engineers who are dedicated to minimizing the environmental impact of polymer composite production. Life cycle assessment is of paramount importance at every stage of a product's life, from the initial synthesis to disposal and a sustainable society needs environmentally safe materials and processing methods. Environment-friendly composites made using the eco materials that are decomposed by micro-organisms and hence can act as an alternative for several products such as wood, and plastic In this work , low cost green composites using indigenously available natural fibers/waste and resins was produced and tested for mechanical properties Test results of the green composites produced shows it is suitable for use in the field of agriculture, geo textiles etc., Test results of the newly produced composite are compared with the existing materials and it is found that the test results are comparable. Especially strength of this natural composite is comparatively superior even without any finishing treatment. This is mainly due to the higher tensile strength of Abaca & Sisal fibers.

KEYWORDS: *Sisal fiber, abaca fiber, Coir fiber, Epoxy resin, Compression moulding.*

1.INTRODUCTION

Composites are combinations of two or more materials in which one of the materials, called the reinforcing material, is in the form of fibers, sheets, or particles, and are embedded in the other materials called the matrix phase. The reinforcing material and the matrix material can be metal, ceramic, or polymer. Composites are used because overall properties of the composites are superior to those of the individual components.There is an emerging potential for natural fiber composites to become future replacement of many conventional materials such as metals and plastics. Among the general advantages of these natural fiber composites include low density, low cost, high toughness, reasonable specific strength, recyclability & biodegradability. In countries like India & China the production of rice and areca fibers is in abundance. Rice husk has found its application in composites, for example - rice husk reinforced concrete bricks areca fibers which is rich in fibers is used to provide good strengths to composites, for example areca fibers used to produce composites which have better electrical properties.Currently natural fibers form an alternative for glass fiber, the most widely applied fiber in the composite technology. The advantages of the natural fibers over synthetic fibers such as aramids, carbon or glass fiber are low density. Nonabrasive high filling levels resulting in high stiffness etc. These natural fiber composites also possess other properties such as biodegradable, low cost, good thermal and acoustic properties. The environmental impact from the natural fiber composite is negligible as these are recyclable.

1.1 DISPERESED (REINFORCING) PHASE

The second phase (or phases) is embedded in the matrix in a discontinuous form. This secondary phase is called dispersed phase. Dispersed phase is usually stronger than the matrix, therefore it is sometimes called reinforcing phase.Many of common materials(metal alloys, doped Ceramics and Polymers mixed with additives) also have a small amount of dispersed phases in their structures, however they are not considered as composite materials since their properties are similar to those of their base constituents (physical properties of steel are similar to those of pure iron).There are two classification systems of composite materials. One of them is based on the matrix material

(metal, ceramic, polymer) and the second is based on the material structure.

1.2 DEFINITION OF COMPOSITE

The most widely used meaning is the following one, which has been stated by Jartiz "Composites are multifunctional material systems that provide characteristics not obtainable from any discrete material. They are cohesive structures made by physically combining two or more compatible materials, different in composition and characteristics and sometimes in form". The weakness of this definition resided in the fact that it allows one to classify among the composites any mixture of materials without indicating either its specificity or the laws which should give it which distinguishes it from other very banal, meaningless mixture.Kelly very clearly stresses that the composites should not be regarded simple as a combination of two materials. In the broader significance; the combination has its own distinctive properties. In terms of strength to resistance to heat or some other desirable quality, it is better than either of the components alone or radically different from either of them.

1.3 POLYMER MATRIX COMPOSITE (PMC)

Most commonly used matrix materials are polymeric. The reasons for this are two-fold. In general the mechanical properties of polymers are inadequate for many structural purposes. In particular their strength and stiffness are low compared to metals and ceramics. These difficulties are overcome by reinforcing other materials with polymers. Secondly the processing of polymer matrix composites need not involve high pressure and does not require high temperature. Also equipment required for manufacturing polymer matrix composites aresimpler. For this reason polymer composites developed rapidly and soon became popular for structural applications.Polymer composites are used because overall properties of the Composites are superior to those of the individual polymers. They have a greater elastic modulus than the neat polymer but are not as brittle as ceramics. Polymeric matrix composites are composed of a matrix from thermoses (unsaturated polyester, epoxy or thermoplastic polycarbonate, polyvinylchloride, nylon, polystyrene and embedded glass, carbon, steel or Kevlar fibers (dispersed phase).

2. MATERIAL AND METHODS

2.1 PARTICULATE CMPOSITES

Particulate Composites consist of a matrix reinforced by a dispersed phase in form of particles. These are the cheapest and most widely used. They fall in two categories depending on the size of the particles

- Composites with random orientation of particles.
- Composites with preferred orientation of particles

2.2 FIBROUS COMPOSITES

SHORT FIBER REINFORCED COMPOSITES

Short-fiber reinforced composites consist of a matrix reinforced by a dispersed phase in form of discontinuous fibers (length < 100*diameter). They are classified as

- Composites with random orientation of fibers.
- Composites with preferred orientation of fibers.

2.3 LONG FIBER REINFORCING COMPOSITES

Long-fiber reinforced composites consist of a matrix reinforced by a dispersed phase in form of continuous fibers.

- Unidirectional orientation of fibers.
- Bidirectional orientation of fibers (woven).

2.4 SELECTION OF FIBRES

The coir fiber was obtained from the coconut. The abaca fiber was produced from tuxies . The sisal fiber was obtained from the leaves of the sisal plant (Agave sisalana). After the extraction of the fibers they are cut into desired length for the processing of the composite board. After cutting the fibers, they are treated with the softening agent (NaOH) and dried. Finally the fibers are ready for the preparation of the composite board.

Figure 1.1 Coir fibre

Figure 1.2 abaca fibre

Figure 1.3 sisal fibre

2.5 EPOXY RESIN AND HARDNER

Epoxy resins are low molecular weight pre-polymers or higher molecular weight polymers which normally contain at least two epoxide groups. The epoxide group is also sometimes referred to as a glycidyl or oxirane group. A wide range of epoxy resins are produced industrially. The raw materials for epoxy resin production are today largely petroleum derived, although some plant derived sources are now becoming commercially available. The resin system consists of Epoxy resin (L-12) and Hardener (K-6) in the ratio 10:1 by weight.

Figure 1.4 epoxy resin and hardener Figure 1.5 Lamination sheet

Figure 1.6 Placing abaca fibre on

Board plate

Figure 1.7 placing coir fibre on top of sisal fibre

Figure 1.8 Pouring of epoxy resin and hardener mix to the fabric

Figure 1.9 prepared sample ready for molding

Figure 1.10 Composite board moulding process

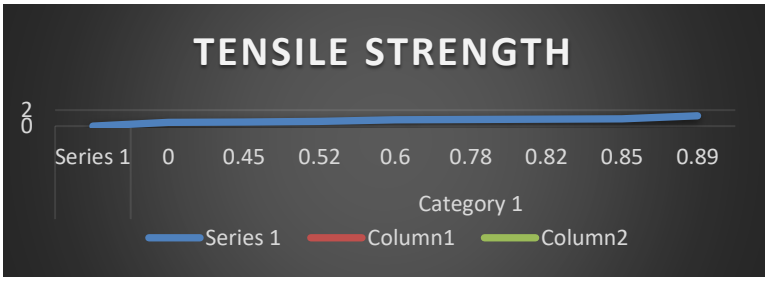
3. RESULT AND DISCUSSION

From the test that is conducted the following data's are noted to be the result of the tensile strength test experiment.

3.1 Data Measurement:

	SPECIMEN
Maximum load capacity	4.3
Initial length, L_o	0.024
Final length, L_f	3.9
Total testing duration	1.3

3.2 Data from machine:



3.3 RESULTS FOR FLEXURAL STRENGTH OF COMPOSITE

	Maximum load (N)	Tensile stress at maxmimum load (MPa)	Tensile strain at maximum load (%)	Load at break (standard) (N)	Tensile stress at break (MPa)	Tensile strain at break (%)	Tensile stress at yield (MPa)
Coefficient of variation	122.27	1.4	2.98	73.12	0.84	9.16	1.4
Maximum	122.27	1.4	2.98	73.12	0.84	9.16	1.4
Mean	122.27	1.4	2.98	73.12	0.84	9.16	1.4
Median	122.27	1.4	2.98	73.12	0.84	9.16	1.4
Minimum	122.27	1.4	2.98	73.12	0.84	9.16	1.4
Range	0	0	0	0	0	0	0

4. CONCLUSION

The feasibility of using abaca, coir and sisal fibers to reinforced epoxy resin has been explained in this paper. This composite board is preferred due to its superior characteristics and their availability. The tensile property, flexural property and also the water absorption property are comparatively higher in this board than the other composite boards.It is evident that the reinforcement material increases the tensile properties of composite.Thus the utilization of cheaper goods and applying it in high performance is possible with the help of this composite technology. All the numerous

experimental tests gathered important information about the natural composites and the best process formulations. Moreover such tests constitute fundamental confirmation of the reliability of the material and of its usage in marine applications. The tests of accelerated ageing and water absorption have evidenced the resistance of the material adopted to the aggressiveness of the marine atmosphere; in the realization of real prototypes it is previewed however the utilization of waterproofing treatments on the exposed parts.

5. ACKNOWLEDGEMENT

We offer our sincere appreciation for the learning opportunities provided by our respected **Chairman Dr. S. A. Joy Raja MBA., Ph.D., (USA)** who with his immense knowledge encourages us to excel in life.
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DEVELOPMENT OF HIGH ABSORBENCY CUM PROTECTIVE SHOE FOR SPORTS AND INDUSTRIAL APPLICATIONS

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ABSTRACT

Technical textiles are having advanced features on specific applications compared to traditional textiles. Itis something which is defined as value added products that are most probably used for their functional purpose. These textiles are only manufactured primarily for their technical performance. Protective textile is one of the part in technical textile. Protech plays an important role in safeness of the human body. It will mainly protect humans from various natural or industrial hazards. These Protective clothing or materials are useful in many aspects but this work is something which is related to sports shoe and also industrial safety shoes. Shoes and Socks are the separate materials, in which Socks are useful for absorbing sweat. If we wear shoes without socks, after a few hours of removal it will definitely cause a too bad smell which makes us feel disgusting. Instead of wearing socks, our idea is to produce advanced shoes with a good sweatabsorbing property and smoothness in the inner layer of the shoes with longer life. By using these advancedshoes the wearer's foot will be more healthy and comfortable to wear for a long time. Whenever these shoesget wet, it will dry so faster and easier because of the great absorbency effect. Due to faster drying, these shoes will not lead to bad smell. This makes it more comfortable for a sports person to wear these advancedshoes instead of wearing both shoes and socks. Industrial workers also can prefer this type of shoes for theirsafety aspect, because they aren't able to work without shoes on considering their safety purpose, it is a veryhelpful one. For these kinds of shoes, fibres used should have all these properties like absorbency, strength,fineness, flexibility and durability. It can achieve with the combination of micro polyester with other materialsgives better effect. This idea is not only for sport and industrial shoes but also for regular use shoes.

KEYWORDS: *Safety Footwear, Absorbency effect, Protection, longer life, Industrial and sports wear.*

INTRODUCTION

Textiles are one of the primary needs of human beings, Technical textiles are more advanced when comparedto traditional textiles. It is something which is defined as value added products that are most probably used for their specific functional purpose. These textiles are only manufactured primarily for their technical performance. In the last two decades, it's facing tremendous growth in the non standard sectors like protectingconsumer goods, Medical textiles, Geotextiles, Automotive parts, Building materials, Sports textile, etc. In the technical industry, technical textiles are the most dynamic one and are promising areas for the future of the textile industry. Technical textile products having high performance fibres, yarns, chemicals to meet therequirements. Special methods and specially built machineries are required to manufacture these products and so the cost is very high. Also it is designed to perform heavy duty and demanding applications.

NEED OF PROTECTIVE FABRICS IN SHOES:

Protective clothing is an important part in technical textiles which protect us from various problems like injuries, deaths, natural or industrial hazards and so on. In protective fabrics we must need protection ratherthan outlook appearance. Basically protective fabrics are made using stronger fabrics like aramid, carbon, glass etc., These textiles are actually our life saving textiles. There are many varieties of protective clothingavailable for specific hazards. Examples of the body or skin protection include laboratory coats, coveralls, vests, sports and industrial shoes, jackets, aprons, surgical gowns and full body suits. Even nowadays these particular protective textiles become in demand, so that in future also it will definitely reach a great peak.

This research aims mainly at sweat absorbing in shoes. It is useful for industrial workers and sports persons.As a general rule a person should replace his shoes for 8-12 months frequently. From this sweat absorbing shoes that duration can be made longer. For the property of sweat absorbing air permeability is required to control the bad odour. There are many kinds of footwear available on the internet today but we have an ideato produce advanced absorbency footwear. By executing the ideas like these, industrial workers and sports people can get more beneficial by this, like they are able to wear these advanced absorbency shoes for a longperiod of time and so the usage time will increase, it results in them feeling more comfortable. Ordinary footwear makes us feel disgusting by producing a bad odour after wearing it for a long time and also moreoverit is not healthier for our feet.

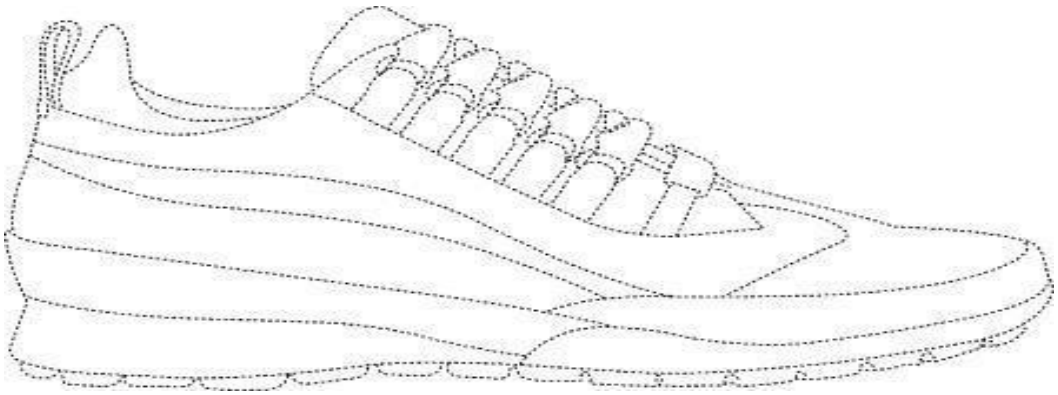
ADVANCED PROTECTIVE SHOES:

Durable boots or safety shoes provide reinforced protection from compression, electric shocks, chemical hazards etc. Our idea is to produce advanced shoes with a good absorbing property and smoothness in the inner layer of the shoes with longer life. By using these advanced shoes, the wearer's foot will be healthier compared to regular shoes. Whenever these shoes get wet, it will dry so faster and easier because of the great absorbency effect, due to faster drying, these shoes will not lead to bad odour. This makes it more comfortable for a sports person to wear these advanced shoes instead of wearing both shoes and socks together. Industrial workers can also prefer these types of shoes for longer time usage because they aren’t able to work without shoes on considering their safety purpose.

DETAILED DESCRIPTION ABOUT OUR RESEARCH WORK:

Footwear is one of the important things which saves our feet from injuries due to heat and cold. Whenever we wear shoes, it should make us feel comfortable because we are going to wear it for a long time. Considering that this idea is to produce advanced shoes which have good absorbent property. If the shoes have high absorbency, we can wear it without socks for a whole day. By wearing these shoes, it will keep our feet healthy, dry and pleasant. It should have good wickability which is an important function other than breathability and protecting human skin from UV rays injury.

Mainly industrial workers must need these kinds of shoes or boots which makes them feel very comfortable. They used to work in day time approximately 8-12 hours and sometimes even for night time. Inside the industries they must wear shoes for their safety purpose. For them we have an idea to produce these types of advanced absorbency shoes and a sports person can also prefer these shoes for better performance. Mostly protective footwear can in all shapes and sizes and still maintains its durability, as long as it's built with quality materials and innovative technology. Protective clothing is now a major part of textiles classified as technical or industrial textiles. Protective clothing refers to garments and other fabric related items designed to protect the wearer from harsh environmental effects that may result in injuries or death. Our idea about advanced absorbency shoes will become more successful and necessary in future. These advanced shoes or boots should absorb sweat easily and get dry as soon as possible. It will be a more helpful and safe product, It will also be an important work for health and safety workers in the ministry of defence, police and fire service, industrial workers and sports players.



1.1 USAGE OF VARIOUS FIBERS SUITABLE FOR ADVANCED ABSORBENCY AND PROTECTIVE SHOES:

There are many fibers which are best for shoes.

Cotton - It has better odor management compared to other materials. It's breathable and doesn't hold on to the by-products of activity like foul smells and odours.

Calico – It is the sub material of cotton. This material is highly absorbent, is also generally very cheap due to it's unfinished nature, and the fact that it remains un-dyed and raw.

Spandex - This material is also known to absorb sweat, breathe and dry quickly – so overall it's a great choice for cheap, feature-rich, malleable material.

Polyester - It has high strength and durability and even insulating property.

Microfiber - Material is highly absorbent and non-abrasive in nature.

Synthetic - This material is breathable and also quickly absorbs sweat.

Bamboo fiber - Bamboo fiber is also moisture wicking, making it a completely odorless sportswear. It also provides amazing protection from UV rays.

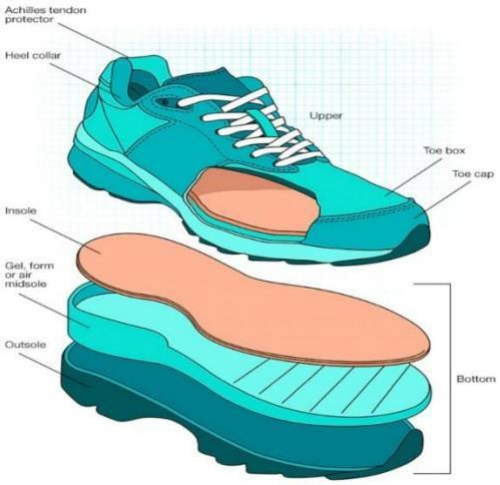
Nylon - Nylon is stretchy, quick-drying, and mildew resistant. It's also incredibly breathable. The fabric allows cool air to reach the skin and also wicks sweat from your skin to the fabric's surface, where it can evaporate safely – leaving you comfortable and temperature controlled.

Gore- tex - It keeps wind and water outside but allows sweat to evaporate.

Here there are many fibers that have a property of high water absorption, we can make use of these fibers for producing advanced absorbency shoes. We have a plan to use polyester for high strength and durability.

Spandex, nylon, micro fiber, calico, cotton all these fibers are very useful for absorbing sweat and getting dry quickly. It has a high degree of absorbing nature and also microployster gives better wickability than any other material we prefer this combination to absorb sweat. These fibres will make us feel comfortable and keep our feet dry. If it gets dry so easily, we can wear that footwear for a long time per day without wearing shocks. In our world, industrial employees are higher in strength so this footwear will definitely make more use for them. Even a sports person can also prefer this kind of shoe for their safety and comfort purpose.

1.2 MODIFICATIONS GIVEN FOR SHOES:



There are many kinds of footwear available on the internet, but we have an idea to produce advanced absorbency footwear. We are giving modifications in shoe's absorbing properties using various fibers which we discussed above and the structure of shoe's are also modified by our idea. By using these fibers our sweat will get absorbed and dried easily. In shoes there are some holes provided for aeration. We can wash those shoes by removing their base part separately and we can make use of those shoes for a longer time. So these are some modifications we wish to give for those advanced absorbing shoes.

We are going to execute our idea especially in the midsole layer of the shoes, by placing the most absorbing fiber property layer so that it can absorb sweat, and then the next layer we can use micro fibers and polyester for high strength and durability, provide some tiny holes outside for aeration then it will become odour free absorbency shoes. The Outsole layer is made using nylon fibers, which provides good abrasion resistance. A special thing in this research is we should remove the midsole as well as outsole layers separately for washing purposes.

BENEFITS THROUGH RESEARCH WORK:

- Industrial workers and sport players gain the best advantages of odour free shoes and free from skin issues even for long term usage.
- They can afford easily to get this product instead of buying both shoes and socks.
- It is reusable by washing easily.
- It is washable after using for many times and if dried properly it can be reused for a long time
- The fibres used in this product can avoid abrasion and can be for a long term of time.

- It can be used by all types of workers in various industries and this product plays a vital role in theirlives.
- Ensures safety precautions of the people.

CONCLUSION:

Protective clothing is one of the important areas in textiles which is growing faster in this global market. These advanced absorbency shoes will become more successful and necessary in future. These advanced shoes or boots should absorb sweat easily and get dry as soon as possible. It will be a more helpful and safeproduct so that we should make use of it. It will also be useful for health and safety workers in the ministry of defence, police and fire service, industrial workers and sports players. The fibres should have the propertieslike absorbency, strong and durability which makes shoes or boots as the quality product so that we can wearor use it for a longer time period. People should keep on trying these innovative ideas until it becomes successful. All textile engineers should come forward to develop these innovative ideas in the technical textiles field.

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DEVELOPMENT OF FACE MASK USING ACORUS CALAMUS EXTRACT

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ABSTRACT

The application of herbal products on the textile substances is a very new concept. It gives a new direction towards the treatments of various diseases through textile industry. Acorus calamus (Sweet flag) and vasambu in local name is a medicinal plant. It is a wetland perennial monocot plant, in which the scented leaves and rhizomes have been traditionally used medicinally against different ailments. In this study, Acorus calamus were investigated through the methanol extract from its leaves and rhizomes. Antimicrobial activity of Acorus Calamus, studied from fresh and dry leaves and as well as from fresh and dry rhizome. Finished fabrics are assessed the effectiveness of the anti microbial property through agar diffusion method which against the micro organisms of Staphylococcus Aureus and Escherichia Coli.The study clearly suggested that A. Calamus rhizomes and leaves have good anti-microorganism property in different timings on cotton fabric.

KEYWORD *: Acorus calamus , extract from rhizome , anti-microbial assessment.*

1.INTRODUCTION

Textiles are indispensable part of human life. They are mainly to cover the human body for protection against all the adversities says Kaplan (2001). Natural textile fibres are more susceptible to attack than synthetic fibres. At the same time human skin supports growth of bacteria, because of its metabolic side products such as acidic and basic perspirations and urine, although it is possible the most important barrier to prevent microorganisms entering the body, denotes mechmet Orhan et al (2007). Awareness about eco friendliness in textiles is one of the important issues in recent times since textiles are used next to skin and are called second skin. Owing to the demands of global consumer the researches are being carried out for new eco friendly processes. Textile finishing is a diversified sector due to the processed raw materials, manufacturing technique and finalized products. Trends in fashion cause continuous changes in colouring and functional finishes says Smith (2006).natural finishes comprises of those substances that are obtained from plants and animals. Natural finishes have many advantages such as non toxic, non irritant, biodegradable, cost effective, easy availability, etc, malik.T et al (2008). Moreover, in the present day world most of us are very conscious about our hygiene and cleanliness. Clothing and textile are a very suitable media for the growth of the micro organisms. They can act as the carriers of some micro organisms such as pathogenic bacteria, odour generating bacteria and mould fungi. Microbial poses danger to both living and non living matters.

To overcome the above mentioned fact, here the study handles vital finishes with Acorus Calamus to improve antibacterial activity, which helps in reducing the growth of microbes. Acorus calamus finish is given to make the wearer feel cool and the finish plays significant role in anti bacterial activity. The following are the objectives of this study

- To find out the availability of natural sources
- To optimize the parameters for finishing
- To treat the cotton fabric using Acorus Calamus extracts.
- To study the effect of natural anti microbial finishes.
- To evaluate the finished samples.

1.1 ACORUS CALAMUS

Acorus calamus, a semiaquatic herb with creeping rhizomes, shows diverse pharmacological properties including antibacterial, insecticidal, antiulcerative, etc. (Pandit et al., 2011). It is a very potent adaptogenic drug. The key bioactive compounds present in *A.* calamus are flavonoid, monoterpene, quinone, sesquiterpene, and phenylpropanoid (Patra and Mitra, 1981).

2. MATERIALS AND METHOD

2.1 FABRIC SOURCING

A fabric source must have a knowledge about all varieties of fabric in order to execute their function effectively. Our fabric is 100% bamboo fabric , we selected this in regarding with its cooling property , moisture absorbency , antibacterial nature , softer than cotton.we purchased 100% bamboo fabric from matrix enterprises , Tripur.

2.2 SELECTION OF PLANT

We collected (vasambu) Acorus calamus Rhizome from from the fields. The main property of Acorus calamus is antimicrobial and antifungal functionality. Basically it is a natural herb which is used for prevent us from bacteria and fungi. We did predetermined of our fabric to remove starch ,natural impurities ,natural yellowish gray colouring matter present in fabric.

Figure 2.1: Acorus calamus rhizome

2.3 EXTRACTION PROCESS

Figure 2.3.1 powdered rhizome

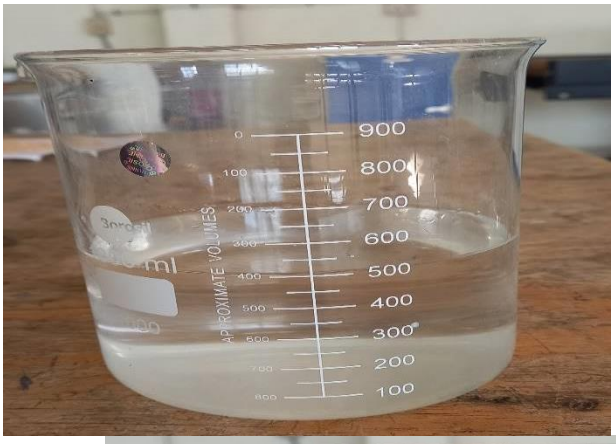


Figure 2.3.2 : Methanol

Figure 2.3.3 : rhizome powder(50g) mixed with methanol(500 ml)

Figure 2.3.4 : filteration

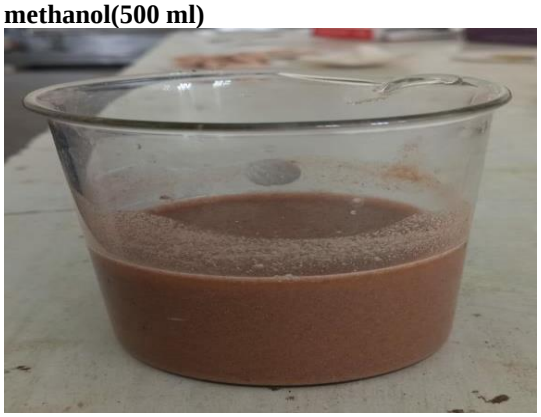


Figure 2.3.5 : semi solid extract

The herbal powder was mixed thoroughly with methanol and water and it was kept in airtight conical flask. The conical flask was incubated for 24 hours in the room temperature.

The supernatant was filtered using a Whatmann no.1 filter paper and the filtrate was dried and the methanol was

evapourated at room temperature. When exposed to the air. The filtrate was collected for the finishing treatment. The filtrate has the activity of the plant so the finish is applied the fabric also has this activity

2.4 FINISHING PROCESS

The durability of the finish can be enhanced when the herbal extract of dry rhizome is applied on bamboo fabric. The extracted 100% herbal extraction solution is mixed with 1:20 ratio liquor. Finishing was applied directly by pad-dry-cure method with binding agent, citric acid. Hence padding mangle was used to finish the sample. The treated sample was cured in room temperature and dried in shade. Thus, the sample wad prepared.

Figure 2.4.1 : bamboo fabric is dipped in extraction solution

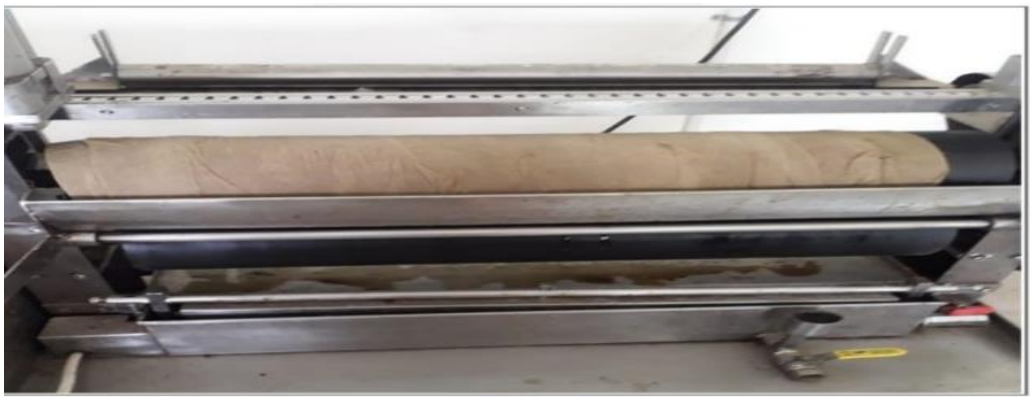


Figure2.4.2 : padding

Figure 2.4.3 : curing

3. RESULT AND DISCUSSION

3.1 ANTI BACTERIAL ACTIVITY

The science dealing with the study of the prevention and treatment of diseases caused by micro-organisms is known as medical microbiology. Its subdisciplines are virology (study of viruses), bacteriology (study of bacteria), mycology (study of fungi), phycology (study of algae) and protozoology (study of protozoa). For the treatment of diseases inhibitory chemicals employed to kill micro-organisms or prevent their growth, are called antimicrobial agents. These are classified according to their application and spectrum of activity, as germicides that kill micro-organisms, whereas micro-biostatic agents inhibit the growth of pathogens and enable the leucocytes and other defense mechanism of the host to cope up with static invaders. The germicides may exhibit selective toxicity depending on their spectrum of activity. They may act as viricides (killing viruses), bacteriocides (killing bacteria), algicides (killing algae) or fungicides (killing fungi).

3.2 THE KIRBY –BAUER METHOD

Kirby-Bauer antibiotic testing (also called KB testing or disk diffusion antibiotic sensitivity testing) uses antibiotic-containing wafers or disks to test whether particular bacteria are susceptible to specific antibiotics. First, a pure culture of bacteria is isolated from the patient.

Then, a known quantity of bacteria are grown overnight on agar (solid growth media) plates in the presence of a thin wafer that contains a known amount of a relevant antibiotic. If the bacteria are susceptible to the particular antibiotic from a wafer, an area of clear media where bacteria are not able to grow surrounds the wafer, which is known as the zone of inhibition. A larger zone of inhibition around an antibiotic-containing disk indicates that the bacteria are more sensitive to the antibiotic in the disk.

3.3 PREPARATION OF PLATES

The medium is prepared and sterilised as directed by the manufacture. Defibrinated blood may be necessary for tests on fastidious organisms, in which case the medium should be allowed to cool to 50^0C before 70% of blood is added. Human blood is not recommended as it may contain antimicrobial substances. The medium should be poured into Petri dishes on a flat horizontal surface to a depyh of 4mm (25ml in an 85mm circular dish; 60ml in a 135mm circular dish). Poured plates are stored $+4^0$C and used within one week of preparation.

Before inoculation plates should be dried with lids a jar so that there are no droplets of moisture on the agar surface. The time to achieve this depends on the drying conditions. The pH of the medium should be checked at the time of preparation and should be 7.2 to7.4.

3.4 PREPARATION OF INOCULUM

Atleast four morphologically similar colonies from agar medium are touched with a wire loop and the growth is transferred to a test tube containing 1.5ml of sterile both. The tubes are incubated for 2 hours at 35^0C to 37^0C to produce a bacterial suspension of moderate turbidity. The density of the suspension is standardize by dilution with sterile saline or broyh to a density equivalent to a barium sulphate standard, 0.5 McFarland units. Before use, the standard should be shaken vigorously.

3.5 INOCULATION

Plates are inoculated within 15minutes of preparation of the suspention so that the density does not change. A sterile cotton – wool swab is dipped into the suspension and surplus removed by rotation of the swab against the side of the tube above the fluid level. The medium is inoculated by even streaking of the swab over the entire surface of the plate in three directions.

3.6 ANTIBIOTICS DISCS

After the inoculums the dried, single discs are applied with force, a sharp needle or a dispense and pressed gently to ensure even contact with the medium. When fastidious organisms are to be tested, touch multiple colonies with a loop and cross streak the appropriate plate for uniform distribution. Not more than six discs can be accommodated on an 85mm circular plate and twelve are easily accommodated on a 135mm circular plate.

Discs should be stored at +40C in sealed containers with a desiccant and should be allowed to come to room temperature before the containers are opened. Discs should be used befor the expiry date on the label. If antimicrobial solution prepared in the laboratory are being used proceed as follows:

- Pick up a 2mm loopful of the standard antibiotic solution and lower carefully onto a paper disc which, when moistened will adhere to the loop.
- Place the moistened disc on the surface of inoculated plate in the appropriately labeled segment.
    - NOTE: take care to avoid inadvertent "contamination" of other discs in the Petri dish with the antibiotic solution.
- Repeat for each microbial agent to be used, placing the impregnated discs in their respectively labeled segments.

3.7 INCUBATION

Plates are incubated for 16 to 18 hours at 35 to 37^0C aerobically or in CO_2 atmosphere for fastidious organisms.

3.8 READING OF ZONES OF INHIBITION

The diameters of zones are measured to the nearest millimeter with vernier caliper (preferably), or a thin transparent millimeter scale. The point of abrupt diminution of growth, which in most cases corresponds with the point of complete inhibition of growth, is taken as the zone edge. In some batches of media, organisms may show a

film of growth within the susceptible zone which may be ignored. Similar findings may be seen with swarming proteus spp.

3.9 SAMPLES

The sample of cotton gauze is inoculated in the culture plates containing bacteria of staphylococcus aureus and pseudomonas aeruginosa. Based on the bacterial growth on nutrient agar plates after 24 hours of incubation with the test specimen, the sample cotton gauze is found to have antibacterial activity as there was a zone of inhibition against the test organisms.

As per standard, the fabric material will be considered to have antibacterial activity only when there is no bacterial growth directly under the sample in the contact area. The *mimosa pudica* and the *azadirachta indica* are mixed with the composition 1:2 ratio extraction treated sample denoted D and the 2:1 ratio extraction treated sample denoted as E.Both samples are allowed for anti bacterial test.

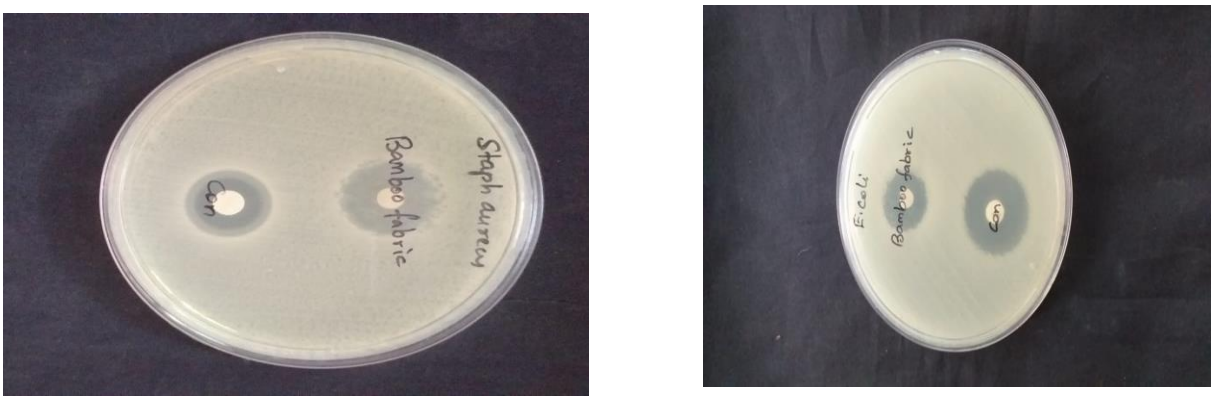


Figure 3.13Zones formation in agar plate

3.10 PHYTOCHEMICAL TEST METHOD

Phytochemical screening refers to the extraction, screening and identification of the medicinally active substances found in plants.

Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds. Although the knowledge of how these substances provide medicinal value to humans reflects a relatively recent scientific understanding, the use of plants and plant extracts to heal, relieve pain and promote good health dates back to before the beginnings of medical science.

RESULT FOR DURABILITY TEST

All our fabrics are subject to rigorous durability and strength testing as part of the manufacturing process. Below are just a few of the more comm. Use ones across the range.

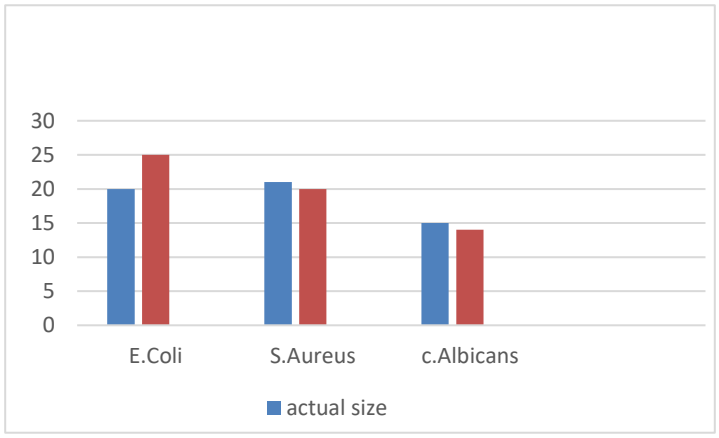
SAMPLE DESCRIPTION: ONE PIECE OF SUBMITTED SINGLE

JERCY BAMBOO FABRIC SAMPLE

SAID TO FINISH WITH ANTIBACTERIAL

COATING USING ACORUS CALAMUS

(VASAMBU)EXTRACT



In the graph, y axis represent the sample fabric in the unit mm. series 1 (blue bar) represents the actual size of the sample fabric. series 2 (orange bar) represents the microbial control in the sample fabric. Column 1 represents the microbial control against E .Coli and column 2 represents the microbial control against staphylococcus Aureus and column 3 represents the microbial control against candida albicans.

Comparatively, E. Coli gives a best result on antimicrobial property among other.

ANTIBACTERIAL TESTING

	Bamboo Fabric	Control(amikacin)
E coli	20mm	25mm
Staph acreus	21mm	20mm
		Control(Nystain)
Candida albicans	15mm	14mm

4. CONCLUSION

In this work, herbal based antibacterial finish was applied to the gauze fabric. Extracts of vasambu were applied to the fabric.Based on the tests conducted, the obtained results were shown in the tables and figures. According to the results, the treated samples D and E showed good antibacterial property and sample D showed excellent wound healing property. The vasambu in 1:2 herbal extraction shows good wound healing property when applied to the fabric compared to 2:1 herbal extraction.

Since vasambu are rich in flavonoids and saponins and abundant availability in many of the countries the scope of implementation and commercialization of herbal extract to impart finishes in textile is will be high and raw

material is 100% from natural resources, it is eco-friendly having economic, social and environmental benefits. The treated fabrics were found to be very hygienic with no bacterial infection when compared to conventionally finished fabrics.And also it gives cost-wise benefit to people. In addition, it is environment friendly.

5. ACKNOWLEDGEMENT

First and foremost we concede the surviving presence and flourishing refinement of "Our Almighty God" for his concealing hand yet substantial supervision all though the construction for this project.

We offer our sincere appreciation for the learning opportunities provided by our respected Chairman **Dr.S.A.JoyRaja MBA.,Ph.D(USA)** who with his immense knowledge encourages us to excel in life.

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SUSTAINABLE CASUAL WEAR OF PALF-COTTON BLEND

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ABSTRACT

The use of sustainable natural fibre in apparels such as casual wear can contribute to slow down the fast fashion crises and improvement in environmental related issues. The objective of our research was to evaluate the potential of using the nature fibre from pineapple leaves to make casual wear out of it .We have theoretically explained the results of blending Pineapple Leaf fibre (PALF) and cotton to make a fabric that matches the comfort of the casual wears and even this blend is relatively cost efficient rather than using 100% PALF fabric. PALF fibre is extracted from leaves and they are soft, lustrous, light weight fibre and blend easily other fibres which are much acceptable for fashion garment. The production of PALF fabric is more labour intensive work which in turn employs more workers and gives life to handloom weavers. We started with analysing fibre's physico-mechanical properties, an attempt has been made to analyse the comfort properties of PALF–cotton blend fabric using the values calculated from standard formulae and the research undergone. As a result, the fabric shows very good physical, mechanical properties and comfort properties desired for casual wear apparels. This inferred that Indian PALF may be successfully used to make sustainable apparel quality fabric which is much suitable for casual wear when it gets blended with cotton.

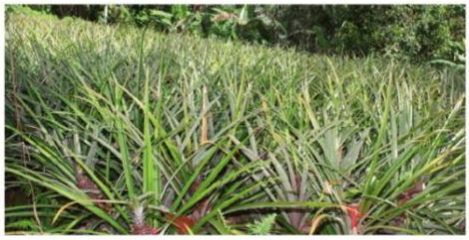
KEYWORD: *sustainability, pineapple leaf fibre -cotton blend, physicochemical properties, comfort properties, casual wear*

1. INTRODUCTION

Due to the ongoing pandemic where everyone had to stay in their homes, the demand for the clothing has been shifted from formal to casual wears. Even though casual wear was always popular however, the lockdown has given it added boost. Today, with the enrichment of people's awareness on environment problems and the demand of environment – friendly fabric, natural fibres have a received a great deal of attention as they are biodegradable and renewable resources, contributing to the circular economy as well. Hence sustainable natural fibres have to be used in right proportions to make a fabric which is suitable for daily wears, without compromising in its comfort**.** In Indian subcontinent pineapple leaves are wasted after harvesting the fruit, because of technology gap exists in the efficient extraction and lack of knowledge of subsequent process for value addition to the fibre. The properties of the fabric were studied and found to be suitable for making casual wear .It is suitable for Indian climatic conditions. It will give almost the same comfort as cotton fabric. This fabric is expensive because it has more labour intensive work. In order to make it cost efficient, instead of using 100% PALF fabric, we can blend pineapple fibre with cotton to make it cost efficient and eco-friendly sustainable fabric. In this paper, we have analysed fibre's physico-mechanical properties and an attempt has been made to analyse the comfort properties of PALF–cotton blend fabric using the values calculated from standard formulae and the research undergone.

2. PROPERTIES OF PALF AND COTTON FIBRE

PALF is extracted from the leaves of pineapple plant, Ananas comosus. Pineapple grows as a small shrub. The leaf of pineapple plant contains a small amount of small white silky fibres. Leaves are cut from plants and manually plucked away. Then every Pina fibre is scrapped manually [6].



Cotton is a natural cellulosic fibre. It is the most used fibre and comfortable to wear in all seasons.

2.1. Physical Properties of PALF

PALF are longer in length and have a stiff hand feel. Pineapple fibres have natural shine similar to that of linen and also give a soft feel. It has low specific gravity and improved texture. PALF have high degree of crystallinity with a spiral angle of 15 degrees. The degree of crystallinity determines the mechanical properties of a fibre. The tensile strength and elasticity modulus of PALF is about 210-690 MPa and 15-53 GPa respectively. PALF has higher torsional and flexural rigidity than cotton. Pina fibre loses its strength in wet condition which is due to the penetration of water molecule in the multi-cellular lingo-cellulosic fibres, up to some extent results in loosening of the binding in the cells and when load is applied it causes cell slippage. PALF have heat stability up to 375.6 °C. Thermal conductivity of fibre is very low at 0.0273 watts/m^2/°K suggesting that this fibre can provide us with thermal insulating property[5].

2.2. Chemical Properties of PALF

PALF consists of 79.5-81.6% of cellulose, 13% of hemi-cellulose, 4.2-12.8% lignin, 1% ash, 2.1% of alcohol benzene and 3.5% water soluble components. Maximum Shrinkage occurs within 20 minutes of treatment with alkali, after which there is only a little shrinkage. Caustic treatment causes longitudinal shrinkage. The length shrinkage is proportional to the weight loss. The losses are mainly due to removal of hemi-cellulose components by caustic treatment. The diameter of yarn from PALF increases on caustic treatment, resulting in bulk of the yarn. Treatment with NaOH causes crimp and enhanced the breaking elongation of PALF.

2.3. Extraction of PALF

Retting Method - Fibres from the pineapple leaves are obtained by softening of pineapple leaves in water. In fermentation, bacteria developed degrade the partition of softer cells of the leaf leaving the fibres unaffected thereby facilitating the separation of fibre bundles which is 2-4 inches in length. After this process, the leaves are removed and dried. After drying the leaves are subjected into breaking which is the first mechanical process to which pineapple leaves are subjected and it is done manually by beating with hammer [6].

2.4. Physical Properties of Cotton

Cotton is white, creamy white, yellowish white or grey in colour. It has a specific gravity of value 1.54 and moisture regain 8.5. Cotton is a moderately strong fibre and has a tenacity of 3-5 gm/denier. The strength of cotton fibre is greatly affected by moisture where the wet strength of cotton is 20% greater than the dry strength. It has an elongation at break of 5-10%. Cotton fibre is an inelastic and rigid fibre. Cotton has a good resistance to degradation to heat. Cotton burns in air. It is stable to heat up to 390°C. Thermal conductivity of cotton fibre is between 0.026-0.065W/mK. It is found that cotton has a gradual loss of strength when it is exposed to sunlight and the fibre turns yellow. It is due to UV light and shortened waves of visible light.

2.5. Chemical Properties of Cotton

Cotton fibre consists of 82-96% of cellulose, 2-6% of hemi-cellulose, 0.5-1% of lignin, 5-7% of pectin and a small percentage of ash, wax and Organic acids. Cotton is highly resistant to alkali. It can be repeatedly washed in soap solution without any further problems. Cotton has high resistance to normal cleaning solvents. Cotton fibre are weakened and damaged by acids. Cotton is easy to dye and print.

3. FABRIC ANALYSIS

3.1. Yarn Formation

The PALF was extracted using retting process. The obtained fibres were processed as like as cotton through modern spinning system. The fibres were passed through Ginning, Blow room, carding machines. The obtained slivers were fed into Rotor, which was economic-friendly method. The Yarns obtained from Rotor was having linear density of 39 Tex. Similarly, the Cotton fibres were processed to yarn through modern spinning system. The linear density of cotton yarn was 22 Tex [2].

3.2. Fabric Formation

A Traditional handloom had been used to weave the PALF/Cotton Blend fabric. The PALF was taken as Weft whereas the Cotton Blend fabric was taken as Warp. A Plain weave Fabric was made with 1 up/ 1 down pattern. The setting of handloom was 60-inch reed space with a 48s reed count, and areal density of 116 g/m^2 [2].

3.3. Dyeing and Finishing

Various types of natural dyes can be used to dye this fabric such has those extracted from vegetables and plants. A vegetable dye is suitable for dyeing this PALF-Cotton blend fabric. Finishing of fabric can be done by chemicals, since our goal is to achieve sustainability, where we have to protect our environment it is necessary to undergo bio-finishing. Bio-finishing is done by using different enzymes, natural bio polymers and aromatic compounds. Enzyme washing can be done. Bio-polymers such as chitosan can be used to apply Antimicrobial finish and Wrinkle free finish. The disadvantage of bio-finishing is the less durability which can be avoided using micro and Nano encapsulation [4].

3.4. Theoretical Analysis

Based on the weaving values obtained from [2], we have calculated the PALF/cotton blend fabric values by using standard formulae. These values are purely theoretical and it may differ from practical values. Using count values, maximum EPI has been found by using EPI = 14*√ . Based on the GSM of fabric, we have derived PPI of the Fabric by using

The Values obtained from these above formulae was tabulated in the following table.

		PALF Fabric	
S.No	Properties		
		Warp (Cotton)	Weft (PALF)
1	Ends per Inch	66	
2	Picks per Inch	30	3.75
3	Crimp %	4.38	0.0092
4	Yarn Diameter (mm)	0.0070	7.7
5	Cover factor	12.9	
6			

The Following table has been taken to interpret easily the properties of the PALF/Cotton blend Fabric [2].

1	Thickness (mm)	0.28	
2	GSM (g/m^2)	116	
3	Yarn Count (Tex)	22	38
4	Breaking tenacity (cN/tex)	3.7	3.9
5	Tensile Strain at break (%)	13	4.9
6	Initial Modulus (cN/tex)	10.2	57.6
7	Tear Strength (N)	354	260
8	Flexural Rigidity (mg/cm)	540	3183
9	Crease Recovery angle	98.5	95.6
10	Abrasion Resistance	0.89	1.15

4. CONCLUSION

In this study, we conclude that the physico-mechanical properties of retted PALF and cotton blend indicate its suitability for using in making very good quality of natural fibre-based apparels. In addition to that the PALF – cotton blend fabric shows better comfort properties such as air permeability, dimensional stability, good moisture absorbency, high durability, water wicking property and crease recovery. Thus, the work shows that Indian pineapple leaf and cotton blend fabric can successfully be utilised for making casual wears.

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Sustainable Textile Innovations: Coffee Ground Fibres

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ABSTRACT

During the last two decades the interest in sustainable fibres has increased immensely. The textile industry has been implementing new technology and developing the fibre which is innovative and better for the industry in terms of social and environmentally sustainable point of view. S. Café is a prime example one of the leading textile innovations. Coffee grounds that are considered as trash are utilized into wearable textile-like yarn which are further converted into fabric. Yarn made from coffee grounds offer excellent natural anti-door qualities, in addition to UV ray protection and quick drying time and recycled polyester. Coffee yarn is multi-functional and can be used in a variety of products, from outdoor and sports performance wear to household items used every day. The coffee grounds used to create the yarn are taken and recycled from some of the world's largest coffee vendors, like Starbucks.

KEYWORD

Spent coffee ground, S.Café, microencapsulate, carbonise.

1.INTRODUCTION

Coffee is one of the most widely consumed beverages in the world, resulting in large amounts of strong residue known as spent coffee grounds (SCG). The leftovers from the final stages of coffee preparation, such as brewing coffee, are known as spent coffee grounds. Every day, approximately 33 million pounds of coffee grounds are generated from the use and disposal of 3.5 billion cups of coffee. An increasing number of companies and individuals are coming up with creative ways to repurpose coffee grounds so that they don't end up as waste but as a possible new resource. Textiles is one of those forms. Singtex CEO Jason Chen collaborated with scientists and researchers to create a yarn made partially from coffee grounds, which led to the launch of the S.Cafe coffee fabric collection. Coffee grounds are also being used to create fibres, yarn, and, eventually, cloth. Coffee grounds are sold as a greener option since they make use of a resource that would otherwise go to waste and offer an alternative to using more traditional chemicals to produce the same results.

2.Manufacturing Process

2.1Preparation material with coffee residue

Microencapsulated backed coffee residue, microencapsulated coffee essential oil, and microencapsulated fragrance organic compound derived from coffee residue are all included in the phrase "stuff with coffee residue." The coffee bean can be used to remove coffee essential oil. After that, microencapsulated coffee residue or coffee essential oil is used.

2.2 Cleaning or sieving of coffee residue or raw material.

The coffee bean waste is rinsed in clean water and then dried, resulting in a 20–100-micron ground particle. The field mixture is sieved after that into fine particle sizes ranging from 80 to 100 um.

2.3Removal of organic contents from material with coffee residue

The sieved mixture is treated with solvents to extract the organic contents. Fat is extracted with ethyl ether in a Soxhlet style extractor. Following the removal of the fatty acid, the aqueous solution containing water-soluble constituents is evaporated to minimise pressure before being extracted with absolute alcohol to eliminate glycerol.

2.4 Preparation of carbonised particles

The above-mentioned three-step mixture is collected and carbonised. In the presence of chemicals such as zinc chloride, magnesium chloride, calcium chloride, or phosphoric acid, coffee raw material is carbonised.

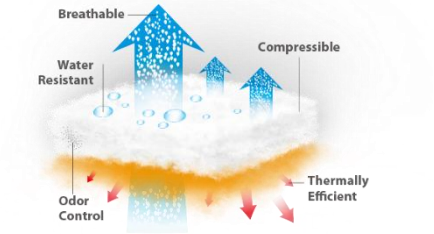
2.5 Mixing of material with carbonised material to form a mixture.

2.6 Blending the mixture with the polyester chip in a weight ratio of 1:9 to produce a masterbatch.

To make masterbatch, ground particle and polymer chip (such as PP, Nylon, or PET) are blended in a weight ratio of 1:9. To make masterbatch, 75 percent of carbonised particles and 25% of the coffee-scented content are blended into a polymer chip (such as PP, Nylon, or PET).

2.7Drawing of Yarn from masterbatch.

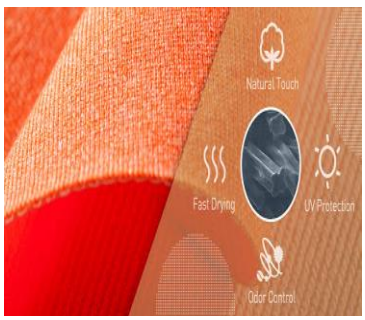
2.8Making fabric with it.[3]



Properties

- Excellent moisture absorption
- Good air permeability
- Elastic in nature
- Natural medicinal property which helps in healing
- Natural lustre [1]

3.Functions



3.1 Odour control: The odours that your body creates during the day are absorbed by S. Café® coffee grounds. Do not worry about washing your S. Café® garments because the coffee grounds are embedded within the yarn; this feature lasts much longer than you would anticipate!

3.2 Fast Drying: For a faster drying process, S.Café continuously transfers moisture away from the skin to the outer surface of the cloth. Moisture moves from your skin to the outer layer of our S.Café fabric, where it

spreads out over the surface region to shorten the drying time. Since this feature is permanent, it can never be washed or worn out.

3.3 UV protection: S. Café coffee grounds have multiple microscopic pores that act as a natural, chemical-free shield for yarn or fibre, reflecting UV rays and providing a pleasant outdoor experience.

3.4 Ice Cool Touch: S. Café ICE-CAFÉTM is a natural yarn that can reduce the temperature of our skin by 1 to 2 degrees Celsius as compared to common fabrics. The fabric itself is cool to the touch.[4]

4. Applications

4.1 Apparel Textile: Coffee fibre can be used in a variety of textiles, including activewear, T-shirts, and under garments. It is environmentally friendly can be washed without the use of detergents.

4.2 Home furnishings: Coffee ground fibre was mainly used in clothes, but it can also be used as part of the framework in coffee shop and home furnishings interior design.

4.3 Athletic wear: Due to the natural deodorising properties of roasted coffee, fabrics made from coffee yarn are ideal for athletic wear which intend to absorb sweat. Apart from that, it has been discovered that coffee fibre dries faster and acts as a UV shield, making the fabric ideal for athletic wear.[2]

5. Environmental merits

- Improves the coffee industry's life cycle and makes waste more efficient.
- Chemicals that are non-toxic in nature are used in the coffee fibre manufacturing process.
- Coffee ground fibres are 100 percent biodegradable and have no negative environmental effects.
- Rather than concentrating on the end-product evaluation, the blue sign is a single standard association that examines all aspects of the manufacturing process, from raw materials to chemical components, as well as water and energy supplies.
- It designed for reducing the environmental impact.[3]

6.CONCLUSION

The fibre gives a second life to coffee grounds which otherwise would have ended up in the trash. There is never a need to waste time and energy to produce the essential S.Café raw material, as coffee is always being consumed and therefore there will always be coffee grounds to be collected and used. In addition, garments made from S.Café can also be composted at the end of their life, ensuring they do not go to waste in one of the world's landfills giving it a circular lifecycle. Therefore, this fibre is eco-friendly and energy saving. So, start your day with a good cup of coffee, and then wear it on your sleeves as well. Science fiction just got science smart.

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Combined Utilisation of Knitted and Woven Fabric in Garments

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ABSTRACT

Knitted fabrics being more widely used than ever due to their comfortable nature and ofcourse their adjustment according to the shape of the body is what made then unique and attractive.The fabric's stability and extensibility can be engineered in the case of knitted fabric.Also the knitted fabric gives a largenumber of design possibility.The woven fabric being a symbol of dimensional stability.Woven fabric is also rigid making it ideal for using it for work cloths.They are very helpful in protective clothing.Each of the 2 types of fabrics having their advantage.The main problem we all have while using pants is the fitting comfortably in the waist. Dress pants and trousers are often neglected when it comes to fit. While the jacket receives most of the attention, a well-fitting pair of pants is a piece of art. While some legs are easier to fit properly than other, certain aspects of a nicely fitting pair of pants can be achieved by anyone. The waistband should sit comfortably around your waist,but snug enough to keep your shirt tucked in.Which is the most important as that decides the fit of the pant.But woven pants have waistband that do not stretch so they can get out of use.In this method we are going to use knitted fabric at the waist area so that the pant can fit the person's even though it may change at a proper changeable interval.The usage of fabric that have a usable elastic deformation range would quite be helpful in both its practical application and also its serve its purpose.

KEYWORD:*knitted fabric,elastic,stability,pant,waistband.*

1.Knitted and Woven fabric

Woven fabrics are made by weaving multiple threads over and under each other in a criss-cross pattern. Because the edge of this fabric isn't secured in any way, it can unravel. Knit, on the other hand, is similar to the way someone would hand knit yarn. It is made of one piece of thread that is made of interlocking loops, so it doesn't form an edge. Knit fabric stretches a lot when pulled by its width and some stretch when pulled by its length. Wovens, on the other hand, will give almost no stretch except on the diagonal. This is important when dealing with the kind of garment that you are trying to make.Knit products are meant to stretch and often have no fasteners like a zipper or button you can use to put it on. So if you are producing a pull-over shirt, chances are you're going to be using a knit fabric. However, for something that doesn't need to give a lot of stretch like pants or a button up shirt you should be using a woven fabric.

1.1.Advantages and disadvantages of knitted fabric

It is of soft texture, moisture absorption, excellent elasticity and extensibility, and productivity. Knitwear is comfortable to wear, fits fit, and has no restraint, which fully reflects the human body curve.However,the disadvantages are easy to disperse, curling, easy to hook, not as strong as woven fabric. In this project we are going to use interlock knit to make the waistband of the pant.Interlock knit is similar to rib knit.It also looks like 2 layers of single knit piled on top of each other.Thus,this type of knit fabric is also called double-faced rib.When you want to sew pants,skirts,tanks,the best type of knit fabric is the interlock fabric.It can come in any fibre. In this project we are going to use interlock knit to make the waistband of the pant.Interlock knit is similar to rib knit.It also looks like 2 layers of single knit piled on top of each other.Thus,this type of knit fabric is also called double-faced rib.When you want to sew pants,skirts,tanks,the best type of knit fabric is the interlock fabric.It can come in any fibre.

1.2 Advantages and Disadvantages of Woven fabric

The advantages of woven fabric are that tend to look “crisp”.Offer a smarter appearance and luxurious integrity.Add structure to an outfit.Look pristine for longer, seldom shrinking and losing shape.Have a rigid fabric composition that combats muffin top.However,the disadvantages in case of woven are,they are not as soft as knits.Don’t always stretch and sometimes feel restrictive.Can be laborious to launder (dry clean and press).Wrinkle quite easily.Relatively more expensive.

2.Elastane Fabric(Lycra)

Lycra is a brand name for elastane, which is a highly elastic synthetic fabric. Despite having different names, Lycra, spandex, and elastane are all the same material, and these fabrics can stretch to 5-8 times their usual size.Unlike many other types of synthetic fabrics, Lycra is highly resistant to heat, and it was quickly recognized as an excellent addition to heat-sensitive synthetics like polyester and nylon.Types of lycra fabric,

Lycra: As a registered trademark of the DuPont corporation, the "Lycra" brand is one of the most reliable and high-quality forms of elastane fabric on the market. However, elastane that has been branded as Lycra can sometimes cost more than other types of spandex.

Elastane: The term "elastane" is most commonly used in Europe, and each continental European language has a slightly different version of this word. Elastane is the most technically correct term used to describe these polyether-polyurea copolymer fabrics.

Spandex: Despite the persistence of a common misconception, spandex is not a registered trademark of any company. Instead, it is the term that DuPont originally used to describe their polyurethane fabric during the development process. "Spandex" is an anagram of "expands," and the attractive simplicity of this name has made it the preferred term for referring to elastane products in the United States and elsewhere.

2.1 Manufacturing of Elastane Lycra is a fully synthetic fiber, which means that all of its components are created in laboratory settings. While many of the constituent parts that are used to create the chemicals in Lycra fabric have organic origins, by the time that they are formed into Lycra fibers, they have been formulated and reformulated to the extent that they have no relation to organic components There are four ways to make Lycra, but most of these methods have been almost entirely discarded. While some manufacturers may still use reaction spinning, solution wet spinning, or melt extrusion to make elastane products, a method known as solution dry spinning makes up almost 95

percent of global Lycra production.This process begins when macroglycol and a diisocyanate monomer are mixed to create the prepolymer that serves as the base ingredient of Lycra. Next, the solution is exposed to minutely calibrated levels of heat and pressure, which instigates the chemical reaction that forms the prepolymer. If the volume ratio between these two substances is out of balance, the prepolymer will not form, and a ration of 1:2 is observed in most applications. In determining the increased elasticity that will be noted in fabrics once elastane is introduced, textile manufacturers keep in mind that this fabric stretches up to eight times its original size. Therefore, if 10 percent spandex is included in an otherwise rigid textile, it should be able to stretch to roughly twice its original size.

2.2 Uses and Advantages of Elastane

Lycra is used in a wide variety of different forms of consumer textiles. Elastane fabrics are very rarely marketed on their own Instead, this fabric is usually woven into other types of textiles to increase their overall elasticity. If a small amount of spandex is woven into polyester, cotton, or wool, for instance, these fabrics become much more elastic. Lycra is most popular in types of garments that are form-fitting. In addition, almost every type of sportswear contains at least some amount of Lycra. Lycra blend knit fabrics make excellent waistbands that are both comfortable and figure flattering. Consider a smooth fabric waistband that can sit at the waist, hips or anywhere in between. This waistband can be folded, crushed or worn flat depending on the day's desired effect. This type of waistband helps achieve a wonderfully smooth transition at the waist, which has always been an issue with an elastic waist. No casings, pins or topstitching involved. A simple alteration is all that is needed to make the change to your pattern. By removing a portion of the garment and replacing it with a band the garment will still fit properly, just smoother. Depending on the desired width of the band the pattern alteration varies.Calculating the band length is easy using the measurement information included here. The suggested patterns and fabrics work out great using this technique.

Calculate Band Length:

This is to ensure the correct "tightness" of the band (also known as negative ease). These tips are an approximation. You'll need to experiment with your band fabric, garment fabric and your body.

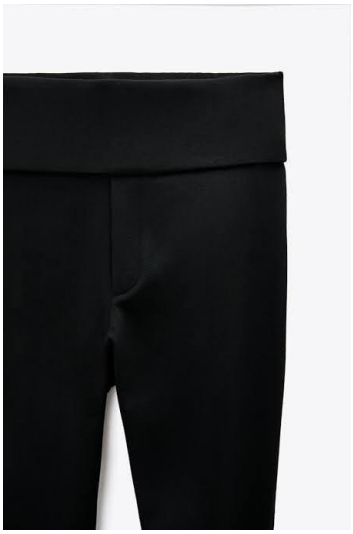
Measure your high hip/low waist (belly button level). Multiply this measurement by 78% and add two seam allowances (5/8" x 2 = 1-1/4").Cut the band to this length on the crosswise grain.

(High Hip Measurement x 78%) + 1-1/4 = Length of Band

example: for a 36" high hip (36 x 78%) + 1-1/4 = 28 + 1-1/4 = 29-1/4" For a wide band, the fabric would be cut 12" x 29-1/4"

• If attaching a knit band to a woven garment cut the band slightly longer, about 2 inches.

• If the knit chosen for the band has less than 100% stretch, for every 10% less stretch, add 1 inch to the length.



3.Flannel Fabric

Flannel fabric is a woolen fabric woven in plain or twill weave having the characteristic soft handle.It looks like a bulky fabric due to the milling that is usually done to this fabric.Flannel fabric is used for suits and pants and infant's clothing. Essentially, "flannel" simply refers to any cotton, wool, or synthetic fabric that fulfills a few basic criteria: Fabric must be incredibly soft to be considered flannel. Flannel has either a brushed or unbrushed texture, and both textures are equally iconic. While many materials can be used to make flannel, not all materials are suitable for this fabric. Silk, for instance, is too fine to be made into flannel, which is supposed to be both soft and insulative. Fabric is woven from yarn, and there are two different kinds of yarns:Combed yarns-Combed yarns for menswear suitings are made of wool by rotating metal combs that align the long wool fibers while discarding the short staple ones.What's left is a strong, smooth yarn with a somewhat glossy finish.Carded yarns-On the other hand, carded yarns are brushed in a way that retains the long wool fibers as well as the short ones. As a consequence, the yarn is weaker than a combed one, hairy and matte. Just as combed yarns are generally stronger and more resistant to rubbing, a carded flannel is weaker than a combed flannel. It is not advisable to wear carded flannel trousers for daily wear, because they will wear out faster in high friction areas.

3.1 Manufacturing of Flannel

A twill or plain weave is usually used to make flannel, and the woven fabric may be napped on one or both sides to create a soft texture that hides the weave. Napping is a process that distresses the spun fiber and makes it take on the appearance of unspun fiber. Naturally, the fiber stays together since it has been woven into a matrix, but napping does decrease the durability of fabric somewhat. combed flannel is usually thinner and lighter than its carded sibling and also a bit glossier. As such, it is better suited to informal evening affairs and morning events. The cashmere stripe trousers for a stroller suit or morning coat are often made of this material or fine twill.Traditionally, flannel was always made of wool, but today you can also find flannel made of cotton or artificial yarns.

3.2 Flannel fabric as pant

Stretch fabric is a cloth which has the ability to stretch.It is made partially of elastic fibres such as lycra,elastane,spandex(different names of the same synthetic fibre).There are also knit fabrics which stretch due to the production method-looping. Flannel fabric is quite popular for being soft, comfortable, and cozy. And this soft characteristic is because of soft fibers (generally wool or cotton flannel), its loose weave (whether plain or

twill), and its napped texture.It's a common pick for flannel shirts and flannel sheets. This fabric has the capability to hold heat quite well, making it a top choice for clothing. One of the important features of this fabric is moisture-wicking. Due to its loose weave, flannel fabric is too airy, which means such fabric won't capture moisture instead wick it away. Apart from this, high-quality flannel is generally created from wool (a natural fabric) that is quite popular for its moisture-wicking capability. interlock knit is another common knit type.It's generally a little thicker and more stable than other knits, which means it sews up a lot like a woven.So the use of it as the waistband not only inproves the size changibility but also the comfortness and the look. The small percentage of spandex or lycra gives these fabrics excellent stretch and great recovery (with means it holds it's shape well and won't get stretched out).

4. CONCLUSIONS

The use of lycra as the waistband not only improves the comfort of the garmant and also help in the changibility of its waist size fitting the user correspondingly.The flannel fabric with lycra waistband gives a perfect combination of formal or informal according to the stitching and also the added comfort of the waistband and the flannel fabric is another added perk to the users.

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DEVELOPMENT OF MEDITATION WEAR USING VANILLA PLANIFOLIA ROSA DAMASCENA MILL

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ABSTRACT

Fragrance finishing of textile materials has been greatly expanded and used in recent years. The fabric production rate is very tremendous and the market has limited scope which can be multiplied by value added finish to textiles like fragrance finish which counts more value in the current scenario of market. Recently fragrances have become available that can be readily added on the textiles and after finishing and fixation; they emit a pleasant fragrance which is sometimes used for aromachology. Fragrance finishing is done by means of vanilla and rose extraction. In this investigation factors such as wash durability , durability of fragrance and antibacterial finish were investigated .The fragrance finished fabric is used as yoga clothes.

KEYWORDS: *vanilla bean, rose essence, fragrance finish.*

1.INTRODUCTION

Fragrance finishing of textiles is the process where we enhance the value of the product by adding some incentives to it .A fragrance is made from a pleasant smelling aroma compound. Aromachology is a science that studies the effects of fragrances on the human body and mind. It researches how scents can be used to induce relaxation and make life more pleasant.Single jersey is a type of weft knitted fabric.

Single jersey typically has approximately twice the stretch in the width direction compare to the length direction. Fabric thickness is approximately two-yarn diameter. The plain jersey knit fabric produces a relatively light-weight fabric and a very high rate of productions.

Laboratory Methanol is the simplest alcohol with chemical formula CH3OH.Methyl alcohol is also known as wood alcohol or methyl alcohol. Methyl alcohol has distinctive odour which is milder and sweeter than other additives. It is volatile and does not have colour. Methanol is a common solvent.

2.MATERIALS USED IN FRAGRANCE FINISHING

SINGLE JERSEY KNIT

Knitted fabrics are produced by interlooping of yarns and showed increasing demand for their shape fitting, smoothness, flexibility, and good elastic recovery. But, all knitted fabrics may not have these properties equally done. Single jersey is a type of weft knitted fabric . When you handle single jersey fabric, you'll quickly find that one side of the fabric is smoother than the other. The material feels soft and light and it drapes very easily. Single jersey fabric is also very breathable.

2.1 VANILLA BEAN

Vanilla a spice derived from orchids of the genus vanilla primarily obtained from pods of the Mexican species named the flat leaved vanilla . The word vanilla, derived from vainilla, the diminutive of the Spanish word vaina

2.2ROSE ESSENCE

Rose is the family group of ROSACEAE. Most rose species are native to Asia, with smaller numbers being native to North America and a few to Europe and Northwest Africa. Roses are erect, climbing, or trailing shrubs, the stems of which are usually copiously armed with prickles of various shapes and sizes, commonly called throns.

2.3B-CYCLODEXTRIN

Cyclodextrins are cyclic oligosaccharides composed of glucose units linked by α-1,4-glycosidic bonds. There are three types; α-cyclodextrin, β-cyclodextrin, γ-cyclodextrin, which are composed of 6, 7, and 8 α-1,4glycosidic bonds as shown in Figure 1. Each cyclodextrin unit has a hydrophobic cavity which can act as a host for a hydrophobic guest molecule. This property comes in useful for solubilising and stabilising highly hydrophobic molecules in solvents such as water.

2.4MICROENCAPSULATION

Microencapsulation is a technology that encapsulates active and volatile substances to form nano- or micro-scale capsules. It may be able to protect the core materials from the surrounding environment and provide some new applications and release characteristics.

2.5METHANOL

Methanol is a type of alcohol made primarily from natural gas. It's a base material in acetic acid and formaldehyde, and in recent years it is also increasingly being used in ethylene and propylene. Mixing methanol with substances like these enables it to be used as an intermediate material to make literally thousands of methanol and methanol derivative products used in practically every aspect of our lives **are most widely used.**

2.6 EXTRACTION PROCESS OF VANILLA ESSSENCE

The extraction process of vanilla essence basically involves washing and then soaking the ground vanilla beans in a solution of alcohol and water.

VANNILA BEAN.

VENNILLA ESSENCE EXTRACTION

The fragrance with β -cyclodextrin inclusions were formed by mixture solution containing alcohol and distilled water (1:3). The solution was emulsified with a high-speed mixer at a speed of about 10,000 rpm for 5minutes. The emulsified system was transferred into a flask.

CYCLODEXTRIN WITH METHANOL

3.CHEMICAL PREPERATION

The products so obtained from plants are relatively impure liquids, semisolids or powders intended only for oral or external use.

B-cyclodextrin	5ml
Methanol	1%
Fragrance	150ml
M.L ratia	1:3
Temprature	Room temperature

4.FINISHING PROCESS FINISHING

In textile manufacturing, finishing refers to the process that convert the nonwoven or woven cloth into a usable material and more specifically to any process performed after dyeing the yarn or fabric to improve the look, romance, smell or hand of the finish textile or clothing.

Rose fragrance finishing.

Vennilla bean finishing

5.PAD DRY CURE METHOD DRYING

Drying is the step where the liquid portion of the solution is evaporated from the fabric. While the concept of drying is simple, in practice it can be the source of unsuspected problems. For drying to take place, the liquid must be converted to vapour and vapour must be moved away from the surface.

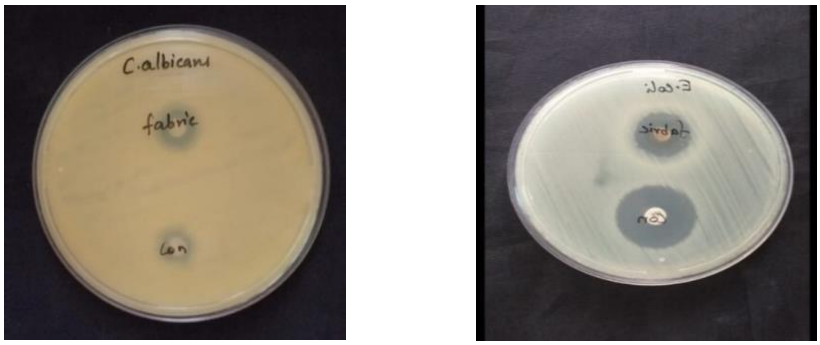
6. CURING

A process carried out after the application of a finish to a textile fabric in which appropriate are used to effect a chemical reactions. Usually the fabric is heat treated for several minutes. However, it may be subject to higher temperature for short times (flash curing) or to low temperatures for longer periods and at higher region (moist curing).The curing process has been done by roller ovens at 160·C for three and half minutes.

7.RESULT AND DISCUSSION

The antibacterial activity of the fabrics were assessed using standard AATCC This

Test method fragrance finish fabric have the anti-bacterial activity on Pscudomonas acruginosa. This bacteria is growth around the wound. The fragrance finish fabric controlled the growth of this bacteria. So the fragrance finish fabric controlled the bacteria growth around the wouwoun



Sample of antibacterial test

ORGANISM	SAMPLE	CONTROL
Ecoli	20mm	26mm
Candida albicans	14mm	12mm

8.CONCLUSION

Fragrance finish is the process by which textile materials are treated with the pleasant odours which yields better beneficial effects. The pleasant smell of vanilla and rose essence helps in elevating the mood of the wearer. The fragrance of vanilla proves good way to meet important psychological and emotional needs, as well as those of a purely physical and sensorial nature. The creation of value added fabrics not only represents an academic advance in the textile industry, but will also bring convenience to our lives. The fragrance finished textiles are very new in the current market and they have gained the much more importance in day to day life.

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Development of Biodegradable Wash Away Packaging Material for Apparels

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ABSTRACT

There has been a great interest to utilize biodegradable and renewable bio polymers in the manufacturing of high-quality, biodegradable and cost-competitive consumer goods. One of the promising candidates for fabrication of bio plastics is starch. These bio plastic material will be similar to plastic but they are biodegradable. The bio plastics have wide range of advantages such as these materials will help in reducing landfills since most of the packaging material are thrown away. The development process of starch packaging material is quite simple and does not involve much chemicals making them eco-friendly. There are various types of bio plastic sources for synthesizing packaging materials includes zein, soya, pectin, wheat, potato etc. The properties and applications of bio plastics will also be discussed. The environmental impact of normal packaging material will also be discussed briefly. This project is focused on developing wash away packaging material for apparels. The packaging materials include poly bags, hand tags and clips. The packaging materials will be synthesized using bio polymer such as corn starch.

KEYWORD: - *Fashion industry, Bio Plastics, Properties of Bio plastics, and Advantages of Bio plastics.*

1. Introduction:

One of the largest and the oldest industrial sectors in the world is fashion industry. According to United States Environmental Program in terms of trade, the fashion is the second largest global economic activity [1]. About 35 million workers are employed in textile and apparel industry thus contributing to the fact that that India is one of the largest producers among other countries [4]. For export garment manufacturing alone, there are around 30,000 companies in India. Fashion supply chains encompasses a number of sectors such as design, resource material harvesting, yarn production, spinning, fabric manufacturing, dyeing, pattern making, cutting, final garment construction (stitching), packaging and retailing [1]. Recently, the emerging trends of the packaging industry is reaching various advancement pertaining to consumer preferences and global influences. The packaging industry have been expected to exhibit safety due to standards of environmental safety and international quality [2]. This project will explain how to develop bio plastic packaging material from natural bio polymer which is cornstarch.

1.1 Types of Bio Plastics:

Bio plastics are being manufactured from a various sources including proteins, polysaccharides and lipids [6]. Proteins are considered as a renewable material for producing bio polymer plastics on an annual kiloton scale.

Examples of proteins include from a variety of sources, include wheat gluten, soy protein, zein, egg albumen and rice protein [5]. Chemically synthesized biopolymers include Polylacticacid (PLA), Polycaprolactone (PCL), Polybutylenesuccinate (PBS), polyvinyl alcohol (PVOH) etc. Microbial bio polymers will include polymers such as PHBV, PHA, and PHBs etc.

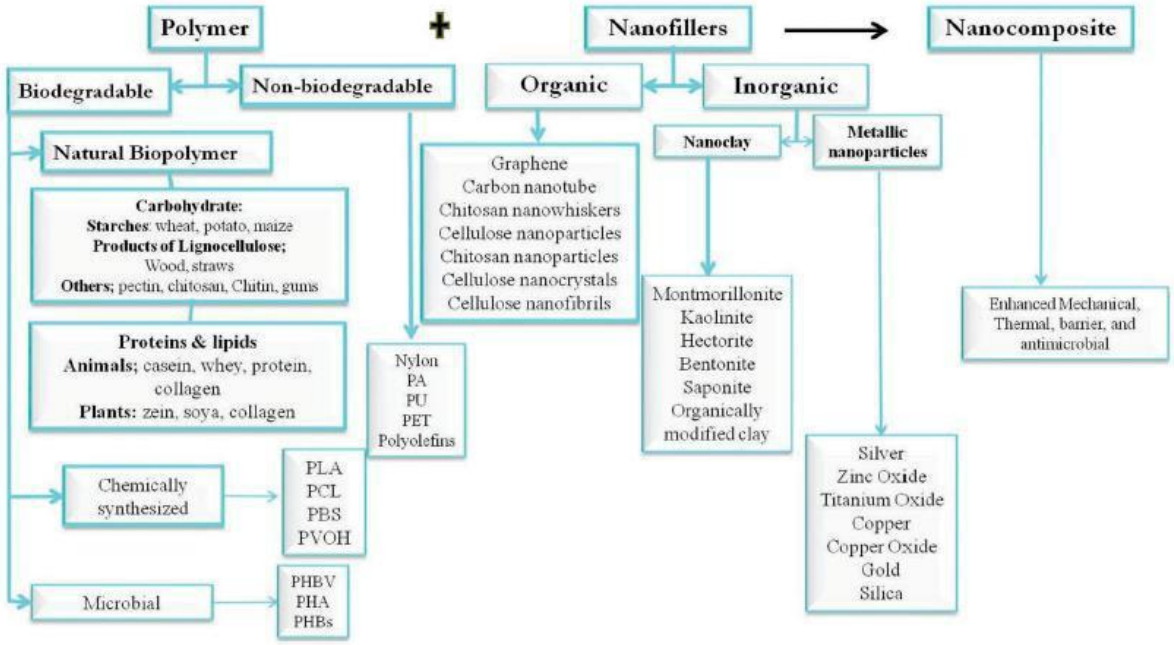

Figure -1: Various sources for manufacturing poly nano composite packaging materials. [2]

1.2 Properties of bio plastics:

Bio plastics are known to reduce critical waste thus being an important aid for many environmental waste problems. Only the bio plastics which have been certified and labelled as compostable are allowed recycle in the environmentally sound and inexpensive “bio waste container” [7]. The most important characteristics of compostable bio plastic materials include [7, 8]:

1. Thermoforming properties
2. Gas permeability
3. High water vapor permeability
4. Transparency
5. Availability and cost efficient
6. Compostable under the DIN 54900 standard
7. Can be processed along with already existing plastic production lines
8. Electrostatically non-chargeable

2. Development method of corn starch based bio plastic:

There are three main steps involved in the formation of starch based bio plastics: breaking of stabilizing intermolecular bonds, orienting mobile polymer chains in the desired shape and allowing the formation of new intermolecular bonds that stabilize the three-dimensional network. These steps can be achieved by thermo-plastic or thermo-mechanical processing. [5] In simple terms, the chemistry behind bio plastic making involves rearrangement of the starch fibers in presence of acetic acid along with glycerol forming starch acetate esters under high temperature. The long chains of the bio plastic starch help in strengthening the structure therefore helping in moulding into desired shapes and desired thickness [15, 16]. Brands such as Reformation have adapted low density polyethylene (LDPE) polybags with biodegradable polymers (BPD) that allows it to break down in landfills [14]. In a similar way, hand tags by moulding it into a tag shape and all information can be printed over the tags. Packaging clips will slightly vary in moulding process since they should be thicker enough to hold the apparel inside the

polybags. The disposing method is also eco-friendly and simple since they readily dissolve even in small amount of water. Although in some cases the dissolving time will vary in accordance with thickness of the material.

Figure -2: An apparel inside bio plastic packaging from Reformation brand [14]

2.1 Advantages of Bio plastics:

Starch based packaging materials have wide range of advantages such as non-toxicity, odor free and low oxygen permeability primarily at low relative humidity. Further the properties of starch based bio plastics can be enhanced by adding Nano composite. Nanocomposites are comprised of a polymer matrix which is reinforced with nano dimensional particles replacing the conventional micro dimensional fillers. The research work conducted by researchers at Toyota Company in the year 1980 reported that the presence of nano particles in the polymer matrix has significantly improved both the physical and mechanical properties of the polymer matrix [8]. While reinforcement of biopolymer matrix along with nano particles often offer better performing bio plastics. The exciting and interesting additional features such as improvement in biodegradability. The nano polymer composites also have numerous limitations. One of the limitations of nano composite is the presence of high levels of glycerol plasticizer which hinder its certain practical application [9].

Table -1: Properties and applications of poly nano composite packaging films [2]

Properties	Application
Enhanced properties (mechanical, thermal, barrier) and performance	Improved shelf-life, reduced packaging wastes, film down gauging
Thermal stability	Heat resistance, dimensional stability
Product information	Product authentication, bar code, RFID, traceability
Nano-coating	Surface reinforcement of base packaging material
Monitoring of the conditions of the product	Gas indicator, freshness indicator, leakage indicator, temperature time indicator, temperature time indicator (TTI)
Antimicrobial	Activated antimicrobial, and anti-fungal surfaces
Intelligent packaging	Self cleaning, environmental interaction, self-mending, deterioration indication
Controlled delivery and control	Bioactive compounds, nutraceauticals
Nano-sensor	Indication of food quality, sensing, indicating biochemical and microbiological variations
Optical property	Transparent packaging, uv-light resistance packaging
Biodegradation	Enhanced biodegradation, eco-benign
Active packaging	Shelf-life prolonging, Oxygen scavenging, antimicrobial packaging

2.2 Applications of bio plastics:

Bio plastics have variety of end uses in wide range of industries, such as packaging, medical, gastronomy, agriculture, electronics, automotive, etc. These materials have found applications for products which have been designed for short-term applications, including films, packaging, catering products and trash bags. The technological advancement have been ensuring that the application range of bio plastics is more expanding to include products such as elements of keyboard, mobile phone cases and some automobile components, which have been assumed for significant magnitudes [12].

Table -2: Different types of market or end-user industries which utilizes bio plastics, the products source and its standard applications [12]

MARKET/END-USER INDUSTRY	PRODUCTS USED	APPLICATIONS
Automotive	Soy-based, wheat straw bio-filled PP, PLA, PLA reinforced, biobased TPU, PA11	Foam seats and fuel lines
Electronic consumer durables	PLA, PLA Kenaf reinforced, PLA/PC, PA11	Mobile phones, laptops, camera components
Consumer	PLA, PLA Kenaf reinforced, starch blends, PHA, PHB & PHBV, PBS, PBAT blend	Toys, writing instruments, beauty products, baby products, containers/buckets
Agriculture/horticulture	PLA blend, PBS, PBAT, starch/PBAT, PHA	Mulch film
Bottles	PLA, PLA blend	Water and soda bottles
Food service	PLA, starch based blend, PLA blend, PHA, PHB & PHBV, PBS	Cups, lids, containers, caps, straws, clamshell, cutlery
Films	PLA, TPS blends, PBAT, PBAT blend, cellulose acetate, PHA blend	T-shirt bags, can liners, organic waste bags, carrier bags
Packaging	PLA, TPS blends, PBAT, PBAT blends, PBS, cellulose acetate	Food packaging and rigid packaging
Fibers	PLA	Clothes/apparel, carpets, furnishings, non-wovens, industrial

PP = polypropylene; PLA = polylactic acid; TPU = thermoplastic polyurethane; PA11 = polyamide11; PC = polycarbonate; PHA = polyhydroxylakanoate; PHB = Polyhydroxybutyrate; PHBV = polyhydroxybutyrate-valerate; PBS = Polybutylene succinate; PBAT = poly(butylene adipate-co-terephthalate); TPS = thermoplastic starch.

Table -3: Global production capacity of bio plastics based on some product type (2011) [12]

BIOPLASTICS PRODUCT TYPE	TOTAL GLOBAL PRODUCTION CAPACITY (%)
Bio-polyethylene	25
Biodegradable starch blends	15
Polylactic acid (PLA)	13
Others (includes regenerated cellulose and Bio-polyamide	13
Polyhydroxylakanoate (PHA)	11
Bio-polyvinyl chloride	9
Bio-polyethylene terephthalate	7
Biodegradable polyesters	7

3. Environmental impact of normal packaging:

Packaging have been given a great deal of attention in the apparel industry sectors which include transport packaging and distribution packaging for distribution centers and retail stores, retailer packaging for the display and billing purpose. Packaging would often have shortest span of time, typically ending up in a landfill or gutter, shortly after the purchase of an apparel. Excess packaging materials are often incorporated to enhance a product's visibility

which have minimal amount of effect on product's serviceability. [10]. Manufacturing criteria which are primarily considered important for environmental sustainability assessment such as [13].

1. Manufactured from renewable resources;
2. Making efficient use of resources such as water and energy while manufacturing;
3. Manufactured with minimal pollution to the environment and waste;
4. Should be washable in low temperature with environmentally friendly agents (wherever possible);
5. Should be returned safely to the environment after the end of their life.

Table-4: Environmental impacts of the sport apparel life cycle [13]

Lifecycle stage	Environmental impact
Raw materials (growth, acquisition and processing)	Resource consumption, greenhouse gas emissions, air/water pollution and toxicity, soil degradation/contamination, biodiversity/land use, solid and hazardous waste
Fibre production (natural and synthetic)	Greenhouse gas emissions, air/water pollution and toxicity, soil degradation/contamination, biodiversity/land use
Clothing production and garment assembly	Greenhouse gas emissions, air/water pollution and toxicity, soil degradation/contamination, biodiversity/land use
Packaging	Solid and hazardous waste
Distribution	Greenhouse gas emissions
Retail	Solid and hazardous waste
Use	Resource consumption, solid and hazardous waste
End of life management	Greenhouse gas emissions, solid and hazardous waste

4. CONCLUSIONS

Thus, the bio plastics are slowly and steadily replacing non-biodegradable packaging materials. Bio plastics are ideal alternatives of conventional plastics such as offering environment sustainability and eco friendliness. Conversely, bio plastics have their own set of shortcomings such as stability and strength. Pointing out the fact that research is much needed to improve bio plastics so that they can be a permanent substitute for conventional plastics. Manufacturing industries and apparel brands have been slowly adapting to bio plastics for packaging. Other industry like foods, electronics, automotive etc. are also adapting to bio plastics.

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DEVELOPMENT OF NON WOVEN MASK USING BAMBOO FIBRES INFUSED BY LEMON

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ABSTRACT

Nonwovens are engineered flat structured sheets which are made by bonding and entangling fibres by means of mechanical, thermal or chemical processes. Nonwoven technology has attracted the attention of the researchers and industrialists as it can manufacture the fabric at a very high production rate and cheap. The principal end uses of nonwoven materials are in the domain of Technical Textiles such as geotextiles, filtration, wipes, health and hygiene products, surgical gowns, face masks, automotive textiles etc. The objective of this invention is to provide solution for various problems that causes regarding face masks. After studying various cases of difficulties in wearing masks and careful observation of effects regarding, the concept of developing bamboo masks evolved. The prepared face masks are analysed for the physical properties such as thickness. Areal density, bulk density. Air permeability. Porosity. Mechanical properties such as tensile strength and elongation and for the thermal characteristics such as thermal conductivity and resistivity.

Keyword: *Face mask, Bamboo, Lemon, Air Permeability.*

1. MASK AND ITS PROPERTIES

Currently, there is a major upsurge in research on the use of non-woven masks using recyclable and biodegradable materials with good breathability, comfort, protection from pathogens. Fear of infection and perceived risk significantly influence travel behaviours, particularly for transit use, and the influence varies based on the infected area and demographic characteristics of the people.

During pandemics, people perceive a higher risk for all types of trip types and avoid traveling to places where they perceive medium to high risk. Nevertheless, people have various travel needs during pandemics. Characteristics of such trips can be remarkably different for different employment categories, such as healthcare and military personnel, could be different from a general office worker.

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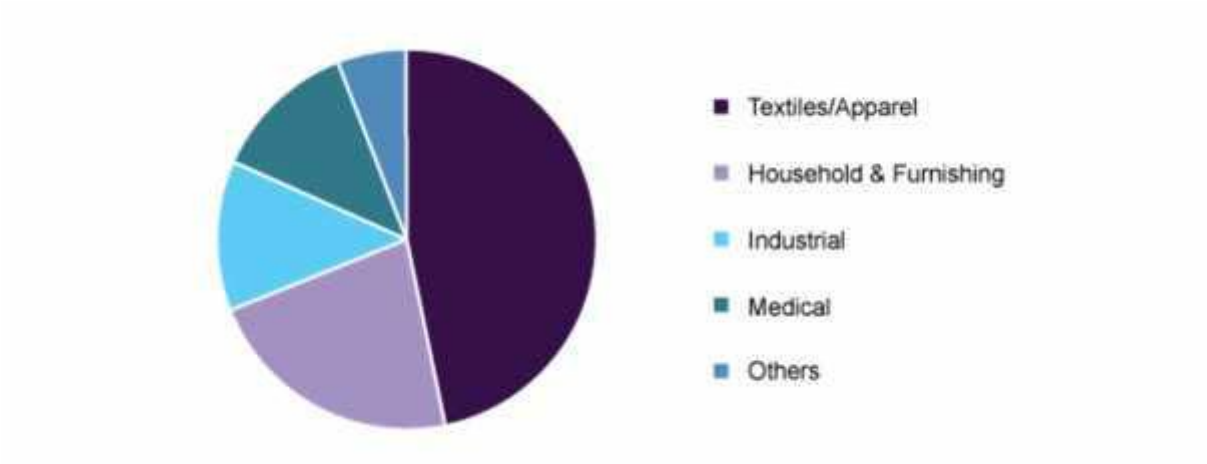
Bamboo fibers

Bamboo face mask

The graph of Global eco fibre market share, by application, 2019(%)



1.1 RISKS

The current situation pushes people to take precautions to prevent infections. The most common precaution is wearing face mask which is necessary. Masks for everyday are made from fabric that grant no protection for the user from being infected. However, it is safe to assume there is a large risk for droplet transmission, especially during exhalation, resulting in a reduction of potential viral spread. These masks should not be used in the healthcare system, but are commonly recommended for the general population for walking, shopping, or using public transportation.

2. GEO TEXTILES INFUSED WITH FRAGRANCE:

Prolonged use of face masks results in adverse physiological and psychological health issues. It is imperative to find a solution to manage these adverse effects. Discomfort is enough to make someone want to give up on masks altogether. Wearing a mask isn't just recommended but something we should all consider as we take measures to protect ourselves and others. Looking for a protective face mask bamboo fibres are better that is found good in terms of a comfortable mask.

Bamboo is one of the most breathable, softest, strongest, ultra soft, comfortable and sanitary fabrics on Earth. Bamboo is naturally resistant to microbes, easier to harvest, and less taxing on the environment. Bamboo is Better masks are made of ultra-soft, comfortable, 100% premium bamboo that is smooth on the face and does not itch.


+


2.1 EFFICIENCY

Bamboo is softer than cotton, has better moisture absorption and ventilation, can absorb and evaporate human sweat. It has natural antibacterial elements, effect of sterilization and is bacteriostatic, anti-ultraviolet in nature. The fabric makes people feel extremely cool, comfortable and never stick to skin even in hot summer. The fibre is eco-friendly and biodegradable.

The main problem dealt with long travelling is motion sickness. The common symptom of it is motion sickness is nausea. A scent of lemon can prevent nausea which is treated. Lemon is a perfect liver food and a great body cleanser high in Vitamin C and potassium and other minerals. The astringent action of lemon helps to contract the epigastric tissues in the gut that loosens up and clears the toxic reaction from the deep tissue and organs.

The concept of bamboo asks is to prevent irritation for a long time face mask wearing personnel. This assures durability and good ventilation with high protection towards pathogens causing severe infection. It also prevents nausea caused by motion sickness which frequently occurs for many personnel during long travellers.

3. CONCLUSION:

Currently, there is a major upsurge in research on the use of non-woven masks using recyclable and biodegradable materials with good breathability, comfort, protection from pathogens. Fear of infection and perceived risk significantly influence travel behaviours, particularly for transit use, and the influence varies based on the infected area and demographic characteristics of the people. Thus our product is both bio-degradable and also air permeable, it would be available at a moderate cost.

4.REFERENCES:

[1]PATENT FILED ABOUT “DEVELOPMENT OF NON WOVEN MASK USING BAMBOO FIBRES INFUSED BY LEMON”

[2]HANDBOOK OF FIBRES

[3] MASK PRODUCTION AND TECHNIQUES

PROTECTIVE MASK

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ABSTRACT

COVID-19 is the virus spreading all over the world. India is one of the largest and population country in the world. We are mostly affected by this virus. This virus is spreadable, seviour and it leads to death. To protect ourself from this virus is to use mask. Mask places a major role here. We are going to do mask which is different from all other mask like features, properties, structure and its function. The construction technique is fully based on design thinking point of view like empathy, mind map, ideation etc,. and this mask is very helpful for protecting ourself from the polluted area. At present air pollution are present in huge area. It may lead to a pollutant world. So that we insert oxygen cylinder along with the mask. It is a dual mask. Now-a-days without mask we can't survive. my project is fully based on our current situation and getting solution.

INTRODUCTION:

COVID-19 is the virus spreading all over the world. At current situation we are protecting ourself by using mask and vaccines. Mask place a major role here. The general feature of mask is to filter small particles like virus or spreading diseases or some harmful gases like carbon monoxide (CO), sulphur dioxide, nitrogen dioxide etc., the fabric mask which is reusable, biodegradable, confortable to wear. Here we are choosing cotton because it can filter small particles present in the air. It have absorption properties and have some suitable properties to do mask. The fabric mask should be made of three layers of fabric, the inner layer of absorbent material, such as cotton. The middle layer of nonwoven or nonabsorbent material, such as polypropylene. The outer most of non-absorbent material, such as polyester or polyester blend. The fabric mask are easy to construct in affordable price and confortable too. For better fitness we use elastic band because it may change its shape well. Along with this mask we are combing oxygen cylinder. So our protective mask have dual features. We use oxygen cylinder which is available in the market. May be in future it is very useful for human beings.

PROPOSED IDEA:

Our idea is fully base on design thinking point of view. Our mask contains Empathize, Define, Ideate, Prototype and Testing. Here we are using some of the design thinking process.

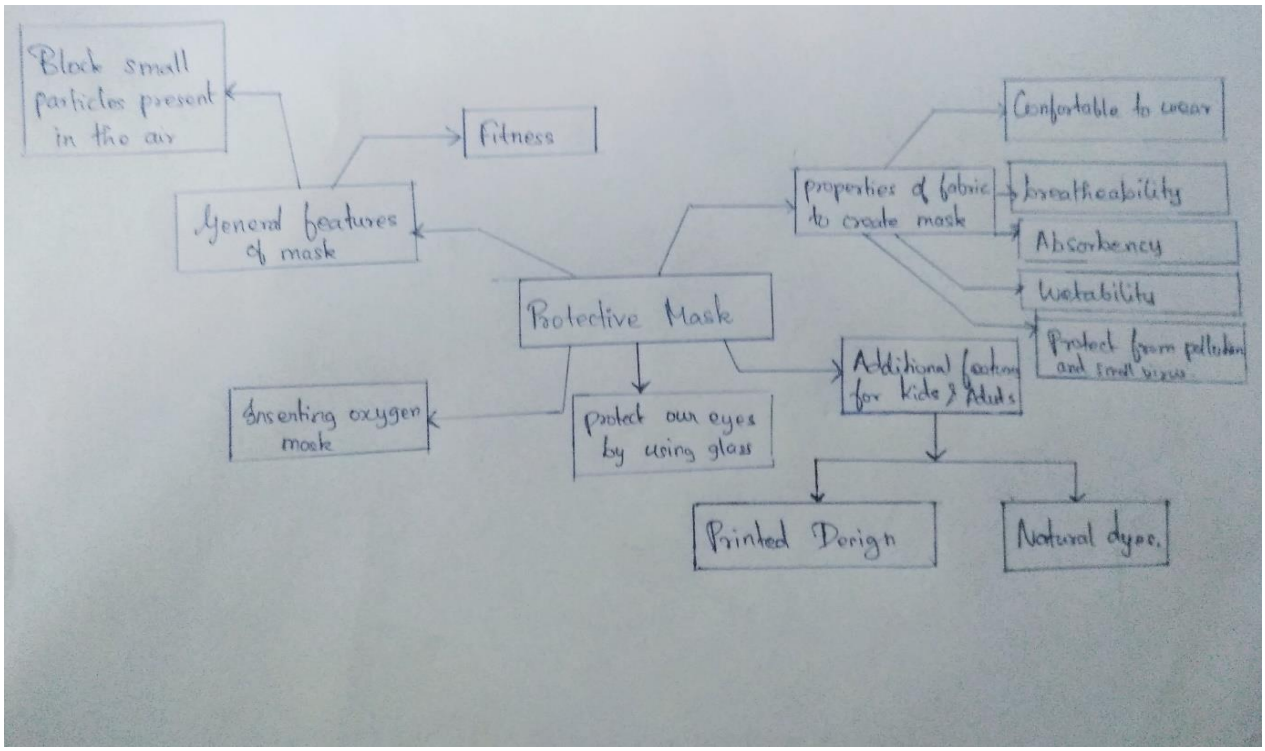
- **EMPATHY:**

  The more basic thing of mask is to cover your nose and mouth. But the real fact is that a sick person coughs or talk, virus particles can spread from their mouth or nose into another person's mouth. You are most likely to inhale these droplets through your mouth or nose and they can also enter through your eyes. So, we have to protect our eyes too. the next important thing is that fabric selection for developing mask. The main feature of mask is to filter out small particles present in the air and it is want to be fit. So, we have to choose fabric with specific properties like, confortable to

ear, it would help for breathability, it filter out small particles, and its wettability properties. These are very important properties of the fabric, to construct a mask. Next for fitness, many people don't know the perfect fitness of the mask to the face. So, we use elastic band for good confortability and fitness. The mask structure places an important role here because it only give the fitness and confortable to the wearing people. So the structure is to be fixed and confortable. Then the kids are not aware of COVID-19 and they don't like to wear mask. To attract the kids, we want to make the mask with more attractive features like color, placing pictures and cartoon images on the mask. To avoid getting diseases by air pollution, the best way is to insert oxygen mask along with our mask.

- **MINDMAPPING:**

By understanding the people queries, feeling and emotions. We move to the next stage mind mapping. We combine all the things in the mind map given below.



- **IDEATION:**

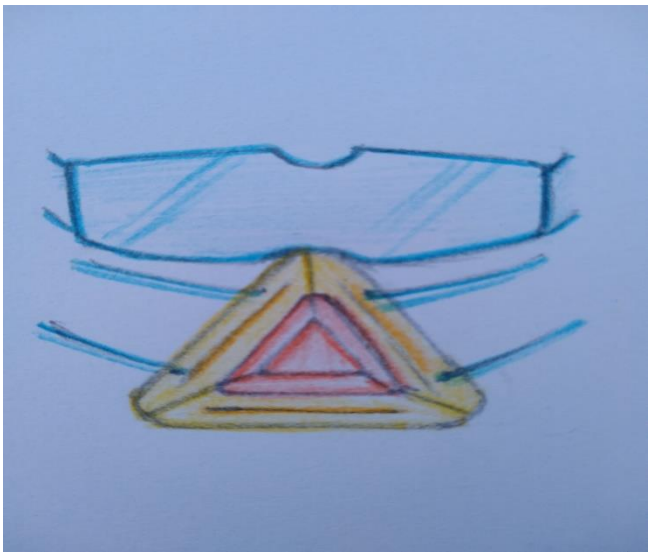
We are going to develop mask by combining all our ideas and put together in one product protective mask. We use SCAMPER process here. Our mask have two functional properties. They are used as normal proective mask and the another one is they are also used as oxygen mask. We choose cotton, polyproplene, polyester blend for creating the mask. Cotton have all the properties like, confortable, wettability, easy to breathe and have good absorbency. The coronavirus is extremely tiny- too tiny to be trapped by most fabrics that still allow air to flow through them. So we create two layered mask to block the small particles present in the air. Our mask is going to be 3D triangle or pyramidal because it is fit to our face. But cotton have shrinkage properties. So we can clean this mask with cold water and by using liquid detergent to clean the mask. Cotton shrink only once. So after one wash, we can wash with normal water and in soap solution. To maintain the pyramidal shape, we use steel strip on each and every corner of the mask. For fitness properties we use elastic band. By connecting the elastic bands over the small metal plate at one end and place two strips on the another side of the metal strips with equal distance. We can use natural dyes for printed design. Cut the center portion of the mask and use cap which is made up of steel wire and apply the layer of cotton over them. So by interlocking method we can open or close the caps. Now we are going to combine the simple face mask by changes its shape and structure. The oxygen mask with pure plastic, to provide oxygen for the people who are able to breathe on their own, but who may require a higher oxygen concentration than the 21% concentration found in ambient air. The oxygen cylinder contain 6000ml of oxygen it means 6 liter of oxygen in liquified form. Its volume is 500ml. it is a bottle type and

it is made up of steel it is easy to carry. To combing the oxygen cylinder along with the face mask with the small rubber tube. The mask has what is called a "demand valve" which only brings air into the mask during inhalation. We use exhalation port(hole on one side of the mask)through which the people exhale carbon dioxide. The normal mask can attached with protective mask by simple interlocking system. It will protect as from polluted air and we can use it as in two ways. Finally we made protective mask with all other features of mask.

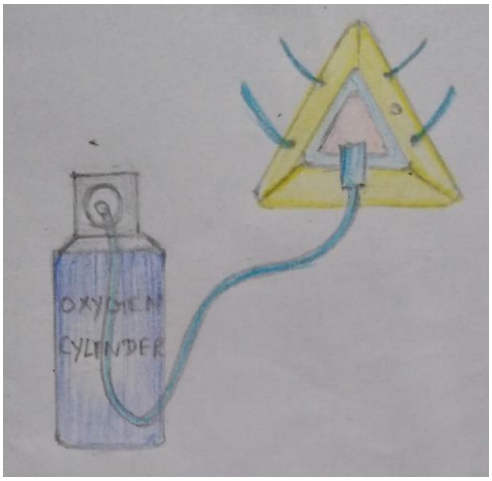
WORKING MECHANISM:

- Construct the protective mask in pyramidal shape using steel strips on each and every corner of the mask and along with this we attach elastic band.
- Then the include glass along with the mask by joining the back side of the strips. It means glass have elastic band with the small strips.
- To make mask more attractive we use natural dyes and create some floral designs.
- Finally, we combine the protective mask with the oxygen mask by interlocking method. This is the final stage of the mask.

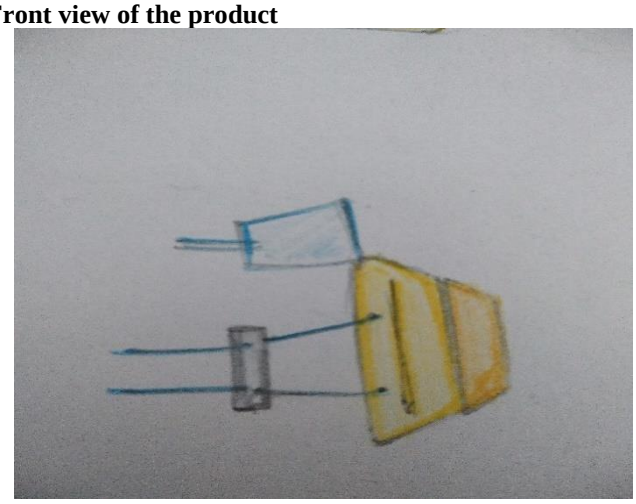
FINAL PRODUCT DESIGN:



Front view of the product



Side view of the product



Mask combined with oxygen cylinder

RESULT AND DISCUSSION:

1. It is very protective mask, protect from our surroundings, diseases and pollution.

2. The oxygen cylinder is easy to carry due to less weight.
3. It gives proper fitness and use different natural dyes to make more attractive.

CONCLUSION:

Measures to prevent infections are necessary in the current pandemic. Face masks have been considered a first step to prevent and contain the spread of the diseases and to avoid lungs problem or some other disease we can attach the oxygen mask and it is very useful feature.

WARLI AIR PURIFIER -TOY

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ABSTRACT

Warli is one of the tribal art form practiced by tribes who lived in north several centuries ago. There are many art forms which was practiced from ancient time , but few stands till date warli is one of those art forms. Our toy is made up of pure cotton fabric. It is stuffed with ragi husk for the soft feel and vetiver which acts as a natural air purifier. It is eco-friendly to our environment and bio-degradable too. It is totally different from the existing toys in the industry both by appearance and function. Vetiver is a root with the earthy and smoky smell which attracts people who love nature. This smell reduces anxiety and makes ourself relaxed. This is the reason we used this stuff in our toy. Recently we came across the usage of vetiver mask due to this pandemic which gave us inspiration to develop our product. Rather than using ordinary stuffs like sponges and cotton used commercially, we used ragi husk to get the better texture and soft feel. In order to represent our Indian culture we have used an ancient art form in an innovative way. It can be used both as toy and a purifier. Most of the people think organic products are costlier than the commercial products but our toy is different from the others , because the materials used to develop our toy are cost efficient and easily available too. Development of our does not require more energy as it is fully handcrafted.

KEYWORD: *Warli, Purifier, Vetiver, Toy, Natural*

1.INTRODUCTION:

Description of the materials used in development of our product:

1.1WARLI:

Warli is the name of the biggest clan found on the northern edges of Mumbai, in Western India. Notwithstanding being in such nearness of the biggest city in India, Warli tribesmen disregard all impacts of current urbanization. Warli Art was first found in the mid seventies. While there are no records of the specific sources of this workmanship, its underlying foundations might be followed to as right on time as the tenth century A.D. Warli is the distinctive articulation of day by day and get-togethers of the Warli clan of Maharashtra, utilized by them to adorn the dividers of town houses. This was the solitary methods for sending legends to a general population not familiar with the composed word. This work of art is basic in contrast with the energetic compositions of Madhubani. Women are fundamentally occupied with the production of these artworks. These works of art don't portray legendary characters or pictures of gods, however portray public activity. Pictures of individuals and creatures, alongside scenes from day by day life are made in a free musical example. These ancestral canvases of Maharashtra are generally done in the homes of the Warlis. Painted white on mud dividers, they are very near pre-memorable cavern canvases in execution and typically portray scenes of human figures occupied with exercises like chasing, moving, planting and gathering.

VETIVER:
Vetiver, (Chrysopogon zizanioides), likewise called khus, perpetual grass of the family Poaceae, the underlying foundations of which contain an oil utilized in fragrances. Vetiver is local to tropical Asia and has been brought into the jungles of the two sides of the equator; it has gotten away from development and gotten a weed in certain districts. Vetiver is a huge tufted bunchgrass and can reach up to 1.5 meters (5 feet) in stature. The dainty leaves and stems are erect and unbending, and the plant bears little earthy colored purple blossoms in long spikes. The fragrant roots fill descending in the dirt and can achieve profundities of multiple meters (10 feet). The plant is very dry spell safe.

1.3RAGI HUSK:

Ragi husk is the waste material from the ragi plant.. Ragi is mostly grown in Tamil Nadu , Karnataka mainly and also grown in other northern states too. After the millet is grown it is beaten and the grain and the husk is separated. This husk is used in our toy.

2.OUR INSPIRATION:

We have came across many types of face masks which were very innovative and smong those a mask made up of vetiver inspired us. This gave us idea to develop our toy which have multiple use. The masks made up of vetiver are easy washable and more eco- friendly to our environment.

3.MAKING PROCEDURE:

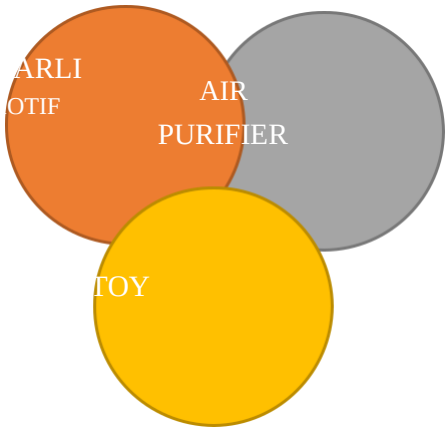

Figure 1: Description

Cut the cut cloth according to the required pattern and size. Sew the pieces accordingly. Stuff the ragi husk and vetiver and sew the open edges.

How Your Toy is Different From Existing Toys:

Our toy is eco-friendly, not harmful to human and animals in any way. It is handcrafted in a different ideology. The toy is covered with pure cotton cloth which is comfortable to feel and touch. And makes it easy to wash and dry. Vetiver a natural air purifier is used in this toy which makes it different from the existing toys in the market. Ragi husk is used as a stuffing material rather than plastic materials used in other toys, which also makes it further unique.

Our toy represents an Indian tribal art form called “WARLI”. The Warli is an indigenous tribe of western India who lived several centuries ago. They practiced this art form to represent their culture and their way of living. Our toy may represent Warli art form but our main theme is to create an environment friendly toy which act as a air purifier and gives a pleasant smell.

4.COST EFFICIENT:

Mostly the organic products available in the markets are costlier compared to commercial products . But our toy is made up of organic products which are easily available . So our product is very cost efficient compared to other organic products.

5.CONCLUSION:

So, finally we conclude that our product is more eco-friendly to our environment, which can easily handcrafted, and liked by many organic lovers.

SEA-CELL FABRIC

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ABSTRACT

Generally seaweed are used for purposes like fertilizers, waste water treatment, medicine etc.., researches have been found that textile fashion fabrics can also be made from seaweeds just like cotton, wool etc.., Most marine algae, including chlorophyll, beta-carotene, lutein etc.., have large pigments. The pigments that have been taken in this study are direct the color of certain seaweed that have many medicinal properties and called as brown algae. Although the use of Sea-Cell is not currently widespread there have been a handful of people who have experimented with it. This present study and paper focuses on how the fabric can be manufacture using seaweed a natural source directly from the ocean without any pollutants. All these properties of seaweed make the textile products appealing where the hand of fabric is important. A company named nanonic.inc have been started to use the seaweed in order to create the fabrics with rich properties. This seaweed fabric comes with two different version one without addition of silver with pure properties and active one contains addition of silver.

KEYWORDS: *pollutants, algae, pigments, medicine, nanonic.inc, properties.*

1. INTRODUCTION:

Seaweeds are nothing but brown algae also known as kelp which are found in oceans which has been often used for medicinal purposes since ancient times. The main reason to use seaweed as main elements to create fabrics is to use the active materials from sea source Seaweeds has many good properties one among which is anti-inflammatory properties. Seaweeds are renewable cellulose fabrics but since seaweeds are rich in sources of both antimicrobial and anti-inflammatory which makes it an inherently healthy product for skin-healthy fibers. It has been found that fabrics made from seaweeds can get or have benefits of deep sea minerals & trace elements. The fabric made from seaweeds is called as sea-cell fabrics.

2. SEAWEED FIBRE & FABRICS:

Seaweed fabrics are nothing but pure alginates also known as brown algae or knotted wrack. Knotted wrack is found on Iceland's which is a family of seaweeds. The chemical that has been found in seaweed is called sodium alginate. The fabrics are produced by lyocell process since it's a cellulose fiber like cotton. This manufacturing process is very similar to that of viscous fibers. This fabric also have good adsorption than that of cotton fabrics hence can be used for manufacturing of products like undergarments, baby clothing etc.., rather than being an edible item this seaweeds used to make fabrics can be a sustainable and eco-friendly one. These seaweed fabrics not only soothes skin diseases but also contains nutrients like calcium, magnesium, iron, trace elements, amino acids etc.., the main properties of seaweed fabrics are high tenacity, soft, breathable, biodegradable, flame retardant, sustainable. The end uses products of these fabrics are cosmetics, wound dressings, fire fighters uniform

Seaweed fiber

seacell garment

3.SEACELL FABRIC PROCESS:

This process of making seacell fabrics is similar to that of viscose but seaweeds are used instead of usage of wood pulp. This process is similar to that of lyocell process. Lyocell fabrics are semi-synthetic fabric which is commonly used as a substitute for cotton. This fabric is primarily consisting of cellulose fiber from wood. These fabrics can be fully sustainable alternative compared to fully polyester fabrics. Lyocell fabrics are also called as tencel fabrics. This process involves direct solutions to prepare than indirect ones. Tencel fabrics are similar to that of rayon.

First step is to breakdown the cellulose from the plat which can be done using amino acids and water. Once this has been done it will be transferred to process of washing and retting. After this process

the material will be filtered and will be sent to the spinneret by giving right amount of pressure filaments of various sizes gets produced.

Then it will be taken too spun as yarns and final stage is spinning those yarns to fabrics. But in this process of producing seaweeds are just added as active materials.

3.1 EXTRACTION OF SEAWEED DYE:

Polyester fabrics are semi-synthetic fabrics made from carbon, oil, water etc.., The dye for fabrics can be taken from green algae. For this process first the seaweed with be collected along with distilled after this process grind the dried seaweeds into powders and store them in a sterile container. Using soxhlet compound about 100ml of solvent is collected. Temperature at 100-200 degree Celsius the extracted solvent obtained from soxhlet process will be added to the polyester cloth using dry and dip process for 30minutes.

3.2 PROPERTIES OF SEACELL:

Seacell fabrics are light in weigh and breathable. The nutrients of seaweed are within the fabric such as iron, calcium, magnesium etc.., one of the amazing properties of this fabric is that it absorbs sweat better than cotton fabrics. Since the main element seaweed is directly from ocean the aqua nature hence makes the fabric sustainable to environment.

4. CONCLUSIONS:

The seacell fabrics are new technology of sustainability to the industry. Although many big brands haven't started this process of doing seaweed fabrics yet it's still in process in industry in few places around the world. It has many useful and good properties that cause no harm to any living beings hence these fabrics produced from seaweed will be good benefit for both economically and environmentally.

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ERZA-THE NURSING FARDHA

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ABSTRACT

ERZA *is a nursing fardha which not just has the special feature of breast feeding but also is comfortable to wear. A woman enters a new chapter of her life when she gives birth to a kid. When a woman gives birth she comes to know how strong she is. The moment a child is born ,the mother is also born. The comfort of a new mom should be taken care of along with the traditions and customs that we follow.This project is all about bringing small design changes to a very cultural attire and making it easy for not only the mothers but also for the younger generation .****ERZA*** *is also seen that it is sustainable and cost friendly. Two types of fardha is discussed in this paper the sustainable one and the normal one but with more comfort and less cost.The sustainable option is also cost friendly but has few shortcomings which is also discussed and the normal one which is not sustainable but comfortable.The effects of Abaya in maintaining the temperature is also discussed.The different materials used to make fardha is also discussed.From chiffon,polyester,crepe,satin to Jersey all the materials are discussed and the best out of it for tropical climatic situations is chosen and implemented in ERZA.The positives of the abaya being black is also discussed. ERZA means strong .As our fardha is used by young mothers who have discovered how much strong they are ,this fardha is named on behalf of it.Though there are nursing fardhas in certain online stores but it costs about four thousand bucks which would be really hard for the all the people to buy.So this one is finely designed in such a way it would be affordable by almost every mother of different financial background.*

1. INTRODUCTION :

India is a country known for it's diversity in culture and religion, Indians live in harmony because of the love they share for other religions and the acceptance of each and every fellow Indians as their brothers and sisters.We can see people of different colour, different tastes, different languages and different religions. Most of them are strongly connected to their culture and religion and equally respect the other religions too. In this colourful and vast nation about 200 million people are Muslims which accounts roughly fifteen percent of the population. Except for the northern states of India,our country has tropical climate.We all have to fight the scorching heat of the sun.As budding designers it's our key role to make our mother land a better place to live with our innovative ideas.That's why we thought about the nursing fardha. It not just helps a new mom to feed her kid but combat the heat of sun too .It's really hard to manage wearing a fardha in the hot climate of India.With all the climate crisis going on it's mandatory for us to find an immediate solution to this problem. The fardhas people use now are mostly made of polyester, chiffon,crepe. This paper consists about fardhas with nursing facilities and the pros and cons of using different fabric fardha is also discussed.

2. THE STORY BEHIND FARDHA:

Muslim women cover their entire body with fardha.Fardha is considered to be Muslim women's identity,modesty,privacy and morality. Fardha can be in any colour. One of the reasons that an abaya is black is that if a woman wearing an abaya stands under harsh or bright light , the outline of the body shiuld not be visible through the abaya.

Black has been the traditional colour of the abaya for hundreds of years and many Muslim women want to continue adhering to the tradition they have grown up with and got used to . It is a sign of respect for the traditions that are ingrained with in a Muslim woman mind and heart .

Since every Muslim woman is wearing a black abaya , a coloured one which you don't see very often stands out and for those that want to blend in and remain inconspicuous ,a black abaya is the best choice.

Although black absorbs more heat , studies have revealed that black provides better convection (the transfer of the internal energy into or out of an object by physical movement) of air inside a black abaya in the summer season .This means that a woman wearing black abaya will feel as cool as man wearing white thobe(Arabian men's outift that covers the arm,neck and whole body and goes down up to the feet)that reflects the sun's hot rays.

In addition maintaining the purity,the veil also protect women's health and well being. Since the body of women worn with hijab is protected against contamination and other possible infections. According to the study,veiled woman lose 40-60 percent less heat than others . Hence , covering the head or observing hijab in cold months can help to maintain their health.

3. FARDHA AND THE MATERIALS :

Depending on the occasion, the material used in the abaya also changes. The normal daily usage abaya is mostly made of hundred percent polyester which is known as the Nidha.This one is suitable for temperate regions and is made of high quality.Nidha abayas are very expensive when compared to other materials as it is easy to wash and comfortable to wear.Chiffon is not generally chosen by the conservative muslims as it is transparent but it's flowy nature makes them more appealing. Crepe is a fine quality fabric with a twisted weave that gives it a slight textured appearance.It doesn't crepe unlike many other fabrics. When you want a luxurious and classy abaya then satin is the perfect choice.Now a days abayas are also made of Jersey which is used to make blouses,skirts and dresses[1].Cotton and linen abayas are good options when it comes to the tropics . Linen fabric is made from the fibres of flax plant. Cotton is always known for it's comfort.Cotton is derived from the cotton plant .When compared linen is more preferred to cotton because it is two times stronger than the cotton and has it's own advantages.

4.ERZA -THE BREAST FEEDING FARDHA:

Normal fardhas are single layered, top to bottom a whole single dress.The first change is to keep an opening with a zipper near the breast area. To cover the zipper different techniques of layering can be implemented. We can use a Cape kind of layering over the normal abaya which is generally done.We can also have three front paneled abaya with some small flap in the joining areas of the panel so as to cover the zippers.As the entire world is now becoming aware of climate crisis, pollution and it's effects,we thought of making ERZA sustainable. When we thought about it the fabric which came to our mind immediately was linen and cotton. Cotton not just makes the mother comfortable but also makes the baby feel comfortable as cotton is soft. During winters instead of using polyester or other synthetic fibers which have a harmful effect on our mother earth we can use brushed cotton which helps to keep the new mom warm and ease her by avoiding several layers of clothing .Linen is also a good option when compared to cotton as it is two times stronger than cotton but has the same temperature regulating properties as that of cotton but is more durable than cotton.The next one is not as sustainable as cotton but is more absorbent than cotton and linen. Even though cotton has been used from earlier times during summer it's an insulating fabric but rayon is a non insulating fabric.Rayon is as breathable as cotton so it can be used in the tropics for sure.Another most important thing about rayon is that it is cheaper than cotton which makes the second type of ERZA more accessible to even more people.

4. CONCLUSION

This paper is not just about a particular religion and how to improve the comfort of the wearer of a particular group. From mullakku to silambhu not just tamilians but the residence of all the states of India have lost these cultural stuff. All these things which are not seen today can be upgraded to current trend and should be redesigned such that it can be used in the recent days.By doing this we will be able to safeguard all the wonderful creations that our ancestors

have created for us. Certain small design changes can keep our rich culture alive.

So as budding designers it's our responsibility to protect our cultural symbols.One another way to keep this alive is by fusing the traditional and modern trends and fabrics. For example now a days we can see ikat and madhubhani printed laptop pouches and other stuff.

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DESIGNING GARMENTS TO SOLVE FITTING PROBLEM OF OBESE WOMEN

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ABSTRACT

Garment fitting is the major criteria to by the product. For getting the best size and fitting all the manufacturers target segments with certain criteria's according to the customers. Fit is the appearance and comfort of the garment in the view of the wearer. For an obese women fitting is an issue and due to this they cannot use the out fits for a long term. Weight changes is the reason for that so that they didn't try any stylization on their outfits because they can't use it for a long time. In this study five garments are designed based on the weight fluctuations of obese women. Here the design collection is done with adjustable methods it's for the long time and easy to use than the normal outfits. From the survey identifies the importance and need of the adjusting methods of the garments to the market potential values. The designs are mainly focusing on the comfort, style, satisfaction and adjusting methods.

KEY WORDS: *Obesity, Comfort, Fitting, Designing, satisfaction **1**.*

1.INTRODUCTION

Fashion is a popular style or practice, especially in clothing, footwear, accessories, makeup, body piercing, or furniture. Fashion is a distinctive and often habitual trend in the style in which a person dress. It is the prevailing styles in behaviour and the newest creations of textile designers. Because the more technical term costume is regularly linked to the term "fashion", The former has been restricted to unique situations, such as fancy dress or masquerade wear [1]. When Eve wanted a coat, Adam had to search all of the trees in the domain for the best leaves – women's discerning tastes in fashion seem to have begun early. Garments of all sizes are available on the market. For a brand aficionado who is still focused on a single brand. There is a possibility that fitting issues with the garments could arise in this case. The majority of customers choose their outfits based on current trends. Customers' preferences can also be based on a single or a few brands. We first weigh the outfit's comfort and appearance before making our decision. In certain cases, the look is fine but there are fitting problems, which can occur in all sizes of outfits. In the case of an obese consumer, however, the likelihood is high. The majority of the time, an average person with a normal body form dresses in a standard size. If that size does not suit them, they can choose to go up a size or simply return to the previous size. It is not a challenge for an average person to fit in. However, it is more complicated in the case of an obese person. Their body measurements change as their body weight increases. There are few options for an obese person who wants to dress in their comfort zone. For an obese individual, customised garments can help with fit problems and can also be worn for a longer period of time than ready-mades. Another effect is that they can use modifying methods to tailor garments so that if a customer's body measurement changes or decrees, they can change it without assistance. This is a cost-effective method of apparel for obese people, since it allows them to spend less in garments than ready-mades.

2. METHODOLOGY

2.1Identifying problem

To recognize the obese women's problematic areas of dressing and to design garments according to their needs.

2.2 Designing

This study resulted in the development of five trends that are explicitly designed to resolve the fitting issues that obese women face. Each outfit has a unique style, as well as a unique approach to resolving the fitting problem.

2.3 Fabric selection

The most important factors in fabric selection are length, colour, texture, and style. The length of the fabric is determined by the garment's nature. Fabric is typically cut lengthwise, but it is sometimes cut on the bias grain axis. Another facet of fabric design is texture. It determines the fabric's visual appearance and feel. The sensation of touching, gripping, and squeezing fabric by hand is known as texture.

2.4 Trims selection

Fabric trims or clothing accessories are material elements that are applied to the garment in addition to the fabric. Trims are items that are used in the sewing room in addition to fabric to create a dress. To produce clothes, they are directly connected to the fabric.

2.5 Cutting

Fabric cutting procedures follow the development of patterns. If the pattern does not have a seam allowance, add one before cutting. Place the fabric on a smooth surface and smooth out any wrinkles or folds.

2.6 Garment Construction

Construct the garments according to the design and patterns by using appropriate trims and accessories.

2.7 Finishing

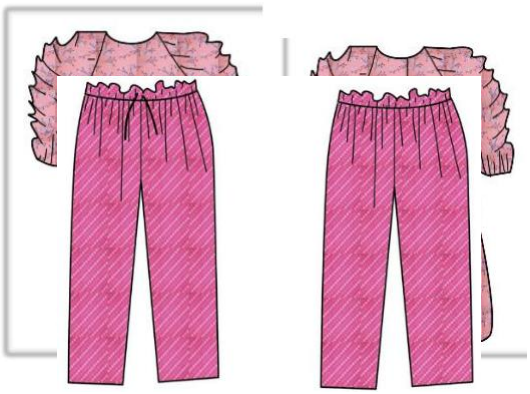
The finished goods from the sewing section and keep records in this area, then send them to the iron section after suckering them. The ironman then irons these according to the buyer's instructions. In the finishing process, thread is sucking, fusing machine, metal Detector, vacuum table, Steam Iron, Table grading machine, Stan drill machine, and so on are used.

2.8 Survey

A survey aids in the collection of data for a new product or conduct among customers. The survey is administered online, making it easier to interpret for all participants and allowing for the registration of responses online35. The following questions are asked of the designed garments.

3.GARMENT DESIGNS

3.1 GARMENT 1- LOOP ADJUSTABLE FLARED DRESS WITH PUFFSLEEVES



- Flared dress with puff sleeve, adjusting loop on front bodice and invisible zipper used for opening on center back bodice.

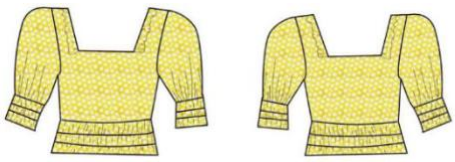
3.2 GARMENT 2- CROP TOP WITH WRAP AROUND SKIRT

- Crop top with elastic shimmering on the hemline and sleeves for both front & back bodice. Triangle cutting with opening on back bodice.
- Wrap around skirt with pleats on left side and elastic on back.

3.3 GARMENT 3- A LINE FLARED FLAT COLLAR DRESS WITH V YOKE

- Aline flared dress with v shaped yock and flat collar. Elastic on sleeve's hemline.
- Invisible zipper is used on the Centre back for opening.

. 3.4 GARMENT 4- CROP TOP & LOOP ADJUSTING PANT



- Crop top with shimmering on bodice and sleeves hems.
- Pant with adjusting loop on front.

3.5 GARMENT 5- JUMP SUIT WITH ELASTIC WAIST BAND

Jumpsuit with elastic waist band and v neck with button and button hole opening on front bodice

4. RESULT

The fitting issues occur in obese women's garments are identified and solve it by using adjustable garment designs. The designs for obese women's garments are designed by applying adjusting methods them self. Cotton printed fabric are selected for the garments, its comfortable for obese women's wear and each garment having deferent prints of fabrics are used. The selection of trims done depend upon the type of garment designs. Pattern making is done with according to the garment designs. Survey was done for the product accessibility among the customers.

5.CONCLUSION

This study deals with the designing of women's wear to solve the fitting problems for obese people. The main advantages of these garments include the style, comfort, fitness. This study arrives at the conclusion that almost all obese patients hesitate to wear a styled outfit as they cannot wear it for a long period of time. This problem is mainly affecting outfits patterns. obese patients find it too difficult to wear a particular pattern outfits made well fit to use some period of time. The five-garment designed in this study focusing on this problem. These garment designs are stitched in such a way that it can be adjusted as per body weight changes. Each garment got each style. These garments are easy to adjust by the customer with any irritations. In this survey conducted after preparing these garments most of the customers are satisfied with this mode and they also commented that this product can gain good demand in market. The survey really focused on fitness., style, comfortless of the product. Most of the people suggested design 1 with puffed sleeve, the aimed population was very happy with design one as it can well answer their obese problems. Style wise people suggested design two crop top with wrap around skirt. Through the survey came to conclusion that these designs are really helped in solving the problems of obese people fitting. Most of the people assured good market potential of the products.

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Textile Based Self-Powered TENG Sensor for Physiological Monitoring

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ABSTRACT

The rapid development in the field of wearable technology gave a lot of attention to smart electronic textiles. Wearable devices like activity tracker, biomedical sensor, smartwatch is becoming more popular. However, these devices need batteries to function regularly. Batteries are rigid, bulky component and requires frequent charging limiting their use in wearable electronics. Therefore, there is requirement to design devices which can harvest mechanical energy from human movements and convert them into electricity. To achieve this objective a wearable energy harvesting device has been developed which works on triboelectric nanogenerator's principle. This wearable TENG device can be wore on human body and it can adapt human motion to convert it into electricity. The woven fabric based TENG device produced with easily available materials like Teflon and Nylon and a conductive fabric is stitched at the backside for charge transfer. The developed prototype has produced maximum power density of 6.4 μW/cm^2. Furthermore, a monitoring of human foot tapping has been demonstrated to show the feasibility of physiological monitoring.

KEYWORDS: *Triboelectric nanogenerator, woven fabric, physiological monitoring, biomechanical energy, wearable electronics*

1. Introduction

Wearable electronics has gained a lot of attention in today's era aiming to give power for various electronic devices like, smartphones, wearable display, high performance sportswear, medical sensors & smart uniforms. This advancement needs not only miniature size electronic components, but also require incorporating in textile fabric or even implanting them inside the human body. Incorporation of heavy & rigid electronic components uncomfortable and hinder the movement of curvy human body parts. Also, power source and frequent charging of powering device makes wearable electronics inconvenient to worn [1]. Generally electrical energy required to powered electronic devices is stored primarily in batteries, also they required to charge as well as replaced frequently. Wearable electronics needs a miniature size power source and capacity of batteries depend on its size and weight. Due to this constraint, technologies that can harvest electrical energy from mechanical energy gain more attention [2]. Textile structure has a great ability to develop light weight, flexible and conformable electronic device. By using some fibers which are conductive in nature or coating of some conductive polymer or substrate onto the textiles, one can create textile based large area electronic system. While one can achieve flexibility and conformability through textile structure, use of batteries as a power source hinders the progress of wearable electronics. Hence self-powered systems have profound impact on wearable textile-based electronics. Biomechanical energy is one of the universally available & feasible power sources. Human body is a rich source of mechanical energy which include walking, arm swinging, breathing & finger movement. It has been estimated that even 1 to 5% of body's power can charge body worn devices without any increasing the load onto body [3]. To harvest this mechanical energy from human motions, lot of powered systems developed which work on piezoelectric, electromagnetic, electrostatic, magneto strictive effects. In 2012, The TENG device was first reported as a technology that convert mechanical energy into electricity. Among most of the energy generating devices Triboelectric Nanogenerator which work on electrostatic effect has shown highest performance for harvesting energy from low frequency movement. Also, TENG can be designed from textile cloth due to availability of material, simple construction and low cost to

manufacture[4]. TENG devices harvest mechanical energy based on couple effect of triboelectric & electrostatic induction. Due to this effect periodic contact and separation between two material of different tribo polarity generates alternative flow of electron through the electrodes[5]. Various textile-based structure1designedto harvest mechanical energy from human motion, pressure and wind energy. However, most of the devicesuses chemical treatment like coating, chemical synthesis etc. This makes the preparation process more complex & expensive as well as infeasible to bulk production [6].

1.1 Structural Design and Working Mechanism

Fanet al.[7] developed first flexible Triboelectric device from two polymeric sheets having different triobolary. Figure 2.1 shows structure of the assembly which work on contact separation mode. The assembly is made by stalking two different polymer Kapton film & PET substrate without any interlayer bonding. A thin Au film deposited on both layer by sputter coating technique which has a function of producing equal and opposite charges on both film through electrostatic induction as well as act as an electrode for charge transfer. The Au film deposited is having Nano scale roughness which increases surface friction, which improve performance of the device.

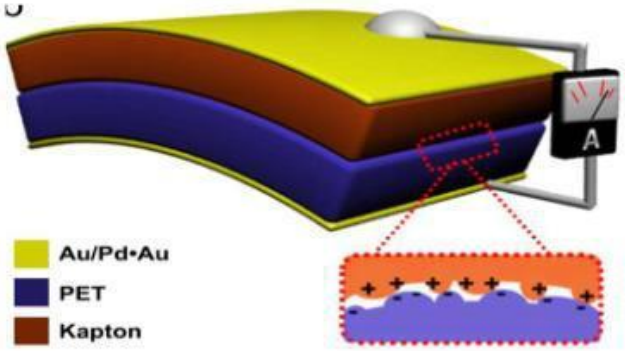

Figure 1. Construction of TENG device

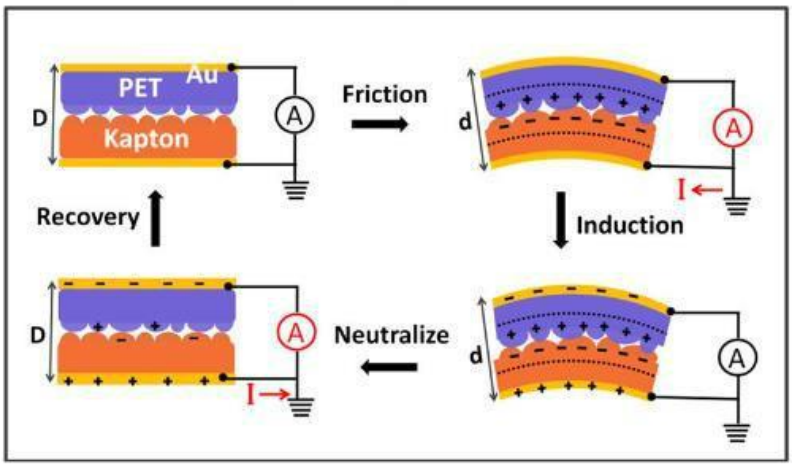

Figure 2. Working Mechanism of TENG device

The working of TENG devices is mainly based on two mechanism mainly contact electrification and electrostatic induction as shown in Figure 2.When two material with different tribo-polarity comes in contact with each other contact electrification causes to develop opposite charge on both surfaces. As material pressed by external force, material which gains electron produces negative charge on it and positive charge produces on another material. As soon as force is released potential difference is created which drives the

electron from one side to another through external circuit arrangement. The application of periodic pressure and release cycle produces alternating current which can convert into DC current using rectifier circuit. [7]

1.2 Sample Preparation

Two fabric of nylon and teflon were prepared separately one with positive and another negative triboelectric material. Plain and matt weave structure were prepared on Mini handloom machine is used to produce fabric having conductive yarn in weft and triboelectric material in warp direction of fabric as shown in figure 3.

Figure 3 Mini Handloom for sample preparation

Two material is used to produce TENG device is stitching of triboelectric layer with conductive layer. For both triboelectric layer finer yarns were used. Nylon is used as a positive triboelectric layer and Teflon yarn is used as a negative triboelectric layer as shown in figure 5. For charge transfer nickel chrome plated thin polyester fabric which has sheet resistance less than 1Ω is used. Conductive fabric stitched with triboelectric layer with standard sewing machine to assure uniform stitching and contact of both fabrics. Figure 4 shows multilayers of triboelectric nanogenerator arrangements.

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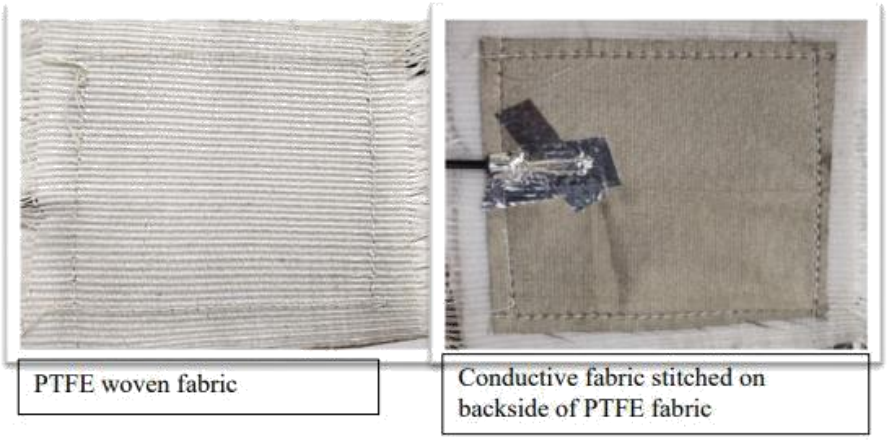

Figure 5 Prepared Sample of stitched conductive fabric

2 Result and Discussion

It shows the instant peak power produces on every contact separation cycle. Peak power density shows concentration of power on unit area. This is obtained from the data of current and voltage considering load resistance connected in circuit table 1.

Table 1. Power output performance for different woven structure

Power	Plain Weave	5/1 Twill Weave
Peak Current (µ)	4.22	8,01
Instantaneous Peak Power (µw)	8.90	32.1
Effective Contact Area (cm^2)	5	5
Peak Power Density (µw/ cm^2)	1.78	6.42

Plain woven structure has interlacement on every end which makes the float length shorter as compared to the 5/.1 twill weave. Hence the contact area between top and bottom electrode is reduces which shows less output voltage for plain weave.

3.Prototype and Demonstration

Comfortability and flexibility of textile based TENG sensor properties giving the advantage of using them directly to with the fabric worn by any person. Prototype of TENG sensor for physiological monitoring has been prepared which is shown in figure 6a, b . The peak open voltage source was obtained by the circuit is 2.5 volt.

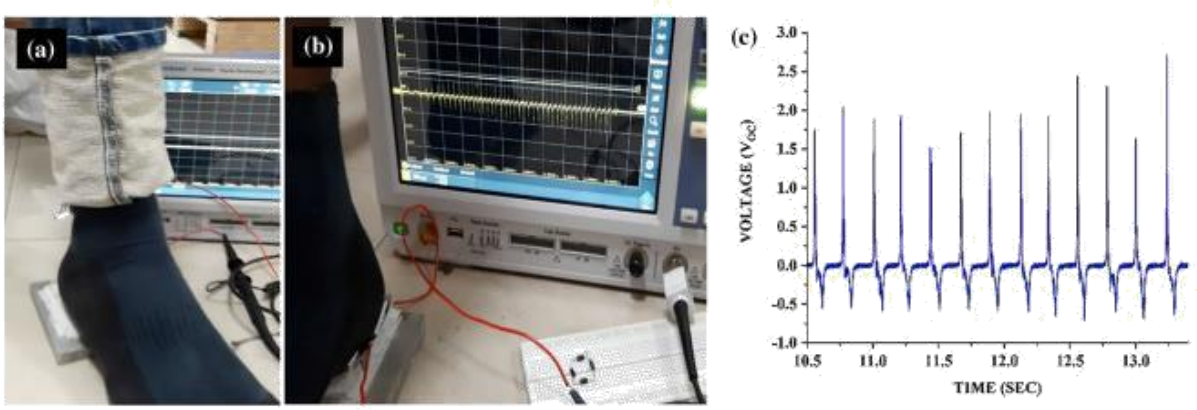

Figure 6. Protype and Demonstration of TENG based senor for physiologically monitoring

4. Conclusion

Plain and 5/1 twill woven structures were prepared to check the effect of contact area on output performance. With increasing float length performance of the TENG shows improvement because, float length increases effective contact area and higher the contact area, higher the charged induced on triboelectric layer. The developed TENG device with 5/1 twill structure and 5 cm × 5 cm area is capable of producing peak voltage of 10.51 V and peak power 6.42μW/cm2.

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Elastic Therapeutic Tape for Permanent Use

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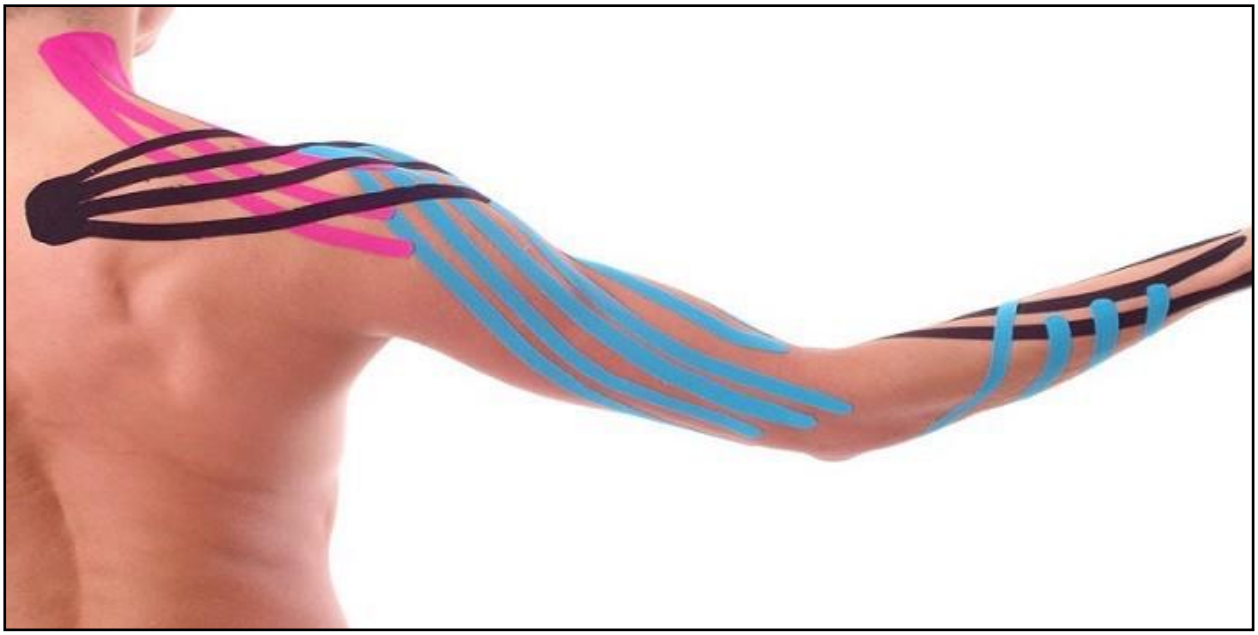
ABSTRACT

Evolution of bandaging techniques gave rise to Kinesiology Taping techniques similarly known as Elastic therapeutic taping. Elastic therapeutic taping or KT's have effects such as the improvement of somatosensory stimulation and an increase in mechanoreceptive and proprioceptive impulses which cause various responses such as the facilitation or inhibition of muscle activation. This type of new taping is considered to have potential beneficial effects for musculoskeletal pain. A woven sheet of stretchable cotton is used. Acrylic adhesives , Vinyl resins and epoxy compounds are usually used as adhesives but once used , the bandage cannot be reused. Thus , a smart waterproof adhesive compound is thus designed as a temperature stimulant which gets adhered to body uniformly at the temperature range of 95 to 99deg F. The strength of the tape is retained hence washing the cotton tape with cold water.

Keyword : - KeyElastic therapeutic tape , adhesives , strength , coating , temperature , permanent

1.**Introduction:**

Elastic therapeutic tape, also called kinesiology tape, kinesiology therapeutic tape, Kinesio tape, k-tape, or KT, is an elastic cotton strip with an acrylic adhesive that is used with the intent of treating pain and disability from athletic injuries and a variety of other physical disorders. In individuals with chronic musculoskeletal pain, research suggests that elastic taping may help relieve pain. The product is a type of thin, elastic cotton tape that can stretch up to 140% of its original length. As a result, if the tape is applied stretched greater than its normal length, it will "recoil" after being applied and therefore create a pulling force on the skin. This elastic property allows much greater range of motion compared to traditional white athletic tape and can also be left on for long periods of time before reapplication. Designed to mimic human skin, with roughly the same thickness and elastic properties, the tape can be stretched 30–40% in the longitudinal direction. It is a latex-free material with acrylic adhesive, which is heat activated. The cotton fibres allow for evaporation and quicker drying leading to longer wear time, up to 4 days. How the tape is claimed to affect the body is dependent on the location on the body, and how it is applied; the stretch direction, the shape, and the location all supposedly play a role in the tape's hypothetical function. At present , musculoskeletal problems like knee pain , muscle pain can cause major difficulties in body movements. Research suggests that , there was a significant improvement in the knee pain when KT Tape was applied . Moreover , KT taping produced an immediate effect for the knee osteoarthritis when patients climbed stairs . This may be the reason where KT Taping produced higher mechano-stimulation (higher mechanical support) .



KT-Tape used on human arm

Heat therapy also is an effective therapy for muscle and back pain. Heat therapy is an effective remedy for back pain because it boosts circulation, which then allows nutrients and oxygen to travel to joints and muscles. This circulation helps repair damaged muscles, relieves inflammation, and improves back stiffness.Any type of heat therapy can help relieve back pain.

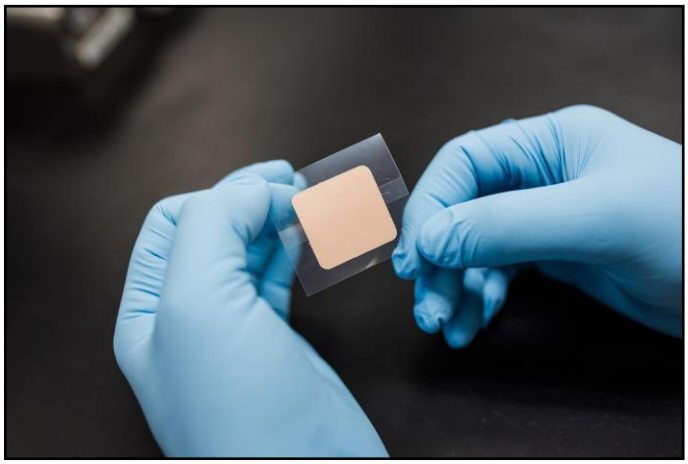
Yet, heating pads are ideal because they're convenient and portable. They're also electric, so you can use them anywhere in your home, such as lying in bed or sitting on the couch.Hot or warm baths provide moist heat, which also promote circulation and reduce muscle pain and stiffness. A bath might work better if you have pain or stiffness in other parts of your body, too.The problem with baths, though, is that it's difficult to maintain the water temperature. That water will slowly cool down.On the other hand, heating pads have adjustable levels and provide a continuous flow of heat — for as long as the pad is turned on.If you don't have a heating pad, taking a warm shower

Heat Patch

or relaxing in a hot tub may also relieve back pain and stiffness. One benefit of a hot tub and shower over a bath is continuous heat similar to a heating pad.

Transdermal Patches also prove themselves of help as a growing field in drug delivery systems. Transdermal patches are patches that adhere to the skin as a way to deliver drugs. They provide a specific, predetermined dose of medication which is absorbed through the skin and into the bloodstream. Transdermal patches deliver drugs topically, where they are absorbed by the skin and into the bloodstream. They provide a consistent delivery of small amounts of a drug into the

blood stream over a long period of time. The length of wear time and the amount of drug delivery different from patch to patch. Thus , getting inspired from the above three types of bandages , I have deduced the respective abstract.



Transdermal Patch

2. Commercial Elastic Therapeutic Tape :

Kinesiology tape is, a tape that you apply to your muscles. It's an elastic tape that provides sensory input into an area, but still allows for full range of motion. It was developed in the 1970s by Kenzo Kase, a chiropractic doctor, in Japan and he wanted to create something that mimicked the elasticity of human skin. While it was used widely by professional athletes, physical therapists, and trainers alike, it didn't really go mainstream until the 2008 Summer Olympics. Most kinesio tape is made from a combination of cotton, spandex, and adhesive, which is what makes it different from the standard athletic tape you might see wrapped around someone's ankle. Traditional athletic tape is made of just cotton, so it doesn't have the stretching ability that kinesiology tape has .

Kinesiology tape works when applied correctly , by lifting the skin from the tissues below it. When tape is applied, it causes compression or decompression of these areas, supposedly allowing it to alter pain signals to the brain. The elasticity of the tape is the most important characteristic.

Depending on the way kinesiology tape is applied, it can be used for a variety of different things including, but not limited to, muscle inhibition/facilitation, pain relief, decreasing swelling, proprioceptive stability (helping your muscles provide stability while still allowing for motion), and tissue decompression.

KT Tape can be useful and helpful in treatment of :-

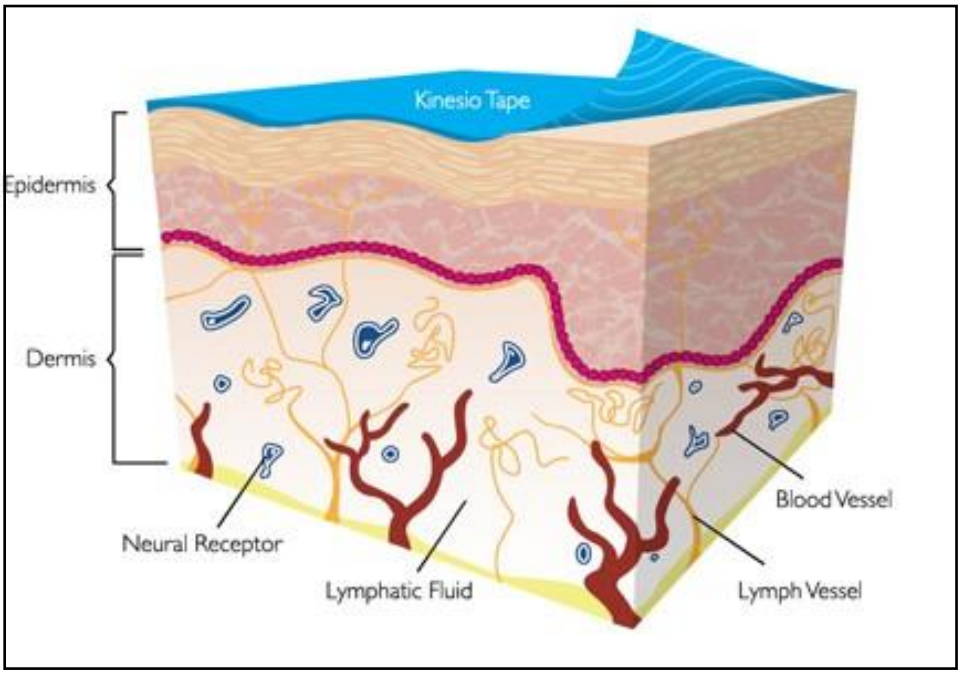
- **Shin Splints:** This kind of pain happens when you overload the muscles in the front of your shin, causing inflammation in the muscle, tendon, and bone. Tape from just below the outside of your knee to just beneath the base of your big toe, then tape additional strips the length of the full width of your shin laterally over your pain points.

- **Knee Pain:** One of the most common issues for runners, knee pain typically stems from imbalances or weak gluteus. Anchor two strips on the quad muscle and then run them down the right and left off the knee cap to create a teardrop shape, Wickham says. Then place one strip running across the other two below the knee cap.

- **Plantar Fasciitis:** This occurs when you overload the connective tissue that runs from your heel to the base of your toes, resulting in heel pain. Tape on strip down the bottom of the foot, the another strip crossing the first on the arch area of the bottom of the foot, Wickham says.

- **Achilles Tendon Pain:** Too much stress can tighten and overwork the large tendon connecting the two major calf muscles—the gastrocnemius and soleus—to the back of the heel bone. Tape one strip starting at the midcalf down to the bottom of the foot, then cross another strip over the back of the heel/ankle, Wickham says.

- **General Muscle Pain:** If you're experiencing general soreness or want more support for a muscle, you can use two strips (or cut one strip into a "Y" shape) to border the area, Lou says.
- **Swelling:** If you rolled or tweaked a joint, and it is inflamed, cut small projections off the anchor point of the tape (so it looks like an octopus) and lay it with no stretch over the swollen area



Application Of KT Tape On Skin

The type of application theoretically determines the physiological outcome. KT is applied unstretched over manually stretched skin above the injured muscle. This type of application will cause the skin to form convolutions which lift the skin. Theories suggest that these convolutions encourage regeneration of injured tissue by increasing interstitial space and alleviating interstitial pressures which occur from swelling post injury . This decrease in pressure also decompresses subcutaneous nociceptors, leading to decreased pain. It is also theorised that lifting the skin detaches filaments which attach the skin to endothelial cells of the lymphatic and capillary beds. This is proposed to to create channels which allows for lymph to drain, thus reducing swelling and allowing increased blood flow to the area.

3. Structure Of Commercial KT Tape:

Kinesiology tapes are generally composite materials created by elastic woven fabrics (plain weave) with an adhesive on one side independently on colour, type, or producer. Until the tape is unused, the adhesive layer is covered with a siliconised paper to be adhesive repellent. During its manufacture, kinesiology tape is applied with a slight stretch of 10% to the siliconised paper The textile backing is extensible or elastic only in one direction, precisely in longitudinal (warp) direction. Depending on the type of application, the tape is affixed onto skin unstretched or with different degrees of pre-stretching.

In designing a KT Tape , key features to focus on are elasticity , degree of elasticity , tensile strength and moisture management characteristics. Thus , Porosity also plays a vital role in comfort properties of the tape . The porosity of material strongly influences its physical properties, such as bulk density, moisture absorbency, mass transfer, and also thermal conductivity.

On the other hand , air permeability also is an important character of the tape . It plays a role in transportation of moisture from the skin to outside. The same goes with the permeability of water vapour and thus , the waking characteristic of the fibre used are also foreseen before designing the tape. Heat Transfer Mechanism of the tape is also considered before designing , which thus protects the wearer from cold or heat . The heat transfer mechanism through textile fabric is a complex phenomenon comprising all three mechanisms (conduction, convection and radiation). However, heat transfer by conduction is generally accepted to be more significant than others. For a textile material composed of fibres and entrapped air, the thermal conductivity is a combination of the fibre material and air thermal conductivity.

In a typical structure of KT Tape , the warp yarns are core spun with a blend of cotton and 0.73 dtex of elastane(90% cotton & 10% elastane). The warp yarns are 100% cotton yarns . The derived fabric for the KT Tape was a plain woven fabric and the fabric has no selvedges , which suggests that the fabric is designed on a traditional loom . The adhesive is applied on only one side of the fabric and further cut and rolled for packaging.

The typical adhesives used in KT Tapes are acrylic and epoxy adhesives covered with a siliconised paper for packaging. The adhesive applied on the back side of woven fabric is 100% acrylic (more precisely poly(butyl acrylate: sodium sulfoethyl methacrylate) and is a heat activated adhesive . The acrylic adhesive is applied in a wave like pattern to mimic the qualities of the fingerprint on the fingertip. This special pattern of adhesive can assist not only in the lifting of the skin, but also allows water vapour and air transportation in free zones where the adhesive is not applied. The acrylic coating pattern in the form of a sine wave also gives support to longitudinal elasticity of the tape strip. Imaging confirms that only 70% of the backside area of the tape is covered by the tape . The adhesives get degraded or wither away after 4 to 5 days of continuous use.

Thus getting inspired from all above discussion , I have designed the respective abstract. The principal aim of the project focuses on adhesion of the where the adhesive would be water repellent and will have good thermal characteristics so as to enhance adhesion properties at an increased temperature. As a certain athlete runs a marathon , it is such that the tape may peel of because of increased muscle temperature and moisture characteristics of the body The abstract aims to increased support to the muscle after taping , enhancing the shelf life of the tape by controlling the adhesive characteristics . .

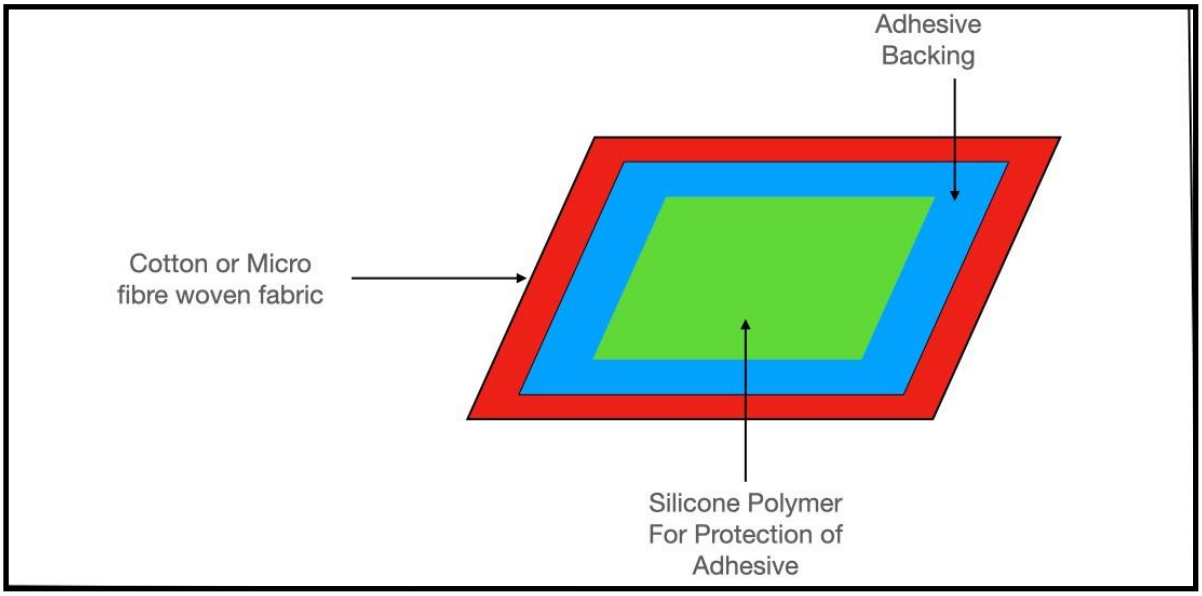
4. Structure Of Proposed Elastic Therapeutic Tape

The structure of the tape is a most important aspect of the project. The project aims towards a permanent use tape for muscle rehabilitation and other musculoskeletal ailments.

- Yarn: 80% cotton and 20% elastane (core spun) is proposed to be used . As elasticity is the most vital property in the tape. Elastic component gives the tape a load sharing abilities and enhanced support to muscle so as to facilitate activity off contraction and relaxation of the muscle. A research chance can also be taken by using polyester

- Fabric : The fabric design for the particular application has a plain woven structure . The warp consists of blended cotton and elastane and the weft consists of 90% cotton and 10% elastane. The plain woven structure is suitable so as to accommodate the adhesive chemical backing on the tape.

- Adhesive Backing : The adhesive backing comprises of two part platinum catalysed silicone gel elastomer. Thus the latex free compound would be water resistant as well as anti allergic towards the human skin.



Structure Of Proposed Tape

5. Mechanism And Working Of Proposed Elastic Therapeutic Tape:

The proposed tape aims for higher durability during use and also reusability after use. Thus , a plain woven structure of cotton would enhance support. The mechanism and working would be similar to the original KT Tape , but the key factor of difference lies in the thermo-responsiveness of the adhesive component and the durability. A key factor of thermo-responsiveness lies in enhanced adhesion when the body temperature rises at a level. As endurance athletes experience a shift in body temperature and thus enhanced sweating takes place. The proposed tape aims at enhanced adhesion by the capture of body heat by means of conduction and further increased adhesion by liquefying the solid wax or oil particles present on the inner surface of the tape.

Cotton is used in the tape which is absorptive material. Hence , for a pain relief application the tape coupled with ibuprofen or paracetamol solution can be applied onto the muscle . Getting inspired by the transdermal patch , the key difference factor in this type of application is about the amount of drug present in the tape . As the tape focuses on reusability and

higher durability the research will be needed if a successful drug delivery mechanism has to be put forth referring to this type of a tape.

The structure of the tape is plain woven, washing can be done to the tape and as cotton has the ability of higher strength when wetted an enhanced support can be given to the muscles after application of wet tape . The entrapment of body heat while activity and release of heat when stationary is the main aim about the proposed abstract.

Proposed Key Factors Of The Tape:

1. Higher Mechanical Support To Muscles
2. Durable
3. Reusable
4. Washable
5. Enhanced Air Permeability Characteristics
6. Higher Porosity
7. Greater Degree of Elasticity
8. Enhanced Water Vapour Permeability
9. Structural design is such that it gives special emphasis on Thermoregulation
10. Greater Adhesion in activity
11. Water repellent Adhesive
12. *Greater C*omfort Characteristics

6. Application

The proposed tape focuses on thermoregulation and reusability. The abstract was designed keeping in mind the only criterion of permanent use of the tape. Hence , as Elastic Therapeutic Tapes have a varied applications the proposed tape will be able to be used in all similar kinds of treatment but the tape can be used repetitively.
The proposed permanent use tape can thus be used in any type of muscle pain . Mechanism can be altered if end use application is different : for example for permanent use drug delivery tape research can be done as per facilitation.

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INCORPORATING SUSTAINABLE FASHION IN TRANSITION GARMENTS AT AFFORDABLE COST

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ABSTRACT

This Project work deals with the Sustainable fashion in Transition garments, and to make the garments at Affordable cost. This project work is meant to be used as a supply of inspiration for designers and corporations, and every one stakeholders whose interest lies within the space of property fashion. whereas the concepts and techniques for property are complicated and approaches are several, this publication presents solely a couple of ways in which to approach property fashion. I hope the publication offers inspiration on a way to create positive amendment in current practices and the way to result new mindsets, making transformative fashion.

Theoretical texts and therefore the individual style cases and real-life business examples given during this book show that an amendment in mentality is feasible. They illustrate however we will challenge our ancient thinking and create manifest new ways in which to border the matter and look for artistic solutions for the matter. Moreover, once downside areas are seen as opportunities wherever style thinking will facilitate produce productive outcomes, the chapters supply samples of a way to do fashion and business otherwise. Even the wildest style experimentations are helpful and significant to all or any individuals if they open new styles of thinking or maybe question the present fashion system.

KEY WORDS - *Sustainable Fashion, Transition Garments, Cost Efficient, Eco-Friendly, Natural and Recycled fibres.*

1.INTRODUCTION:

Fashion industry has huge impacts on world setting. The demand to attenuate the environmental pollution isn't solely from fashion companies however conjointly customers. From the style firms' perspective, as a result of the assembly method in fashion is especially sensitive to setting in terms of constructing intensive use of chemical product and huge quantities of water and pesticides, it's considerably necessary for fashion product to be made in an exceedingly property manner and follow the rule of thumb of property like ISO 14000. From the style consumers' perspective, customers square measure growing to own social and environmental awareness. Consumers' environmental attitudes directly influence their eco-fashion consumption and usage. They perceive that if provide chain is a lot of property, a lot of natural resources square measure used and fewer carbonic acid gas square measure emitted, in return, retail costs may well be conjointly enhanced. Previous studies reveal that fashion customers have an interest in buying property fashion product and conjointly willing to pay a better value as long because the quality of eco-product is happy.

2.OBJECTIVES:

[1]. To study on the importance of sustainable fashion.
[2]. To identifying the style and usability of transition garments.

[3]. To development the designs for transition garments.
4. To Construct the developed designs into garment.
5. To Conduct a survey to know about the customer opinion.

4.FASHION:

Fashion is Associate in Nursing aesthetic expression, at a specific amount and place and during a specific context, of consumer goods, footwear, lifestyle, accessories, makeup, hairstyle, and body proportions. In its everyday use, the term implies a glance outlined by the style trade as that that is that the look of the instant. what's referred to as fashion is therefore that that is formed accessible and widespread by fashion system (industry and media). In reaction to exaggerated mass-production of commodities consumer goods at lower costs and world reach, property has become Associate in Nursing pressing issue among politicians, brands, and shoppers.

5.FASHION TREND:

A fashion trend signifies a specific look or expression that is unfold across a population at a specific time and place. A trend is taken into consideration an extra passing look, not printed by the seasons can collections free by the design trade. A trend can thus emerge from street vogue, across cultures, from influencers and celebrities.

Fashion trends area unit influenced by several factors, likewise as cinema, celebrities, climate, inventive explorations, innovations, designs, political, economic, social, and technological. Examining these factors is termed a gadfly analysis. Fashion forecasters can use this information to help verify the enlargement or decline of a particular trend.

6.NATURAL FIBRE:

Natural Fibres Associate in Nursing capillary staple directly procurable from an animal, vegetable, or mineral supply and convertible into nonwoven materials like felt or paper or, when spinning into yarns, into plain-woven artefact. A fibre could also be more outlined as Associate in Nursing agglomeration of cells during which the diameter is negligible as compared with the length. though nature abounds in fibrous materials, particularly plastic sorts like cotton, wood, grains, and straw, solely atiny low range are often used for textile product or different industrial functions. except for economic concerns, the quality of a fibre for industrial functions is set by such properties as length, strength, pliability, elasticity, abrasion resistance, absorbency, and varied surface properties. Most textile fibres area unit slender, flexible, and comparatively sturdy. they're elastic therein they stretch once drug tension so part or fully come back to their original length once the stress is removed.

7.SUSTAINABLE FASHION:

Sustainable fashion is regarding meeting today's desires whereas making certain that the means we tend to approach meeting those desires meet future desires further. If you dig down a bit deeper, property fashion is additionally regarding benefitting the folks concerned throughout the style provide chain – from farmers to customers to everybody operating in end-of-life facilities like exercise factories.

8.TRANSITIONAL DRESSING:

Transitional wear is usually accustomed describe vesture that may interchange between seasons and carry you thru that point of year once Mother Nature is being most fickle. But, we have a tendency to aren't here to debate that sort of shift wear, we have a tendency to are talking a couple of new form of transition in clothing: items that take you from day to nighttime or work to play with easy accent modifications.

Shift wear saves you time (no additional deciding what to wear to what) closet house (one combine of pants takes you everywhere) and cash. Trends these days are targeted on comfort and style; the Normcore trend was immense within the past few years, basic sneakers and sweats dominated the runways and street scene. This trend is evolving into a broader vary for wear ability altogether social aspects; granny heels, track pants offered in associate array of materials and cuts and bomber jackets were runway dominators for this spring.

9.METHODOLOGY:

3 Sustainable Fashion
4 Transition Garment
5 Designing
6 Fabric selection
7 Trims selection
8 Pattern Making

9 Garment Construction
10 Spreading
11 Cutting
12 Stitching
13 Finishing
14 Survey

9.1 GARMENT-1 (TRANSITION-1,2&3):

Crop top – over coat with skirt

Crop top – over coat – skirt with slit

Crop top – over coat with pant

9.2 GARMENT-2 (TRANSITION-1,2,3&4):

Crop top – balloon pant – saree draping

Crop top with frills – balloon pant – saree draping

Crop top with frills – pant – cancan draping

Crop top with frills – balloon fit pant

9.3 SURVEY:

Comfort of the Product
Market Potential of the Product
Fit of the Product
Long Lasting Property of the Product
Difficulties in Using the Product

9.4 RESULTS AND DISCUSSION:

Designing of Garments
Selection of Fabrics
Selection of Trims and Accessories
Pattern Making
Cutting
Garment Construction
Finishing
Final Product
Survey

10.CONCLUSION:

The garments are designed.

The fabrics selected are at affordable cost.

Transitional Indo Western – Party and Casual wear are constructed.

The constructed garments are given for survey and the best design is found.

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FABRICATION OF DIAPER USING BAMBUSOIDEAE AND HERBACEOUS LEAVES

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ABSTRACT

The novel idea related to smart diaper to sense wetting by incorporating conductive wire has been The adult diaper are having some functional problems based on the work has been focused in direction to make diapers more compact and using viscous bamboo to enhance the comfort properties and making it eco friendly .The viscous bamboo taken as core and treated with antimicrobial natural finish like neem .The performance has been checked for its functional and comfort properties .The result found satisfactory , the modification has been done to improve the performance suggested.

KEYWORDS: *Antimicrobial, Smart diaper, Absorbency, Comfort aspects.*

1. INTRODUCTION

The construction of adult diaper is similar to baby diaper with a top sheet, distribution layer, absorbent core, back sheet, a cuff system an elastic leg gathers. The inner layer of adult diaper facing towards the skin has to rapidly transfer liquid to the layer beneath it. The direct skin contact layer demands high degree of softness. The absorbing and distributing layer below transfers the liquid to the storage.

The absorbent core layer consisting of a mixture of cellulose flaks and super absorbent polymer blocks and absorbs the liquid. The outer layer facing the clothing forms a moisture proof barrier. It therefore generally consists of a polyethylene film or a breathable nonwoven polyethylene composite are simultaneously gentle to the skin .Typical fiber here primarily includes cotton, rayon, and cellulose, as well as synthetic fibers and various mixtures.The absorbent hygiene products have become an indispensable feature of modern day living for all generations. Core of diaper is the main functional part of the product affecting its performance. The performance requirements of the diaper core material are absorption capacity, absorption rate and water retaining capacity. Core consists mainly of super absorbent polymer, which are non-biodegradable and cellulosic flakes.

Thus this work has been focused on making core more effective, ecofriendly by using fibers like viscous bamboo .Fibers are treated with natural neem finish for antibacterial properties. Smart diaper concept has been introduced by imparting conductive yarn to sense wetness.

1.1 Non woven

Nonwoven fabrics are defined as web structures bonded together by entangling fiber mechanically, thermally fusing the fibers or chemically bonding the fibers. Nonwovens are defined by the international nonwovens and disposables association (INDIA). Non-woven are sheet, web, or bat of natural and manmade fiber or filament, excluding paper, that have not been converted into yarns and that are bonded to each other by any of several means.Material was cellulosic. In 1960's the United States Department of Agriculture (USDA) worked to improve water conservation. From 1970's it was used for disposal hygienic products.

2.MATERIALS AND METHODS

2.1 Materials

Bamboo fibre were procured from Pallava textiles (P)Ltd., Mangarangampalayam, Tamil nadu. Other materials such as superabsorbent polymer, polypropylene based nonwoven, plastic sheet and adhesive were procured from the market.

2.2 Methods

2.2.1 Measurement of Bamboo Fibre

The moisture content and regain of bamboo fibre was determined as per ISO 6741-1: 1989 method. The fineness of bamboo fibre was measured using BISFA 1988 method. The tenacity and elongation of bamboo fibre were determined as per ASTM D-3822-01 method. .

2.2.2 Determination of Absorbency of SAP

The absorbency of superabsorbent polymer (SAP) was determined using the procedure given in US patent (5,419,955). The nylon cloth was cut into 6 cm × 12cm strips. Accurately weighed (W1) 1.0 g of the superabsorbent polymer (SAP) was taken in the nylon bag. Five such nylon bags were prepared and sealed. Two empty nylon bags (blank samples) were also prepared. Then 0.9% saline solution is filled in the plastic container upto 1.5 inch in depth. The nylon bag with SAP was held horizontally and SAP was distributed uniformly throughout the bag.

The bags with SAP and without SAP were laid on the surface of the saline and allowed to wet for 1 min before it is submerged. After a soaking period of 60 min, the bag was removed and allowed to drip for 15 min. The average weight (W3) of five nylon bags containing SAP was determined. The blanks were also weighed (W2)

and the total absorbency was calculated using the equation given below:

$$\text{Total absorbency (g/g)} = \frac{[(W_3 - W_2) - W_1]}{W_1}$$

where W1 is the initial weight of the SAP; W2, the average weight of blank samples after the test; and W3, the weight of bag with SAP after the test.

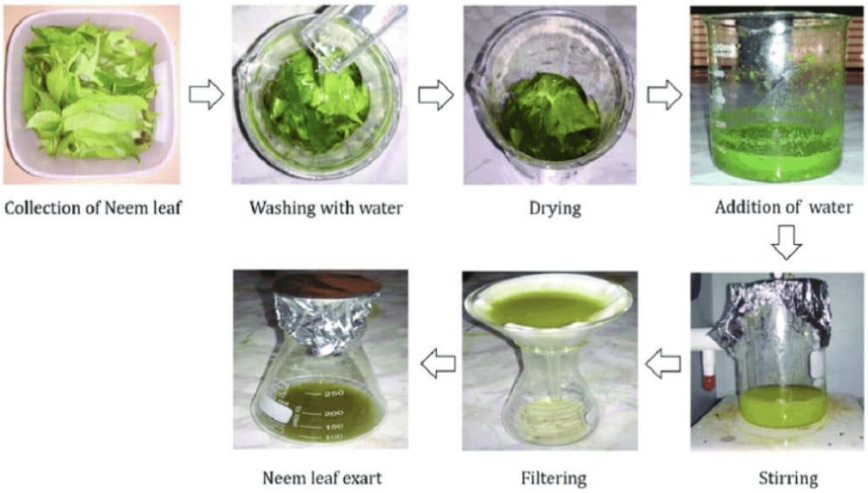
2.2.3 Absorption Capacity

The primary purpose of disposable diapers is to absorb the urine, dispersing it quickly and to retain the absorbed fluid without re-wetting of the surface. The total absorptive capacity of the diaper was determined. It was assessed by immersing the product into a known test solution for a standard time and measuring the difference in weight.

2.2.4 Web bonding (Needle punching)

Needle punching is a process of bonding nonwoven web structures mechanically interlocking the fiber through the web. Barbed needles mounted on a board punch fibers in to the web and they are withdrawn leaving fibers entangled. The needles are spaced in a non-aligned arrangement are designed to release the fiber as the needle board is withdrawn. Stitch bonding is a method of consolidating fiber webs with knitting elements with or without yarn to interlock the fibers. There are a number of different yarns that can be used. They are faster to produce and the cost of production is less. Thermal bonding is the process of using heat to bond a web structure that consists of a thermoplastic fiber. Thermal bonding is the leading method used. Polypropylene is suitable fiber with a low melting point of 165C chemical bonding is the process of bonding a web by chemical and its common method

2.2.5 Neem extraction



Neem (Azardirachta indica) is n the mahogany family Meliaceae. It is having more than 300 active compounds isolated from different parts such as leaves, bark and seeds of neem tree .With concentration of 10% Neem gel gives zone inhibition of E.coli and S.aureus of mm and 17mm respectively. Leaves of Neem were collected and left to dry at room temperature for 24 hours. Then grinded to a very fine powder and kept in dry containers. The ethanol extraction was prepared by soaking ach powder in 100% ethanol in a concentration of 1:4 for 24 hours. The neem leaves are converted into fine powder by grinding ,filtering and further grinding . This fine filter extraction is treated diaper.

3.Result and discussion

3.1 Antibacterial

Bamboo has an inherit natural barricade against bacteria, most varieties of bacteria and bugs that attempt to thrive on the bamboo plant are eradicated naturally on contact material has natural antibacterial activity it could prove more durable as part of the material.

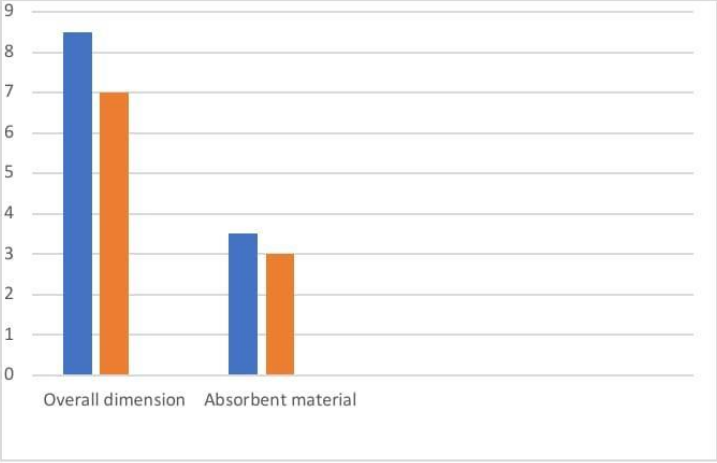
Bamboo fibers are used mainly in textile industry for making attires, towels, and bathrobes. Due to its antibacterial nature, it is used for making bandages, masks, nurse wears, and sanitary napkins.

3.2 Properties of bamboo fibre

The properties of bamboo and organic cotton fibres are given in Table 1. It can be observed that the moisture content and regain of bamboo fibre is 12.7% and 14.5% respectively. It is almost double as that of organic cotton fibre. This property enhances the absorbency of fluid very rapidly. Further, the bamboo fibres have similar tenacity but are highly extensible as compared to both cotton and organic cotton. In addition, the bamboo fibre is exceptionally soft, light, silky and its cross-section is filled with several micro-gaps and micro-holes which makes it breathable and cool to wear. It has natural functions of antibacterial, anti-ultraviolet, sterilization, bacteriostatis and deodorization12. Therefore, bamboo fibre products do not cause skin allergies and protect the children from ultraviolet radiation.

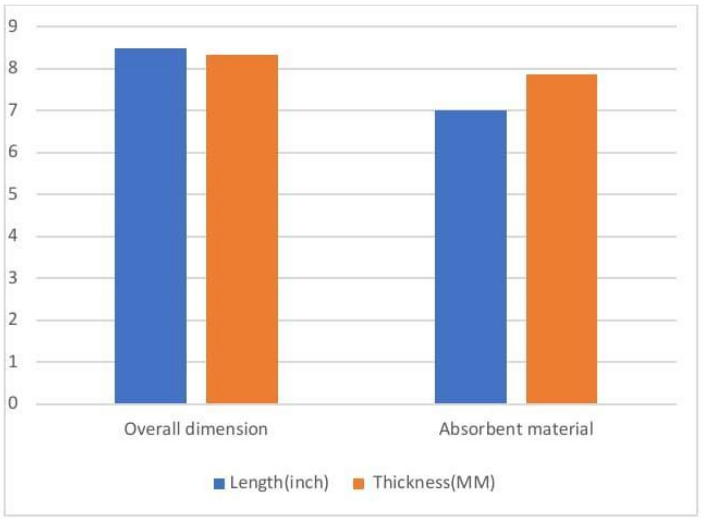
Property	**Bamboo fibre**
Moisture content,%	**12.7**
Moisture regain,%	**14.5**
Fineness, cN/tex	**1.8**
Tenacity, cN/tex	**22.5**
Elongation,%	**20.5**

3.3THE GRAPH BETWEEN LENGTH AND WIDTH



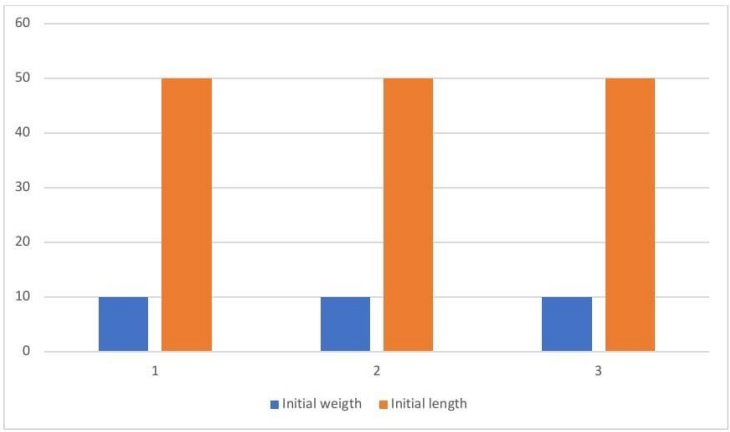
- This graph shows the overall dimension and the absorbent material of length and width of the diaper.
- It varies and shows the difference of length and width of adult diaper.

3.4 THE GRAPH BETWEEN LENGTH AND THICKNESS



- This graph shows the overall dimension and the absorbent material of length and thickness of the diaper.
- It varies and shows the difference of length and thickness of te adult diaper.
- Length is measured as inch and the thickness is measured as mm.

3.5 THE GRAPH BETWEEN INITIAL AND FINAL WEIGHT



1. This graph shows the overall dimension and absorbent material of initial weight and initial length of the diaper.
2. It varies and shows the difference of initial weight and initial length of the adult diaper.

3.6 Total Absorbency of Superabsorbent Polymer

Superabsorbent polymers are the materials that have the ability to absorb and retain liquid (~70-200 times of their weight) under a slight mechanical pressure (1-5 kPa in diapers). The swollen gel holds the liquid in a solid, rubbery state and prevents the liquid from leaking onto the skin and clothing, which helps to stay dry for a long duration. It is found that the total absorbency of superabsorbent polymer (sodium polyacrylate) is 107 times of its own weight. This plays a vital role in the performance of a diaper. Superabsorbent polymers are cross-linked networks of flexible polymer chains.

The polymer used in diapers is a high molecular weight sodium polyacrylate polymer. Similar SAPs have been used safely for years in sanitary napkins and adult incontinence products. Scientific safety testing and a long market history

on these materials support the conclusion that they are non-irritating, non-allergenic, and safe for consumers.

4.CONCLUSION

Liquid strike-through time is lowest for the adult diapers composed of viscous bamboo while highest for the one made of pure bamboo fibres. 4.2 Absorption capacity is highest for the diapers made of viscous bamboo. 4.3 Acquisition time under load is lowest for the diapers composed of both 70/30 and 50/50 proportions of viscous bamboo. It is highest for pad made of pure viscous bamboo. 4.4 The rewet under load is lesser for the diaper produced from bamboo. The diaper pad composed of pure bamboo fibre is lighter as compared to all other products. The adult diapers made of viscous bamboo perform well with regard to absorption capacity, liquid strike-through, low rewet value and medium weight. Hence, these adult diapers are found to be the best.

5.ACKNOWLEDGEMENT

First, I wish to express my sincere gratitude to my supervisor, Professor Collins, for their enthusiasm, patience, insightful comments, helpful information, practical advice and unceasing ideas that have helped me tremendously at all times in my research and **writing** of this report.

In performing our project, we had to take the help and guideline of some respected persons, who deserve our greatest gratitude. The completion of this project gives us much Pleasure

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INNOVATIVE PRODUCT DEVELOPMENT IN TEXTILE AND FASHION

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ABSTRACT

Natural dyes square measure dyes or colorants derived from plants, invertebrates, or minerals. the bulk of natural the dye material is place in a very pot of water and heated to extract the dye compounds into answer with the water. Then the textiles to be artificial square measure value-added to the pot, and control at heat till the required color is achieved. Textile fibre is also artificial before spinning or weaving ("dyed within the wool"), when spinning ("yarn-dyed") or when weaving ("piece-dyed") several natural dyes need the utilization of gear referred to as mordants to bind the dye to the textile fibres. Mordants (from the Latin verb 'mordere', which means 'to bite') square measure metal salts which will type a stable molecular coordination advanced with each natural dyes and natural fibres. traditionally, the foremost common mordants were alum (potassium metallic element sulfate - a metal salt of iron. several alternative metalsalt.mordantwere additionally used, however squaremeasure rarely used currently to fashionable analysis proof of their extreme toxicity either to human health, ecological health, or both.

KEYWORDS : *-Keyword 1- NATURAL DYE, Key word2- DYEING,*

1.HISTORY OF NATURAL DYES

Color and its various uses come over the horizon from pre-historical period by all cultural groups and on all major land masses. The ancestors of man must have noticed the abundance of multitude of colors worm by nature. Certainly it would have been fascinating to them. Every civilization has its myth and association with color. Aristotle, the great philosopher of the fourth century BC, considered yellow and blue to be the two primary colors relating to life's polarities. A physicist considers that black and white are no colors. Psychologically, however black and white are colors because they produce visual sensation and they have strong effects on other colors either by mixing or by juxtaposition. The greatest contribution to our understanding of color came from men whose work combined science and mathematics with art, metaphysics and theory indeed the sum of human study.

1.1 COLORANT

Colorant" is used as a name for material such as dyes and pigments. Ability of natural colorant to be used as natural dyes has been known since ancient times. A dye can generally be described as " A colored substance that has an affinity to the substrate to which it is being applied". The dye is usually used as an aqueous solution and may require a mordant to improve the fastness of the dye on the fibre. In contrast, a pigment generally has no affinity for the substrate and is insoluble

.

1.2 CHIEF SOURCE OF COLOUR

The chief source of colouring matter, until about a century ago, had been nature in general and vegetation in particular man learnt to use different kinds of natural coloring matters to dye cloth. Biochemists have identified that the vital activity of plants is also dependent on colorants in way that the bright color of flowers are important I attracting insects and birds to act as pollinators. When these are used for dyeing fabrics, they not onlr impart color to fabric, but also act as antifungal agent where by they impart protection to fabric against bacterial or fungal infections or as much reluctant . Some dyes like indigo has a coloring sensation also.

.2. COLOUR

Color is one of the elements of nature that made the human living more aesthetic and fascinating in the world. They are supposed to be associated with emotions , human qualities, seasons, festivals and passion in our life. In the past, at down of the civilization, the people tried to ornament their surroundings similar to that of natural colors observed in the plant, soil, sky, and other sources This give birth to a new science of colors from natural origin.The art of dyeing was an old as human civilization. From the historical records, it is learnt that natural colorants were available to people during Greco-Roman periods. Our Vedas , the Atharveda carries description of natural dyes. The use of natural dyeing materials is evident with the wall paintings of Ajanta, Ellora and Sithannvasal and they still demonstrate the efficacy of dyeing craft that had been inherited from ancient times in India. Ancient Egyptian hieroglyphs contains a thorough description of Extraction of natural dyes and their application in dyeing. Further developments extending over many thousands of years led to rather completed dyeing process and high quality dyeing.

2.1 USES OF NATURAL DYE

Ever since primitive people could creative, they have been endeavoring to add colorto the world around them. They used natural matter to stain hides, decorate shells and feathers, and paint their story on the walls of ancient caves. Scientists have been able to date the black, white, yellow and reddish pigments made from ochre used by primitive man in cave paintings to over 15000 BC.Natural dyes have been used since ancient times for coloring and painting fabrics. Until the middle of last century, most of the dyes were derived from plants and animal sources by long and elaborate processes. Among Indigo, Terrain, purple, Alizarin, cochineal and logwood dyes deserve special mention.

2.2 DYEING PROCESS IN EARLY HISTORY

Since the difference in mordanting different fibres has been mentioned, it would be remiss not spend a momenton the historic nature of fabrics themselves. Wool, a protein based fibre has beenfound in Europe dating back to 2000 BC. It was a common medical fabric in both dyed andnatural colors,and was processed by both professional manufacturers and housewives. Silk, another protein based fibre, was imported from China to Persia as early as 400-600 BCE. It became quite popular in late middle ages, and major silk manufacturing centers were setup in France, Spain and Italy.The silk production centers also became centers of dye technology, as most silk was dyed and required the highest quality dyes available.

2.3 ROLE OF MORDANTS IN NATURAL/VEGETABLE DYEING:

The mordant is the life for the vegetable colors except Indigo. Without mordant no color can be obtained in vegetable colors. It acts as an agent between the fibre and the color by heat pouring the color to penetrate into the fibre prominently and make it fast. Most of the vegetable dyestuff will not by themselves adhere to yarn or except as surface stain, easily washed away. A Mordant, usually of metallic origin introduced upon the prepared cloth, units with the dyestuff during the process of dyeing the vat, usually under heat to form an insoluble lac. A pattern or pictorial motif may be obtained by the painting or printing with mordant on cloth, when subjected to dye vat will take a permanent color only where the mordant has been applied. There are dijjerent mordant like myrabolon, alum, ferrous sulphate, oxalic aciod, zinc oxide nad copper sulphate which are used in the vegetable color dyeing. The different colors can be obtained depending upon the amount of mordant applied therefore without mordant there is no color in vegetable dyestuff.

[3]. EXTRACTION OF COLOR AND DYEING:

Well dried natural products like Flowers, Roots, Barks, Leaves, Ponds etc are weighed and socked in hot water for 24 hours before actual dyeing. The quantity of natural products for dyeingvaries from40 – 80% on the weight of the material. After soaking in hot water for 24 hours the solution is boiled for 45 – 60 minutes to extract the maximum quantity of color. Finally it is filtered and transferred to the dye bath.

3.1 DYEING OPF SILK WITH NATURAL/VEGETASBLE DYES

Silk fibre because of its natural; beauty, luster and charm is called the queen of textiles.Silk fibre consists of sericin as a gum. The sericin an amounts to 25 % of the total weight of silk material. Unless we remove the gum from the fibre it is not possible to get the yarn having smooth and lustrous fibre. Tha process of removing the gun from the fibre is called Degumming.

DEGUMMING :

The degumming bath contains 20-30% soap on the weight of the material using M:L 1:30. The raw material is entered into the bath atr low temperature and then temperature is increased to 90-95c and worked for 1–2 hours . Then it is removed from bath and washed with worm water then with cold water to remove the traces of soap solution and taken for further process.

MYROBALAN TREATMENT:

The degummed silk material is treated with 20g/l myropbalan solution at room temperature for about 1 hour by using material to liquor ratio 1:20.Afterworking the material for 1 hour in the above solution it istaken out from the bath squeezed evenly and dried under sun light without washing.

BLACK COLOR DYEING:

In this process the Myrabolan treated material is treated with required quantity of black color solution at room temperature for about 30 minutes. Then the material is remove3d and squeezed evenly and dried. To get the jet black color the above material is treated with 0.1 g/l alizarin at boiling temperature for about 15 minutes. The3n the material is removed from the bath, washed thoroughly and dried.

DYEING WITG ALIZARINE:

To produce red color the Myrabolan treated material is treated with Alum solution. Generally 20 g/l alum will be using for this purpose by using material to liquor ratio 1:20. After treating the material at room temperature, the material is squeezed and dried without washing under sun light. After drying the material is washed and treated in bath containing 0.5 % alizarin by using material to liquor ratio 1:20 for about 30 minutes at boiling temperature , Then the material is removed from the bath, washed thoroughly and squeezed and dried.

DYEING WITH POMEGRANATE RIND:

The Myrabolan treated material is treated with Alum solution. Generally 20 g/l alum will be using for this purpose by using material to liquor ratio 1:20. After treating the material at room temperature, the material is squeezed and dried without washing under sun light .

Required quantity of pomegranate rind and water is taken in the vessel and boiled for 10 minutes. Generally 20 g/l pomegranate rind will be using for this purpose by using material to liquor ratio 1:20. The alum treated material is entered into the bath and worked for about 30 minutes at boiling temperature. Then the material removed from the bath washed thoroughly with cold water and dried.

DYEING WITH CHAWALKODI:

The Myrabolan treated material is treated with Alum solution. Generally 20 g/l alum will be using for this purpose by using material to liquor ratio 1:20. After treating the material at room temperature, the material is squeezed and dried without washing under sun light. Required quantity of chawalkodi and water is taken in the vessel and boiled for 10 minutes. Generally 10 g/l chawalkodi is using for this purpose by using material to liquor ratio 1:20. The alum treated material is entered into the bath and worked for about 30 minutes at boiling temperature. Then the material removed from the bath washed thoroughly with cold water and dried.

DYEING WITH AMBAHALDI POWDER:

The Myrabolan treated material is treated with Alum solution. Generally 20 g/l alum will be using for this purpose by using material to liquor ratio 1:20. After treating the material at room temperature, the material is squeezed and dried without washing under sun light. Required quantity of ambahaldi powder and water is taken in the vessel and boiled for 10 minutes. Generally 10 g/l ambahaldi powder is using for this purpose by using material to liquor ratio 1:20. The alum treated material is entered into the bath and worked for about 30 minutes at boiling temperature. Then the material removed from the bath washed thoroughly with cold water and dried.

DYEING WITH RATHANJOTH:

The Myrabolan treated material is treated with Alum solution. Generally 20 g/l alum will be using for this purpose by using material to liquor ratio 1:20. After treating the material at room temperature, the material is squeezed and dried without washing under sun light. Required quantity of Rathanjoth and water is taken in the vessel and boiled for 10 minutes. Generally 20 g/l rathanjoth is using for this purpose by using material to liquor ratio 1:20. The alum treated material is entered into the bath and worked for about 30 minutes at boiling temperature. Then the material removed from the bath washed thoroughly with cold water and dried.

INDIGO BLUE DYEING:

Indigo blue color is treated with required quantity of naoh and hydros at 50c for 10 minutes. Then set the dye bath by using the material to liquor ratio 1:20.Take required quantity of indigo blue color and water, enter the material in to the dye bath and worked for 30 minutes at 50 – 60c . Then the material is squeezed and dried. Then the material is washed thoroughly, squeezed and dried.In the application of vegetable/ natural dyes on silk by changing the mordant we can get different colors with the same color.The other mordant commonly used in natural dyes on silk are Alum ,copper S sulphate, Ferrous sulphate, Potassium dichromate etc

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A STUDY ON THE EFFECTS OF PHYSICAL PROPERTIES AND THERMAL PROPERTIES OF POLYESTER NON-WOVEN FABRIC.

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ABSTRACT

This paper reviews the manufacturing methods of a nonwoven with suitable fabric for thermal properties, porosity and physical properties. Nonwoven fabrics are basically classified as layers of sheet are prepared by web structures combined together by tagging fiber mechanically, thermally, chemically. The non-woven is made through needle punching; the needle punched sheets are flat and the material that are made from single separate fibers. Nonwovens are materials that are permeable and manufactured using different methods from the traditional methods of fabric manufacture. Especially while producing non-woven fabric through needle punching technique it describes more pores in its structure and using of recycled polyester helps to reduce the fabric wastage and to get the market needs. Thermal isolation is one of the important functional properties required in various fields such has automobile textiles and domestic use. In this project the influence of porosity on thermal properties of polyester non-woven fabrics was analyzed.

1.INTRODUCTION

Nonwovens are the fabrics that are manufactured using stable and long fibres by blending together using chemical, mechanical, and heat treatment Non-woven are mainly manufactured in web structure the nonwovens are of a sheet that often have no need of converting into yarn for the formation of fabric. Polyester in non-woven replaces the natural fabrics to meet requirement improves basically the polymer is extracted from petroleum based products [13]

In polyester it the result shows that water filtration efficiency is increased by 8% as compared to other fibres [15]. Needle punching is the oldest and also a well- established method of forming non-woven textile materials. Needle punching is a process of combining fibres mechanically. The needle punched non-woven technology is considered as one of forwarded developing technology [12]. and it is the best alternative to the non-woven industry than the other different process and recycled nonwovens have many advantages as compared to non-used fabrics reduced product cost, good handling, and environmental protection [1].This needle punching process is considered to produce mainly for medium and heavy weight non- woven. The needle punching is a process that doesn't requires weaving or knitting processed yarns and no need of converting fibre to the yarn. Recycled fibres can be used to decrease the cost price mainly so useful in certain applications [11] (one time application) ex: luxury accommodations, schools, hospitals etc.

Non- woven are the fabric area engineered fabrics have limited life and are very high durable [19]. These fabrics are used in specific qualities such as thermal insulation, and softness is suited for such jobs. The recycled fibres helps in achieving and to meet present market required. Maximum yield can be achieved from raw material and both natural and man-made fibres are used in the process for better specifications. In many studies it absorbed that the polyester has great filtration parameters that are good at filtration [14].The recycled fibre materials have any benefits since they are cheap and average best as compared to normal fibres.[2].

2.NON WOVEN FABRIC MANUFACTURING PROCESS

Non-woven is mainly manufactured in web structure or sheets. The fibres bonded together using the chemical, mechanical, heat treatment. For the fabric production process both the short and long continuous fibres can be used. the nonwovens are of a sheet that often no need of converting into yarn for the formation of fabric[18].

Unless like other fabric the manufacturing of nonwovens doesn't need of conversion from fibre to yarn instead it's a direct fabric manufacturing process. Non-woven are manufactured at the cheap of cost and its more durable fabric and can be used almost all applications such as water filters, face masks, soil stabilizers etc.

3.WORKING PRINCIPLE OF NEEDLE PUNCHING NONWOVEN TECHNOLOGY

3.1OPENING AND MIXING

At this process the fibre of different bales are mixed to get even quality. And then the fibres are opened and cleaned (removing the nefts and impurities) for the upcoming carding process. here the nefts and other impurities are removed to improve quality

3.2CARDING PROCESS

The process opens and individuals the fibre then combed them so that length of every fibre is same and oriented combes in the direction of cylinder moving are aligned in the parallel direction.

3.3CROSS LAPPING

The web formed in the card is carried to the cross lapper to increase the thickness, weight, width of the fabric and to improve the uniformity.

3.4WEB FEEDER

The layered web is adjusted to meet the quality requirements and standards and is sent to the needle punching machine. Web feeder mainly uses to avoid the web from damaging, changing its shape. Nonwoven fabric has both fibre and web properties.

3.5CALENDAR

Here the produced fabric is compressed by pressing rollers and rolled to the roll. Non-woven roll goods can be converted in varies of variety such as converting and cutting the fabric as per the requirement for the end product using the calendar roll pressure method the fibrous substance can be converted into nonwoven fabric.

3.6NEEDLE PUNCHING

Here the web is delivered to needle loom the total numbers of needles are punched at a time due to the continuous penetration of needles the fibre get mechanically interlocked the count of repetitions of needle punching is changed as the requirement and quality of fabric

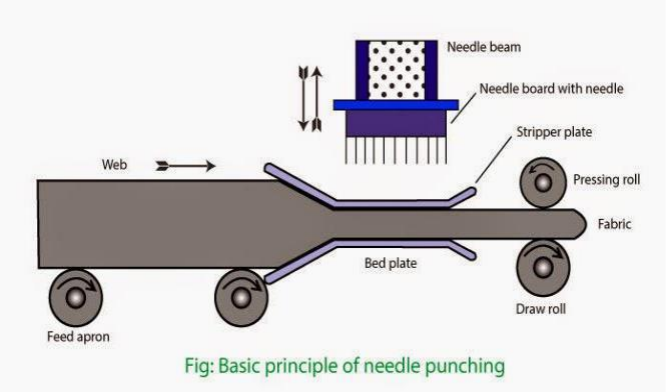

Fig: Basic principle of needle punching

3.7CUTTING AND WINDING

The produced fabric is winded to the roll and packed the end of the fabric to avoid the fabric loss during transport. Edges of the fabric are removed using sceser to give the even shape of the fabric.

4.AIR PERMEABILITY

Figure.2
Air permeability Tester

Air permeability shows the rate flow of fluid to the porous substance. In air permeability test the fabric is taken to different test to find its quality. In process of finding permeability test the fabric weight keeps on increasing and punch density and penetration length. Due to the consolidation of fibres in the fabric the air permeability get decreased [17]. The air permeability of polyester using non-woven fabric is very low as compared to the other fabrics and their blends.

In non-woven the air permeability decreases with increase in the punch density. In properties of polyester fabric due to the change in porosity the air permeability of fabric keeps on changing.

In different cases the air permeability can reduces with increase in the needle penetration and cut length of fabric. The air permeability increases with decrease in fabric weight.

5.POROSITY

The porosity of the fabric is defined as the fraction of void volume and the volume of the fabric[16]. This can calculate from fabric and fabric densities. The particular thickness and gsm the void space are available in the total material itself. The porosity is one of main essential criteria that shows the fabric properties mainly such as air and water and liquid absorption. the porosity valve is ranges from zero to one.

valves	content
Zero	No of fibres acclimated in the non-woven fabric
One	No of available void space
Porosity	1-FVF
FVF	fibre volume fraction

FVF	volume of fibre/volume of fabric

In polyester it is observed that the porosity is influenced by air permeability the result says that increase in air permeability the porosity of fabric also increases[10].For finding or to determine filtration efficiency to the fabric pore size is mainly required. There are any methods available to measure pore size of non-woven fabrics [6] .they are

The porosity value can be calculated using the formula

Porosity (H):Va/Vm [5]

The average or apporiapet porosity is calculated by passing a spherical glass of different sizes taken from 50 to 500mm.

6.THERMAL INSULATION

The thermal insulation can also be say as a flux of heat which is divided by the temperature gradient. For most of the textile fabric materials conductivity is one of the main important factor.

Polyester in one of the fibre is hardly known as insulation of heat. Here the thermal properties of non-woven and different blends of non-woven are calculated. The blending the polyester fibre with woollenized improves the thermal properties of fibre.in thermal insulation the effectiveness of nonwoven fabric is normally calculated by buck density, compactness and porosity of the fabric [7].

And in other studies they noticed that due to increase of count of pores the thermal insulation also increases. The thermal insulation help to avoid the usage of current and reduces the cost of consumption of customers. Here the needling density is inversely proportional to the thermal resistance this is because of fabric get towards maximum degree of consolidation and finally the amount of pores in structure count becomes more.

Thermal insulation is a type of technique helps to decrease the power consumption [3]. The thermal insulation can also be say as a flux of heat which is divided by the temperature gradient. For most of the textile fabric materials conductivity is one of the main important factor for best quality [20].

7.Conclusion

Here the polyester many major great properties has the ability of replacing the present market natural fibres and has the ability to reach the market needs and the process of needle punching of conversion of fibre to nonwoven fabric and finally different test such as porosity level and thermal insulation properties are attempted to find accurate quality of the fabric.

8.Acknowledgement

We are heartily thankful to the Kumaraguru Institute of Technology, which has given us the golden opportunity to prepare or analyse project report of "A study on the effects of physical properties and thermal properties of polyester non-woven fabric". We are also thankful to honorable professor Mr. Thiruurugan V who has leaded us to enlighten ourselves in preparation of this project.

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CHARACTERIZATION OF LUFFA CYLINDRICA AND ITS APPLICATION AS FOOT SCRUBBER

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ABSTRACT

Diabetic patients suffer more severe foot problems due to the reduced blood flow which in turn results in loss of feeling in the foot. Since there is no feel in the foot, incase of any injury, the individual will not recognize the pain due to the wound and there is reduced blood flow, healing of wound takes more time and the possibility of getting infection is very high resulting in amputation of parts of the foot or the foot or leg as whole to prevent from infection spread and save the life of the patient. Throughout the world, it's estimated that every 30 seconds one leg is amputated due to diabetes. Globally, there are around 415 million individuals suffering from diabetes and India ranks second largest with 69 million diabetic patients. Furthermore, almost 15% of diabetics develop an ulcer in their lifetime and around 85% face amputations. Individuals may be worried about the possibility that they will lose a toe, foot, or leg to diabetes. By taking care of feet every day by natural antimicrobial foot scrubber, chances of having diabetes related foot problems will be reduced. Good foot care is very important to prevent serious infections. But the existing solution available to cure this problem is not using natural scrubbers. The natural scrubber made out of Luffa cylindrica offers good scrubbing action against callus in the foot and in addition to cleaning the foot, it also supports the diabetic patients by providing antibacterial and antiviral properties.

Keyword: - *Foot problems, Diabetic Patients, Natural scrubber, Amputations and Luffa Cylindrica etc….*

1. INTRODUCTION

The fruit of Luffa cylindrica plant bears quite a lot of medicinal properties. It is known to have many antiallergens, antifungal and anti- inflammatory agents[1]. Luffa cultivation worldwide has been steadily increasing in the past 20 years in response to the rising demand for renewable fiber sources and clean agricultural practices. Luffa fiber is not a single filament like glass fiber, but rather a bundle of cellulose fibrils making a fibrous vascular system in a hierarchical structure. It is found in tropical and subtropical countries of Asia (India, China, Pakistan, and Indonesia), Africa, and South America [2]. The natural foot scrubber bath made out of luffa cylindrica offers delicate scrubbing. Furthermore natural foot scrubbers with antibacterial and anti-inflammatory properties are used as scrubber pads. As a result, Luffa cylindrica fiber studied to determine their dynamic properties.

2. MATERIALS AND METHODS

2.1 Material Collection

Luffa Cylindrica fibre obtained from Nattu Marunthu kadai, Coimbatore, India. These were washed thoroughly with water to remove impurities like oil, dust, etc. The photo of the Luffa Cylindrica fibre is shown in Figure 1.

Figure -1: Luffa Cylindrica Fibre

2.2 Chemical and Physical Properties

The Luffa Fibre tolerates mechanical stress and resumes their original shape after being pressed down. Luffa cylindrica fibre has a high water absorption capacity, making it suitable as an absorbent. The sponge has a high degree of porosity, high specific pore volume, stable physical properties and is non-toxic and biodegradable. Chemical and Physical Properties of luffa fibres are shown in Table 1[2].

Table -1: Chemical and Physical Properties

Chemical constituents (%)		Physical properties of luffa fiber	
Cellulose (%)	63.0 ±2.5	Density (gm/cc)	0.92 ±0.10
Lignin(%)	11.69 ±1.2	Diameter (μm)	270 ±20
Hemicellulose (%)	20.88 ±1.4	Aspect ratio	340 ±5
Ash (%)	0.4 ±0.10	Microfibrillar angle	12 ±2

2.3 Mechanical Properties

The variation in mechanical properties such as tensile and impact properties of luffa composites were evaluated. Mechanical Properties of Untreated and Chemically Treated Luffa Fibers are resulted in Table 2 [2].

Table -2: Mechanical Properties of Untreated and Chemically Treated Luffa Fibers

Fiber Samples	Tensile strength (MPa)	Tensile modulus (MPa)	%Extension
Untreated luffa fibres	178.20	4263.84	3.12

2.4 Water Absorption

Three specimens were immersed in water at various temperatures (23, 50, and 100◦C, respectively). The specimens were removed from the water after a certain period of time. The weight of the specimens was taken and they were then immersed in water again. The water absorption test was continued for several hours until a constant weight of the specimens was reached. The results are reported in Table 3 [2].

Table -3: Results of Elemental Analysis

Sample	% Water Absorption		
Temperature	23◦	50◦	100◦
Untreated Luffa Fibre	12.27	17.74	21.43

2.5 Elemental analysis

The elemental analysis of untreated *Luffa cylindrica* fibers was undertaken with an elemental analyzer. The estimation of five elements, *i.e.* carbon, hydrogen, nitrogen, oxygen, and sulfur was undertaken. The resulting O/C ratio is summarized in Table 4.

Table -4: Results of Elemental Analysis

Sample	%C	%H	%N	%O	%S	O/C ratio
Untreated luffa	56.47	5.45	0.09	32.61	0.50	0.58

2.6 Antimicrobial Activity

Staphylococcus aureus, Escherichia. coli, Candida albicans,was used for paper disc diffusion assay and was first grown in Nutrient broth for 18 hrs at 37◦C. After the top agar containing 5 × 105 CFU/mL hardened, dissolved samples 15 µL aliquot were dropped onto the surface of paper disc and incubated overnight at 37◦C. If the sample examined had antimicrobial activity, a clear zone would form around the paper disc, representing inhibition of strains growth[3]. The Zone of inhibition for microbes shown in Figure 2.

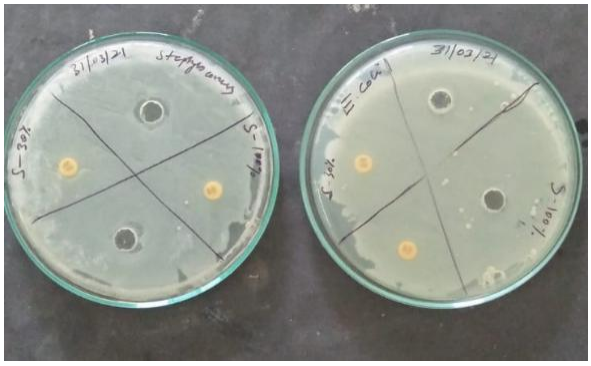

Figure -2: Zone of inhibition for microbes

3. RESULTS AND DISCUSSION

3.1 Mechanical Properties

The tensile properties of the luffa fibre were influenced by the strength and modulus of the fibers as reported in Table 2. All mechanical tests showed that untreated luffa fibre withstood less fracture strain than treated fiber.

3.2 Water Absorption

The untreated luffa fibre absorbed water very rapidly during the first stages (0 to 50 h), approaching a saturation point (equilibrium sorption) where no more water was absorbed. Untreated luffa fibers exhibit higher rates of water absorption due to the hydrophilic nature of lignocellulose. The untreated luffa fibre showed the highest water absorption of 12.27%, 17.74%, and 21.43% at 23, 50, and 100 oC, respectively. The results are reported in Table 3.

3.3 Elemental analysis

In Elemental analysis the O/C ratio for untreated fiber was 0.58. This ratio is an indication that there was still lignin on the surface. When this ratio reaches 0.83, the sample is said to be pure cellulose, whereas when it is in the range 0.31 to 0.40, it is said to be pure lignin. The resulting O/C ratio is summarized in Table 4.

3.4 Antimicrobial Activity

The extracts showed antimicrobial activity against Staphylococcus aureus, Escherichia. coli and Candida albicans. The zones of inhibition ranged between 18.00 and 27.00 mm, the greater zone of inhibition was recorded against Candida albicans ranging from 20 to 27 mm. The fresh plant extract was shown to be more active than the dried plant extract. The Zone of inhibition for microbes shown in Figure 2.

4. CONCLUSIONS

Through these studies, it effectively demonstrates the potential in conversion of a low priced, readily available agricultural waste Luffa Cylindrica fiber into a highly valuable product. Luffa Cylindrica fibre is fastly becoming an indispensable crop because of its very wide industrial applications. This emerging cash crop will improve the economies of many nations in the near future because of its numerous applications such as foot scrubbers for diabetic patients.

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Sustainability in Textile

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ABSTRACT

Mankind knows sunflowers by generations. On a broad outlook it appears that sunflower stem have no application other than using as fire burning material . But as a matter of fact, there are non-apparel uses of textiles such as sustainable applications. The term sustainable reminds us that " involving the use of natural products and energy in a way that does not harm the environment". The necessity of using sunflower stem in sustainable textile is to ensure equal observation compared with cotton, cost efficient compared with cotton, an innovative health from waste product which replace the usage of cotton in diaper. The global consumption of cotton is around 82%. The leading producer of diaper is Procter & Gamble Company (P&G) an annual revenue of US$66 Billion uses 26% of cotton in diaper production. They preferable uses cotton for comfortable, hypoallergenic, sustainability, absorbent. But now a days cotton is not cost efficient to produce diapers. And I judge that cotton won't drops its price. Because of rise in price of cotton, diaper company lose 60% of revenue from diaper, because suddenly they can't suddenly rise the price for consumers. Cellos material cotton and super absorbent polymer (SAP), closure material plays a major role in manufacturing of diaper . Sunflower has equal water observation and drying power comparing with cotton, but its stems are used as fire material , trellises etc. So we can use sunflower stems fibers in an innovative way to reduce the cost of diaper. By using this innovative product diaper price comes from Rs.14 – 8. So join together with me to create a sustainable textile world.

KEYWORDS:

Sustainable textile, Innovative material, SAP, Sunflower fibre.

1.Introduction

Sustainable textiles mean that all materials and process, inputs and outputs, are healthy and safe for human and environment, in all phases of the product life cycle and all the energy, material and process inputs come from renewable or recycled sources.In this we develop the baby diaper which used for children. The leading producer of daiper in the world was P&G. In production, the company Procter & Gamble has more no of production rate. They use 82% of cotton for diaper production.

2.Reason

Due to the high usage of cotton in dress's or low cultivation of cotton.The diaper price was increased, due to price hike of cotton.

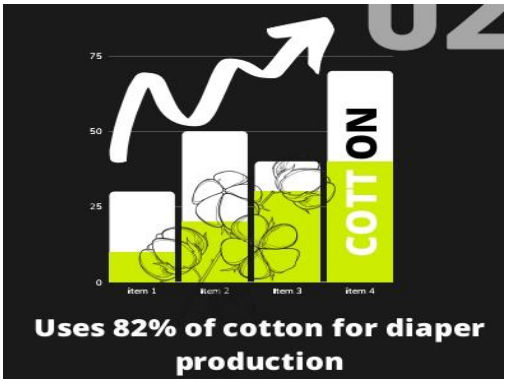
3.Economy crisis

We are going to balance these economy crisis in diaper production

4.Diaper disection

Diaper have three layers. Which is topsheet, distribution layer, absorbent core.

Δ. Topsheet protect the skin from over hydration and reduce irritation, material hydrophilic spun bond non-woven fabric



Δ. Distribution layer moves liquid away from the baby's skin and distributes. It more evenly across the entire diaper core for better absorbency material cotton

Δ. Absorbent core keeps the baby's skin dry, even if he or she sits on a full diaper material super absorbent polymer called sodium (SAP) poly acrylate

We are going to replace this cotton by sunflower fibre.

Sunflower fibre is obtained from pith and bark of the stem .

It had around 80% water absorbent, moisture regain is equal to cotton.quick day comparitively with cotton.

Why we choose sunflower ? Because of after plucked the sunflower. The plant burned or used to compost for agriculture land. If we use sunflower stem.

5.Cost efficient

Generally the price of cotton diaper around Rs.14 by implementing this the price of diaper will reduceed to Rs 8 to 10.

6.Conclusion

In this paper we discuss the sunflower stem fibre in diaper. And it 's properties. If we reduce use of cotton in diaper, cotton will used effectively in other ways. And also we focus on natural materials like sunflower stem fibre in daiper.

TEXTILES AND ENVIRONMENT

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ABSTRACT

In the present scenario of development, the new quality requirements not only emphasize on the long service life of the product but also a production process that is environment-friendly. As the development is taking place, the environmental hazards and pollution are becoming the major concerns. The textile industry is one of the most productive sector and active sector in the world. The environmental parameter was not considered in the measurement of resource utilization in the textile industry, although it has been implicated in the use of scientific methods. India's textile and chemical industries consume a lot of water and suffer from high levels of water pollution. Depending on the type of fibre and production processes, the water consumption of the fabric varies from 50-300 litres per kilogram of prepared fabric. Fabric contamination affects water colour, toxicity and odour, eliminates oxygen in the water, adds solids, and destroys plant and animal health. Even the textiles industries can give rise to other types of pollution too. So, developments have been done in various fields to reduce the pollution and some textile products are being used to reduce the pollution in the industries. In last few decades air pollution is becoming the major problem. Consequently, various technologies have been made like pulse jet filtration and other sustainable methods have been developed to control the air pollution (industrial air pollution). At the same time when on one side the pollution is being controlled on the other side waste management is also an essential factor for the clean development. The methods used for the waste management must be clean and efficient, clean in the way that the waste can be reused or reduced without any environmental concern and efficient in the way that a large proportion of the waste can be reduced. The waste can be reduced in many ways, may be by reusing it, or by reducing it by making some other valuable product out of it in terms of economy. The textiles are giving rise to various problems from industrial point of view but many developments are made to prevent the natural hazards by using textiles. One of the such natural problem is soil erosion which leads to mass destruction of animals, plants and human beings. Various textile materials and structures used as erosion control geotextiles. So where on one side textiles are a cause of various environmental issues and on other side it is a solution too.

KEYWORDS: *Pollution, Waste Managements, Soil Erosion, Geotextiles.*

1. GEOTEXTILES

Soil erosion is a major threat to the human world, the rain washes away the topsoil, the cover of the forest is gone at a fast pace. In India it is estimated that a large portion of the land used for agricultural purposes decreases as soil erosion leading to more loss of fertile soil every year. Wherever the earth is emitted by green, some kind of coverage should be provided to prevent soil erosion due to rain or wind. This cover is called geotextile.

1.1 Basic solution to prevent soil erosion

The soil is made up of small tiny particles which are to be bound together with certain amount of force to form a layer. The roots of the plants are the general cause of the force that is provided to bind the soil particles together. If there is not any plantation present on the surface then the particles are set free, wind and floods can overcome the binding force of the particles easily and fade away the top layer of soil, also known as top soil which is having a good fertility. The basic solution to prevent the soil erosion is to bind the soil particles together by mean of some force so that the layer could not wash away easily. Various methods can be there to bind these particles together, one of these can be geotextiles. Geotextiles is a permeable fabrics which is used in association with soils ability to protect, separate, filter reinforcement and drain.

1.2 Types of Geotextiles

The geotextiles can be classified into 2 groups: Natural geotextiles and man-made geotextiles.

Natural geotextiles: These are collected from plants, animals and minerals origin. The basic properties of these type are high strength, high modulus, low elasticity and low breaking extension. These type of geotextiles are biodegradable in nature so these are having temporary applications. The benefits of using these types of geotextile are: low cost, strength, durability, robustness, and biodegradability.

Man-made: These are also known as geosynthetics. All geosynthetics are geotextiles but all geotextiles are not geosynthetics. On the basis of raw material they are further classified into 4 classes: Polypropylene, Polyester, Polyamide and Polyethylene.

1.3 Soil Erosion Control by using Natural Geotextiles

Natural fibres in the form of netting can help to grow vegetables on slopes. These nettings are likely help in protection of seeds and soil until the site where it is used is stabilised by vegetal cover permanently as they act as a physical barrier between soil and the rainwater. These nettings spreads overs seeded slopes and act as a shield between soil and the impact of the rain drop, minimises runoff and slows down its velocity. These nettings also maintain the capacity of the soil to absorb water. These nettings hold the soil and seeds in place and retains soil moisture. When the seeds germinates, they grow through the gaps present in the fabric (nettings) and achieve a cover all over the surface. At thus point of time the natural geotextile used as having biodegradability so starts to degrade at its own.

1.4 Soil Erosion Control by using Man-made Geotextiles

These polymer products furnish erosion control, aid in vegetative growth, and eventually become entangled with the vegetation to provide reinforcement to the root system. As long as the material is shielded from sunlight, via shading and soil cover, it will not degrade, at least within the limits of other polymeric materials. The seed is usually applied after the material is placed and is often carried directly in the materials backfilling soil.

1.5 Other functions of Geotextiles The geotextiles can perform at least these five major functions:

1. Drainage: It can efficiently collect superfluous water from structures, such as rain water, from the soil and discharge it.

2. Separation: It will prevent two soil layers of different particle sizes to mix with each other.

3. Filtration: These are an ideal interface for reverse filtration in the soil adjacent to geotextile.

4. Reinforcement: Heavy structures can be used to reinforce earth structures by means of fill material.

5. Protection: It is an ideal protection from erosion of earth embankments by wave action, currents or repeated breakdown. A layer of geotextile can prevent leaching of fine material.

2. CONTROLS AND ROLE OF TEXTILES FOR POLLUTION

The clothing industry is one of the world's largest polluters. The fabrics make up one-fifth of the world's industrial water pollution and use 20,000 chemicals, many of which are carcinogenic, to make garments. Clothing industries transform fibres into yarn and into fabrics or related products. The textile industry produces large quantities of various chemicals and impurities mainly from coating, finishing, dyeing and printing processes. The textile industry majorly polluting the air and water.

2.1. Role of textiles in controlling air pollution

Most processes performed in textile mills produce atmospheric emissions. The gaseous air has been identified as the 2nd greatest pollution problem for clothing industries. Mainly air pollution occurs in industry due to emission of various types of gases: CO_2, NO_2 , SO_2 etc. Various methods can be used to control the air pollution but economically used method in industries is pulse jet filtration.

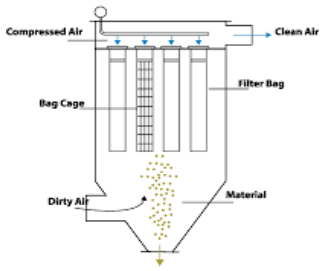
2.1.1. Basic mechanism of pulse jet filtration

The dirty air to be filtered is entered to the filter through the inlet port located in the lower section of the filter. The large particles are blocked by baffle plate and directed to the hopper and air particles carrying fine particles to the bag filter. As the filtration proceeds, more and more particles will be collected and a filter cake will be developed which helps in achieving maximum filtration. The clean air enters to the upper chambers of the filter, where it get out through the filter. As the dirt particles are collected continuously more and more resistance will be developed in the filter bags. Then the sequential time controller gives a signal to solenoid valve and compressed air header to release air pulses periodically. The compressed air leads to a shock wave through filter bags in opposite direction to normal air flow. Due to this shock the dust cake formed will fall off to the hopper. Short pulses comes into effect less than a second.

Figure – 1 : Pulse jet bag filtration.

2.1.2. Control of Air Pollution by Absorption

Air pollution control systems which are based on absorption collect gas molecules on the surface of a solid. Although synthetic carbon is the most widely used adsorbent, systems use silica gel, alumina, and bauxite. The adsorbent must have high porosity, contain fine capillaries, have a large surface to volume ratio, and interaction of certain components of the air



pollution stream. Saturated Adsorption beds should be removed and replaced. Beds are often regenerated by desorption. Solvent recovery usually occurs economically feasible when the solvent concentration is more than 1,000 ppm. However, regulations often require the removal of solvent or organic vapours at levels below 1,000 ppm. Adsorption systems for solvent recovery include superheater, condenser, decanter, blower, cooling tower, water pump, filters, housing, charging carbon, carbon boat, screens, pipes and plumbing.

2.2. Role of textiles processes in controlling water pollution

Water is widely used in the textile industry. The water consumption percentage is high for various processes such as desizing, scouring, bleaching, mercerizing, dyeing, printing and other processes to eliminate complete water use. After using water in various processes, they interact with dyes, chemicals or other useful substances, contaminated there & creates water pollution. So reduction of water pollution can be achieved by these steps:

1. When water left out after the pre-treatment process, water contains chemicals which is used at the time of dyeing then for the utility of chemical present in water, pass this water for again pre-treatment process so that, this can prevent the misuse of chemical and water in order to reduce pollution.

2. Biodegradable chemicals may be used for pre-treatment process so that the chemical degrade itself after present in water and this can lead to reduce the water pollution as well as water use.
3. Reduce pollution from overhead use of dye, the temperature of the dye should be controlled. If the dye bath is heated by direct steam, the heating should be gentle, so that avoid overflow and subsequent loss of bath solution, which it causes pollution.
4. Different types of Black dye they form more impurities after the dye material. Therefore, this is recommended to avoid these types of dyes that are very dangerous and build up a lot which pollutes the dyeing process. In vat dyeing, potassium dichromate should be replaced by peroxides or periodate's for pollution control and for its toxic & hazardous nature.

3. WASTE MANAGEMENTS IN TEXTILES

Global production of all apparel and textile fibers amounted to more than 110 million tons annually, leading to the generation of high amount of textile wastes. While the textile industry has a long history of being thrifty with its resources, a large proportion of unnecessary waste is still produced each year. Commercially, textile waste generation is influenced by the production of textile goods, higher the production, the greater the amount of waste.

3.1. Waste managements in some of the processes in textiles:

3.1.1 Waste reductions during sizing

1. Size selection in sizing: Replace starch-based sizes with synthetic sizes. The advantages of this are, a reduced pollution load as synthetic sizes have lower BOD levels and they can be recycled for reuse.

2. Sizing recipe optimisation: Ensure that only the minimum required size is added onto the yarn. This reduces chemical consumption as well as the pollution load to drain during desizing.

3.1.2 Waste reductions during desizing

The effluent from desizing will contain the sizes that were added onto the yarn before weaving/knitting. Using and recycling synthetic sizes in place of starch sizes will reduce the pollution load from desizing.

3.1.3 Waste reductions during scouring

Incoming raw material should be screened for toxic chemicals as these will be removed during the scouring process. Detergents should be easily biodegradable. Avoid the following detergents: linear alkylbenzenesulphonate; nonylphenoletoxylate; dialkyldimthyl ammonium chloride; distearyl dimethyl ammonium chloride; di dimethyl ammonium chloride; sulphosuccinates; alkylphenolethoxylates; complexing agents with poor biodegradability (eg, EDTA; phosphonic acid; NTA; phosphonates). Reuse scours washwater for desizing. Recycle continuous scour washwater to batch scouring.

3.1.4 Waste reductions during bleaching

Replace the use of chlorites and hypochlorites with hydrogen peroxide. Ensure that bleaching is carried out efficiently. Recycle bleach washwater for scouring. Use vacuum slots to remove excess solution which can then be reused.

3.1.5 General waste minimisation options for dyeing

Operate at lowest possible bath ratio -- this leads to a reduction in operating costs, water consumption, chemical use, energy use and less effluent discharge; Minimise stripping and/or redyeing procedures; Avoid shading additions; Avoid the use of detergents to wash fabric after reactive dyeing; high temperatures are just as effective; Minimise auxiliary use. The greatest costs in reprocessing are associated with the cost of dyes and chemicals -- typically, the costs can increase by as much as 30%. In dyeing polyester, avoid the use of carriers by upgrading dye machinery or replace with less harmful alternatives. Good fabric preparation increases the chance of right-first-time dyeing as fixation is improved. Dye fixation onto cotton can be improved by mercerising the yarn or fabric prior to dyeing.

3.2 Treatment technologies There are two possible locations for treating the effluents, namely, at the textile factory or at the sewage works. The advantage of treatment at the factory is that it could allow for partial or full re-use of water. The following technologies have all been used: Coagulation and/or flocculation, membranes (microfiltration, nanofiltration, and reverse osmosis), adsorbents (granular activated carbon, silica, clays, fly ash, synthetic ion-exchange media, natural bioadsorbants, and synthetic bioadsorbants), oxidation (Fenton's reagent, photocatalyis, advanced oxidation processes, ozone) and biological treatment (aerobic and anaerobic). Since the effluent from the textile industry is complex and variable, it is unlikely that a single treatment technology will be suitable for total effluent treatment and water recycling.

3.3 Post consumer textile waste management

Postconsumer textile waste refers to textile products that the consumer disposes for any reason—they might be run-down or not liked by the consumer anymore. Generally, postconsumer textile wastes tend to be of good quality, which can be recovered or reused as second-hand clothing, and are generally sold to poorer regions of the world. Even the textile products that will most likely not be used by the consumers can potentially be shredded into fiber to be reused for manufacturing.

Estimates suggest that a vast majority, as high as 95 percent, of the discarded product could in fact be used again—re-worn, reused or recycled, depending on their condition. Indeed, the conditions are pushing the trend, because, as natural resources are limited and cost of waste disposal is increasing. Even though the textile and apparel sector is one of the most intense consumption sectors, implementation of recycling throughout the sector is not satisfying. However, parallel to the increasing global awareness of environmental problems, the awareness of consumers about sustainability has also started to increase. Consumers are now demanding recycled textile products and manufacturers are seeking ways to meet this demand.

4. CONCLUSIONS

The textiles are basically produced in the industries which can cause pollution. The textile industries can lead to two types of pollution: Air pollution and Water Pollution. Some techniques and methods have been given to control pollution caused by this industry such as pulse jet bag filtration technique and control of air pollution by using the method of absorption. To control the pollution the most important step is the waste management which can also help the industries to overcome economical loss upto some extent. Some techniques and methods have been given to manage the waste in some of the processes used during the production of textiles. The textiles are not only solution to the problems like pollution but these are also being used to control the natural hazards like soil erosion. The use of various types of geotextiles can control the soil erosion in the prone areas. The textile are the solutions to the problems which have been raised during their processing.

DEVELOPMENT OF NATURAL MULTIFUNCTIONAL MASK

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ABSTRACT

This project deals with the development of multifunctional non-woven fabric mask, including Anti-microbial finishing using natural essential oil.A kind of multifunctional mask with Non-woven cloth of the present invention; pass through the fibrous raw material in the blending ratio of 60:40 of Bamboo fibre and Banana fibre. Both the rawmaterials are being natural,ecofriendly and easily available in the market.The Two fibres blended together undergoes web forming process to produce the non-woven fabric with the process of needle punching technique. Finally, the finishing process is done with teatree(Melaleuca alternifolia)essential oil with squeezingrollers,which has various benefits in respirational properties.The final process undergoes various testing process and then result of the finall product is less weight and thin;water absorption is good ,good permeability,and with antimicrobial protection,can effectively inhibts the growth of bacterias and viruses.

KEYWORDS: - *Multifuctional, Non-woven, Mask,rawmaterials, Natural, Ecofriendly, Blending, Webforming, Needle punching, Melaleuca alternifolia oil,Finishing,Testing.*

1. INTRODUCTION

Natural fibers have always attracted scientist's attention because of their advantages from the environmental standpoint, but almost all the research has been focusing on cellulose from vegetable sources. Environmental concerns have always appreciated the study to substitute synthetic materials with the different variety of natural materials. Many scientists have focused their research work on expending materials from nature. Composite material can be defined as a material system composed of two or more dissimilar constituents, differing in forms, insoluble in each other, physically distinct and chemically inhomogeneous . One such example is the operative use of cellulose obtained from plants that have been explored for several decades. Bamboo has many advantages as a material choice. It grows faster than any other woody plants, making it highly renewable. Bamboo fabric is similar to the softness of silk. Since the fibres are without chemical treatment, they are naturally smoother and rounder with no sharp spurs to irritate the skin, making bamboo fabric hypoallergenic and perfect for those who experience allergic reactions to other natural fibres.Also,banana fibre has various benefits and used to make different products such as eco-papers like tissue, filters and currency paper. Being natural, heat resistant, having high tensile strength, It can be blended with other fibres. Eco-friendly bags are made from banana fibre.The experiments were conducted by varying the comparison of the orientation of Other natural fibres to produce the mask material which is evaluated from thermal properties of the material and area density. By blending of these two fibres and to finish the fabric by Melaleuca alternifolia which is highly beneficial essential oil to Inhibits the growth of Bad bacterias and have Anti-microbial properties. The final Ecofriendly product have a lightweight, strong, porous and hydrophobic,completely natural, also Easy respiratory facemask,it is potentially used by the consumers.

1.1 OBJECTIVES

- To produce the Non-woven fabric from Bamboo fibre and Banana fibre in the blending ratio of 60:40.
- To produce the fabric undergoes needle punching method followed by web forming process.
- To Ensure its Multifunctional property, the fabric is finished with natural essential oil of (Melaleucaalternifolia)Tea Tree by squeezing rollers.
- To check the properties by testing methods.

2. MATERIALS AND METHODOLOGY

2.1 MATERIALS

• Bamboo fibre

FIGURE 1

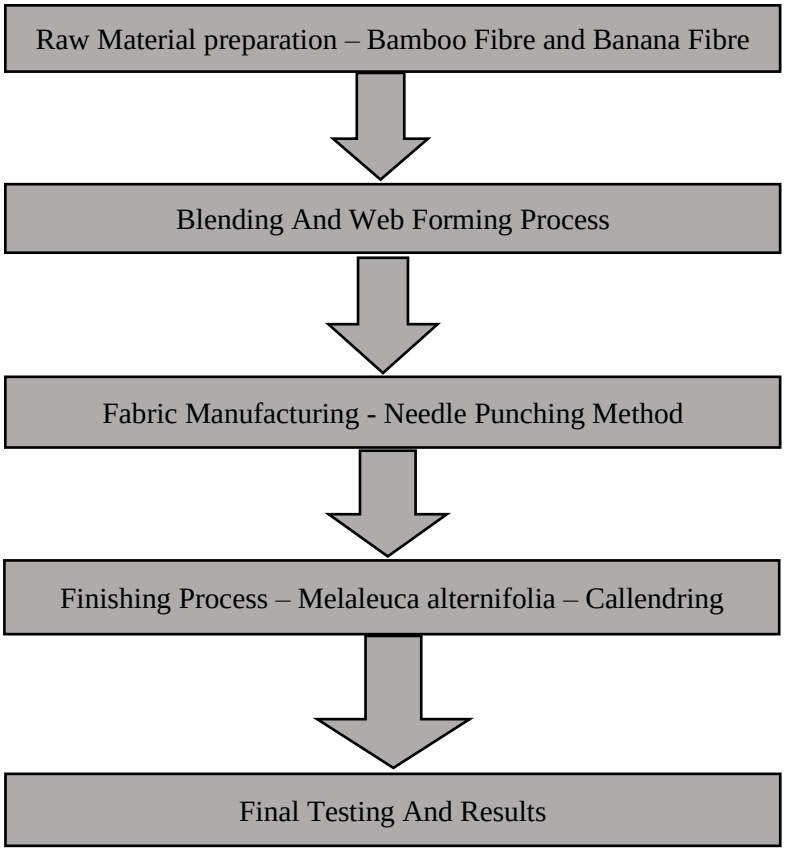
• Banana fibre

FIGURE 2

• Melaleuca Alternifolia Oil.

FIGURE 3

2.2 METHODOLOGY



3. TESTING METHODS

- Air & Water Permeability Testing
- Filtration Efficiency Testing
- SEM
- FTIR
- Element Analysis

4. CONCLUSIONS

The COVID-19 pandemic has forced the global population to adopt new ways of living, including the wearing of masks as a new norm. Everyone has to be aware of wearing masks in this pandemic.We took some efforts to produce the mask which is completely consumer friendly,natural and eco-friendly product.This was followed by R&D efforts in the engineering of multifunctional masks with properties such as antimicrobial activity. the fight against any infectious diseases requires efforts and solutions in prevention, detection, diagnosis, and treatment. The wearing of masks therefore serves as a key strategy towards airborne disease prevention that cannot be easily substituted.Therefore,this non-woven mask servers as a best mask with convenient benefits.

5. ACKNOWLEDGEMENT

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DEVELOPMENT OF A WEARABLE ANTENNA

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ABSTRACT

With the rapid development of wireless communication technology, the area of wireless body area network (WBAN) is gaining much prominence. WBAN links various electronic devices in and on the human body. One of the key attributes affecting the performance of textile-based antennas is related to multipath fading. This arises from many aspects, particularly the physical characteristics of a wearable antenna. The movement of the human body can produce shadowing, polarization mismatch, and undesired scattering by both the body as well as the environment. To improve performance and overcome multipath fading, the antenna diversity technique can be adopted for off-body to on-body communications. In addition, the effect the human body has on the antenna's performance needs to be considered owing to its proximity with the radio frequency sources. The human body has a high dielectric constant and low conductivity at microwave frequency and thus may affect the functioning of the antenna. There is constant research in the field of developing electroconductive polymers in order to produce electroconductive yarns. However, since the research involved, and the materials proposed at the present are not economical and increase the manufacturing costs of patch antennas made from such conducting polymer materials. The project undertaken aims at developing a wearable antenna predominantly composed of textile substrates that owing to its flexible nature and economic aspects can be produced at a larger scale and improved by reiterative runs. An attempt has thus been made to focus on the hardware fabrication and software simulation of textile-based microstrip patch antennas.

KEYWORDS :- *wireless body area network, multipath fading, electroconductive fabric, dielectric constant, etc.*

1.Electroconductive Textile Substrate Formation

1.1 Yarn Formation

We made the conductive yarn by means of doubling process. The doubling process was carried out by twisting 2 cotton yarn with a copper filament to give the resultant conductive yarn. The cotton yarn used for the doubling process was procured from the Shiv Shakti Mills, Bhiwandi. The count of the cotton yarn used for the doubling process was 20s Ne. We decided to make use of the coarse yarn so that the resulting conductive yarn could have sufficient strength to withstand the shedding forces experienced during the fabric formation stage. The conductive property of the yarn is due to the presence of a copper filament into the yarn structure. A 42 gauge copper filament was used so that sufficient tenacity along with optimum bending modulus for the end use application. The resultant count of the conductive yarn thus formed from this process was 3.43 Ne. The entire yarn formation process was done on the yarn doubler machine present in the spinning workshop of the Textile Department in VJTI, Mumbai.

1.2 Electroconductive Fabric Formation

The electroconductive fabric formation was done by making use of the electroconductive yarn made in the previous process. The weaving was done by means of simple handloom machine present in the Textile Department in VJTI, Mumbai. Two different fabric samples were prepared. One with an EPI of 24 and the other with and EPI of 28. However, in the actual antenna fabrication, only the fabric sample with an EPI of 28 was used for all the purposes. The different fabric parameters for both the samples are as summarized in the table below.

Table-1 The specifications of the two types of substrates

Fabric Parameters	Sample 1	Sample 2
EPI	24	28
PPI	28	30
Reed Count	24	28
Fabric Width	20 cm	20 cm

Figure-1: Unravelled Electroconductive Fabric Sample

2.Fabrication of the Microstrip Antenna

2.1 Antenna System 1

In this system, the substrate is made up of the electroconductive fabric while a thin copper strip is used for the radiating patch and the ground plane. A coaxial feed system is used for exciting the radiating patch. The entire substrate is made us by sandwiching multiple layers of electroconductive fabric over one another to form a substrate with required thickness of 3mm. The antenna is designed to have a resonating frequency of 3.5 GHz. A circular patch shape is used for making the radiating patch. The SMA connector is connected from the bottom side of the antenna by means of soldering with electric solder.

Fig-2: The first antenna system

2.2 Antenna System 2

In this system, the radiating patch and the ground plane is made up of electroconductive fabric while the substrate is made up of Polypropylene nonwoven web. The thickness of the Polypropylene web is 6mm. The SMA connectors are from bottom of the ground plane. However, soldering on the textile substrate causes issues thus the radiating patch and the ground plane were connected by means of silver conductive paint.

Fig-3: The second antenna system

Table-2 Different components of both the systems

Parameters	Antenna System 1	Antenna System 2
Resonant Frequency	3.5	2.1
Substrate thickness	3 mm	6.5 mm
Radiating Patch Element	Copper Sheet	Electroconductive fabric
Ground Plate Element	Copper Sheet	Electroconductive fabric
Substrate Dielectric Constant	-	2.2
Patch Shape	Circular	Rectangle
Dimensions	45x25x3 mm	80x65x6.5 mm

3. Testing and Analysis

3.1 Determination of Yarn Count

The yarn count can be measured by measuring the length of the yarn weighing a pound. The length of the yarn can be measured by means of a wrap reel which is commonly used in the textile industry while the weight of the yarn can be measured by means of Analytical balance, Knowles balance or Quadrant balance. A Beesley's balance system can be used to get the yarn count directly from the balance with significant reliability. The count of the conductive spun on the doubler machine was found out to be 3.43 Ne.

3.2 Textile Testing

The strength of a yarn is one of its most important characteristics. A tensile testing machine is used for measuring the tensile test of the yarn. Yarn extension also plays a considerable role in the processing of the yarn and in the end-use properties of the fabric produced. Number of tensile testing instruments are widely prevailing in the industry working on different principles.

The tensile testers are designed to test single yarn strength or a lea strength. However, in case of conductive yarns generally single yarn strength is measured. It was found that the resultant electroconductive yarn contains 67.44 % copper by weight while the remaining 32.66 % is made entirely of cotton. Thus, the electroconductive yarn made in Textile Department of VJTI, Mumbai shows considerably conductivity.

3.3 Impedance Measurement

It was found that the resultant electroconductive yarn contains 67.44 % copper by weight while the remaining 32.66 % is made entirely of cotton. Thus, the electroconductive yarn made in Textile Department of VJTI, Mumbai shows considerably conductivity.

3.4 S_{11} Measurement

S_{11} is a measure of the power reflected back at the antenna port due to the mismatch from the transmission line. When connected to a network analyser, S_{11} measures the amount of energy returning to the analyser and not what is delivered to the antenna. The amount of energy that returns to the analyser is directly affected by how well the antenna is matched to the transmission line. A small S_{11} value indicates a significant amount of energy has been delivered to the antenna. S_{11} values are measured in dB but have a negative value, for eg. -10 dB. S_{11} is also referred to as return loss which is simply a negation of the S_{11} value having a positive value, (i.e Return Loss = - S_{11}). So if the antenna Return Loss is 8dB then the S_{11} value is -8 dB.

[4]. Conclusion

Upon the completion of our project we made the following assessment of our work: This project helped us to acquire the knowledge of a completely different domain which couldn't be possible with the normal coursework of the college. The overall working of the antennas was understood because of this project. The major parameters (such as Return Loss curve, Radiation Patterns, Directivity and Beamwidth) that affect the design and application were studied and their implications understood. We got a chance to understand the IE3D software and its exact functioning for getting the simulated results. It was concluded that the hardware and software results which were obtained matched the theoretically predicted results.

STUDY OF POLYESTER HIGHLOFT TEXTILES FOR THE ACOUSTIC & THERMAL INSULATION APPLICATIONS

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ABSTRACT

In our project deals with a "STUDY OF POLYESTER HIGHLOFT TEXTILES FOR ACOUSTIC & THERMAL INSULATION APPLICATIONS". High-loft textiles are termed as bulky nonwovens. They are defined as low density bulk fiber structures with high thickness ratio of the basis weight. While the fibers may be finite or infinite, bonded or un-bonded. The bulk fabric contains no more than 10% of the solid component in the whole volume and their thickness is greater than 3 mm. The bulkiness of these materials influences the consumption and utilization of fibre raw material, compressibility, Acoustic and thermal insulation properties. Bulky fabrics are most commonly usedin upholstery, as liners and stuffing materials (clothing, sleeping bags, blankets) as structural and reinforcement materials, insulation (thermal and acoustic) and healthcare. Usage depends on the technology of producing the fibrous web and the method of its consolidation. In our project, we are using Polyester & Low melt PET fiber (which is acts as a 'binder' for the high-loft material) blended. We are using 4 samples in different deniers of polyester fibers. Which are produced by the 'STRUTO' (vertical laid & thermal-bonding technology). After produced the polyester high-loft material samples, are taken out to the next step. To scrutinize the effect of GSM of high-loft material on the acoustic and thermal insulation behavior. And, investigate the compression of the produced samples. Finally, the 4 fabric samples (polyester & low melt PET blended non- woven high-loft material) are, taken out to analysis their sound absorption for acoustic applications. Some additional testing methods also taken such as, thickness, density, resistance to compression & recovery, resistance to compression, sound absorption & transmission materials, thermal conductivity .The other test methods are carried out to determined, whether, the produced polyester & low melt PET (blended) non-woven high-loft material samples are suitable for the required applications or not.

KEYWORDS:-

Bulky non-woven, Polyester, low melt PET fiber (binder),'STRUTO' (Vertical laid& thermal – bonding technology), Acoustic behaviors, Thermal insulation, Thickness, Compressibility

1.INTRODUCTION

1.1HIGH-LOFT TEXTILES

High-loft textiles are termed as bulky nonwovens. They are defined as low density bulk fiber structures with high thickness ratio of the basis weight. A term given to a fiber structure that contains more air than fiber. It is a lofty, low-density material that is used in such applications as fiberfill, insulation, etc.

General term for a fiber structure containing more air than fiber. In general, higher loft retains warmth. While the fibers may be finite or infinite, bonded or un-bonded. The bulk fabric contains no more than 10% of the solid component in of the whole volume and their thickness is greater than 3 mm. The bulkiness of these materials influences the consumption and utilization of fibre raw material, compressibility, acoustic and thermal insulation properties.

Bulky fabrics are most commonly used in upholstery, as liners and stuffing materials (clothing, sleeping bags, blankets) as structural and reinforcement materials, insulation (thermal and acoustic) and healthcare. Usage depends on the technology of producing the fibrous web and the method of its consolidation.

Fundamentals features of composite materials are high strength, light weight fatigue resistance, high stiffness, fire resistance, flexibility and thermal resistance.

2.Objectives:

d) To produce high loft material using polyester fibre. Production of high loft material using “STRUTO” (Vertical laid and thermal bonding) technology.
2. High loft textiles produced using polyester fibre and low melt PET which acts as binder for the high loft material.
3. To analyze the effect of GSM of high-loft material on the acoustic and thermal insulation behaviour. And, investigate the compression and recovery behavior of produced samples.
4. To analyze their sound absorption property for acoustic applications

2.1 Study of POLYESTER & LOW melt PET fiber :

POLYESTER:

Both polyesters can be easily molded or thermoformed and have many attractive properties, like high strength & toughness , good abrasion & heat resistance , low creep at elevated temperatures, good chemical resistance and excellent dimensional stability, particularly when, glass-fiber reinforced. Polyester fiber is used as cushioning and insulating material in pillows, comforters and upholstery padding.

Physical properties		Original value
Tensile strength, ultimate	-	10.0 – 123Mpa
Elongation at break	-	0.50 – 2.40%
Modulus of elasticity	-	1.00 – 10.6 Gpa

Melting Point	-	260^{o} C
Flexural Yield (Strength)	-	53.8 – 265Mpa
Safe ironing Temparature	-	325^{o} -350^{o} F
Specific Gravity	-	1.22 – 1.38
Moisture Regain	-	0.4 - 0.8

2.2 Some other applications of POLYESTER:

Polyester are also used to make bottles, films, tarpaulin, sails(Dacron), canoes, liquid crystal displays, holograms, filters, dielectric film for capacitors, film insulation for wire and insulating tapes.

Non-woven polyester fabric :

- Anti-static
- Biodegradable
- Custom machined colors
- Flame Retardant
- Heat sealability
- Hydrophilic
- Printing
- Anti-microbial / anti-bacterial

Low melt PET fiber: (acts as a " binder ")

Made by, mixing general and modified polyester, low melt fiber can be melted at lower temperatures than normal fiber and bonded with other fibers like solid polyester and recycled materials. Non-woven fibers are run through either a hot-air oven, a calendar or an infra-red heater. This leads to soldering the fibers together when the low melt fibers melt and flow around the standard polyester fibers. For, high loft non-wovens, this is the primary bonding method and a secondary one when needled non-woven fibers are to be heated to give more strength.

Properties of melt Fiber:

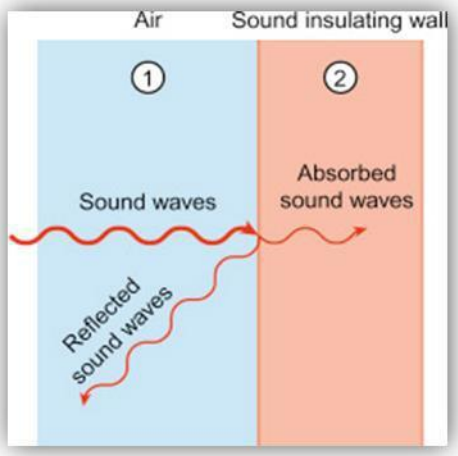
- It bonds well as it provides diverse melting points by controlling the sheath part i.e; modified polyester.
- It has lower melting points, that's between 110^{o}C to 180^{o}C than other fibers.
- After, being combined with other fibers, the bonding strength remains durable semi-permanently.
- As, it is homogeneous with other types of fibers, it blends easily.
- It is recyclable, which is a great feature considering people who are seeking greener options.
- The fiber has a remarkable heat bonding property.
- Low melt fiber have stable structure thereby, can be processed smoothly into any other form.
- The fiber is used in different applications as it is highly resilient.

Polyester Low Melt Fiber :

Tenacity GPD	:	> 5.8
Breaking elongation Rate	:	13%
Thread density	:	2%
Double length fiber content	:	< 10mg/100gms

2.3 Factors influencing the sound absorption:

Sound absorption is the measure of the amount of energy removed from the sound wave as the wave passes through a given thickness of material. Fig. is a schematic representation of sound absorption and reflection of an insulating wall. While propagating from air into an absorbing material, the sound wave could experience reflection or absorption thereby losing energy, experiencing



dampening effects. In a polymeric material sound absorption takes place by transforming sound waves into heat. Sound absorption is necessary for soundproofing. Materials with their characteristic impedance similar to air are regarded as best soundproofing materials thus Foamed plastics are the preferred materials for such applications. Typically, elastomers and amorphous polymers show higher sound absorption properties as compared to semi-crystalline or crystalline materials.The factors that influence sound absorption, such as bulk density, composite thickness, porosity, fibre diameter, airflow resistivity, tortuosity and surface impedance.

2.4 Investigation on the sound absorption behaviour & Thermal properties of "STRUTO" non-wovens by establishing relationship between these properties:

Investigation on the sound absorption behavior and thermal properties of Struto nonwovens by establishing relationship between these properties. Seven Struto nonwoven fabrics were selected to examine the noise reduction coefficient (NRC) and average values of sound absorption coefficients ($\bar{\alpha}$) as well as thermal properties, including thermal conductivity and thermalresistance. The Brüel and Kjær impedance tube instrument and Alambeta were used for the evaluation of acoustic and thermal properties, respectively. The influence of structural parameters on acoustic and thermal properties of Struto nonwovens were investigated and analyzed. The results showed that Struto nonwovens with higher thickness, finer fibers and higher fabric grams per square meter can provide better sound absorption performance.

The effect of specific airflow resistance on sound absorption performance was also investigated. It is observed that sound absorption performance has a strong correlation with specific airflow resistance. The effect of porosity on specific airflow resistance and thermal properties was studied in detail. The result indicated that porosity has a strong correlation with specific airflow resistance and thermal properties. It was also observed that sound absorption, the NRC and $\alpha\overline{\overline{\ }}\alpha^{-}$ have an insignificant correlation with thermal conductivity, while they are strongly correlated with thermal resistance. The correlation coefficient of the NRC with thermal resistance is 0.9835, indicating that the NRC is directly proportional to the thermal resistance of STRUTO nonwovens.

2.5 "STRUTO" Vertical laid & Thermal Bonding Technique & other Testing Methods:

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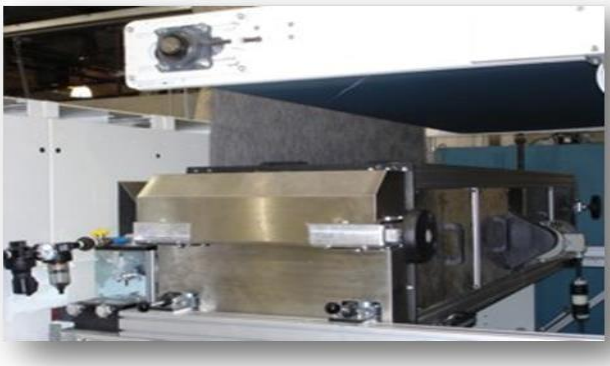

And other test parameters:

19 Resistance to Compression & Recovery

20 Sound Absorption & Transmission of Materials

21 Thermal Conductivity

22 Thermo-Gravimetric Analysis (TGA) &

23 Differential Scanning Calorimeter (DSC)

6

3. MATERIALS AND METHODS

3.1 Materials & instruments:

S.No	Details
6.	Fibre used: Polyester fibre
7.	Denier: 0.8, 1.8, 2.6 and 15 denier
8.	Low melt polyester: 20% by weight
9.	GSM: 150, 200, 300,400

3.2 TESTING METHODS AND INSTRUMENTS

S.No.	Test	Instrument	Testing Standard
1	Thickness	Thickness tester	DIN 53855
2	Density	Density tester	CSN 80 0845
3	Resistance to compression and recovery	Compression tester	CSN 64 5441
4	Resistance to compression	Tensile tester LABTEST 2050	DIN 54 305
5	Sound absorption and transmission of materials	Impedance Tube for sound insulation	ASTM E-1050, ASTM E -2611 , ISO 10534-2
6.	Thermal Conductivity	Thermal conductivity Tester	ASTM C518, ISO 8301, JIS A 1412, DIN EN 12939. DIN EN 13163 and DIN EN 12667
7.	Thermo-gravimetric analysis (TGA) and Differential Scanning Calorimeter (DSC)	DSC / TGA (Q600) (TA instruments) equipment	

3.3 PROCESS SEQUENCES OF OUR PROJECT

Analysis the properties of POLYESTER & Low melt PET (acts as a “binder”)

Produce the non-woven fabric in (0.8D,1.8D , 2,6D, 15Dd) of polyester fiber bounded with low melt polyester (20% by weight) using “STRUTO” technology (vertical laid & thermal bonding)

Analysis the effect of GSM of high-loft material on the acoustic & thermal insulation behaviors

Investigate the compression & recovery behavior of our sample

Other test methods are takes place [Thickness , Density, Resistance to compression and recovery, Resistance to compression, Sound absorption and transmission of materials, Thermal Conductivity, Thermo-gravimetric analysis (TGA) and Differential Scanning Calorimeter (DSC)]

Finally, to analyze the sound absorption property for acoustic applications & Thermal insulation property for insulation applications

- **CONCLUSIONS**

An innovative research has been carried out, on the resistance to compressibility and recovery , sound absorbtion and transmission of materials ,acoustic performance and thermal insulation properties of " HIGH LOFT POLYESTER FIBER ".

5.ACKNOWLEDGEMENT

The Students can acknowledge any person/Studentities in this section**. This is not mandatory.** We express our sincere gratitude to our chairman **Dr.B.K.Krishnaraj vanavarayar,** correspondent **Shri.M.Balasubramaniam** and our sincere gratitude to our joint correspondent **Shri.K.Shankarvanavarayar** and our principal **Dr.J.Srinivasan** for their support and for providing the required facilities for carrying out this study.

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ENHANCEMENT OF YARN QUALITY BY DOUBLE ZONE APRON DRAFTING SYSTEM IN COMPACT RINGFRAME

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ABSTRACT

Spinning process is the most important stage in entire textile manufacturing, which decides the overall Quality of the material, out of all spinning systems out there, Ring spinning is the versatile one in terms its quality Ring Spinning System, compared to rotor and air-jet spinning, is capable of giving much stronger yarn and a fabric of much better hand and good quality in most of the aspects. Some of advantages of Ring spinning are Production of high strength yarns, spinning of fine count yarns, it is universally applicable (any material can be spun), The know-how for operation of machine is well established accessible to everyone, it is flexible as regards quantities (blend and lot size), Since the speeds in drawing section are best controlled, yarn evenness is excellent. But if short fibers are too much, yarn unevenness occurs, Fine yarns can be produced as compared to open-end system. Though it has a good quality in most of the aspects. It still needs further Quality improvements in terms of fibre guidance in drafting zone, Existing fibre guidance is good only, but if we give further guidance by adding one extra apron in the Back drafting zone, Certain quality parameters will improve better. This project is working on Spinning Technology especially Quality improvement with the help of double zone apron implementation in compact spinning machine. This project is focusing on improving the quality of Compact Ring spun yarn with the implementation of double zone apron in compact spinning. This project develops a better guidance for the fibers in the drafting zone, so that some quality parameters of the yarn improved like RKM, Hairiness, and Single yarn strength CV% etc.

KEYWORDS : - *Compact spinning, Further Quality Improvement, Double Zone apron, Break draft zone*

1. INTRODUCTION

Ring spinning is the one of the conventional spinning system. Spinning methods are drastically developed in technology wise, but we can't achieve the higher yarn quality in other spinning system. Comparatively productivity was very low in Ring spinning technology than others. So, in this project, we are going to improve the Ring spinning Yarn quality by mechanical modifications.

Due to improper and insufficient fibre guidance in drafting zone, the yarn quality is deteriorated. The aprons must be pressed against the bottom apron with controlled force in order to provide guidance. So, we all know the apron guidance in main drafting zone was help full for fibre guidance and avoid the formation of drafting waves. As the apron guidance bring fibre guidance, we are implement the additional guidance to the fibres in break drafting zone by double zone drafting system along with correct machine & process parameters. We have implemented the additional apron guidance in break draft zone and collected the yarn samples in ideal condition for yarn quality comparison. As per our expectation, we have observed the improvement in yarn mechanical, evenness and structural parameters.

2. PRINCIPLE OF INVENTION

The figure 1 is the pictorial representation of drafting system in existing compact ring frame. There is an apron in main drafting zone to ensure the fibre guidance in higher drafting force and to avoid the formation of drafting waves on final yarn. Through this apron guidance in main drafting zone, the yarn quality was improved. In-between the apron

the spacer also used to maintain the gap between top and bottom aprons. So the aprons are ensuring the fibre guidance in main draft zone until front roller nip.

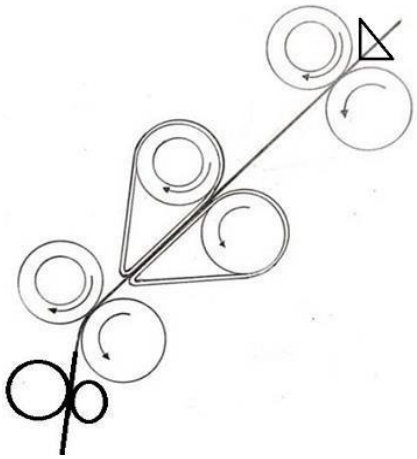

Figure -1: Pictorial representation of Drafting system in Existing compact ring frame

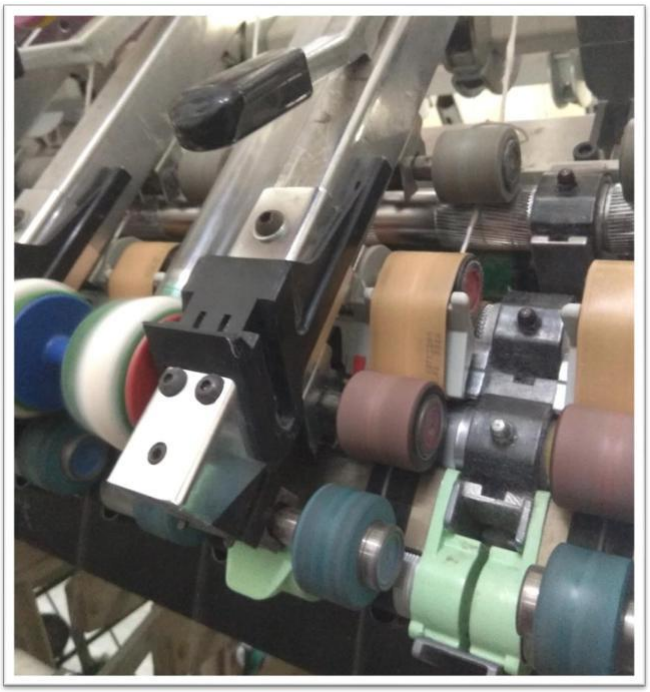

Figure -2: Machinery representation of Drafting system in Existing compact ring frame

The figure 3 shows the pictorial representation of drafting system with additional apron guidance in break draft zone of compact ring frame. Modification implemented with additional apron & nose bar in break draft zone by assembling components. Due to provision of additional fibre guidance, it will allow the fibre movement in controlled manner, it makes an easy drafting in-between the aprons. The yarn samples collected from this both existing and double apron drafting system, and quality of both yarn samples are tested in various aspects. Due to the positive fibre guidance in break draft zone, the improvement found in double apron yarn quality results when we compare with existing yarn quality results.

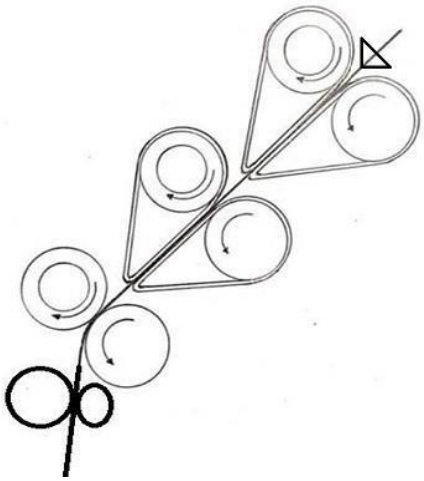

Figure -3: Pictorial representation of Drafting system with Double apron guidance in compact ring frame

Figure -4: Machinery representation of Drafting system with Double apron guidance in compact ring frame

3.SIGNIFIGANT & PERCENTAGE OF IMPROVEMENT IN DOUBLE APRON YARN QUALITY RESULTS

As per the Table 1, the following quality parameters are tested for Double apron system yarn sample and it is compared with existing yarn sample. The significant difference & percentage of improvement on yarn quality parameters due to double apron guidance are observed and given in Table 1.

Table -1: Double apron system yarn quality results

S.No	Parameters	Significant status	Percentage of Difference
1	Count Cv %	Significant	38 % Improvement
2	TPI Cv %	Significant	51.5 % Improvement
3	CSP	Significant	12.40 % Improvement
4	RKM	Significant	12.75 % Improvement
5	Elongation	Significant	36 % Reduction
6	U%	Significant	8.25 % Improvement
7	Cv% (m)	Significant	8.5 % Improvement
8	Cv% (1m)	Not Significant	4.5 % Improvement
9	Cv% (3m)	Not Significant	5.9 % Deteriorated
10	Thin/Km -30%	Significant	41.57% Improvement
11	Thin/Km -40%	Significant	67.41 % Improvement
12	Thin/Km -50%	Significant	82 % Improvement
13	Thick/Km +35%	Significant	28.2 % Improvement
14	Thick/Km +50%	Significant	38.5 % Improvement
15	Thick/Km +70%	Significant	50 % Improvement
16	Neps/Km +140%	Significant	23 % Improvement
17	Neps/Km +200%	Significant	19 % Improvement
18	Neps/Km +280%	Not Significant	21% Improvement
19	Neps/Km +400%	Not Significant	21 % Deteriorated
20	Normal Sensitivity level	Significant	27.7 % Improvement
21	Higher Sensitivity level	Significant	29 % Improvement
22	Hairiness	Significant	4.8% Improvement
23	Lint Shedding waste	Significant	12 % Improvement

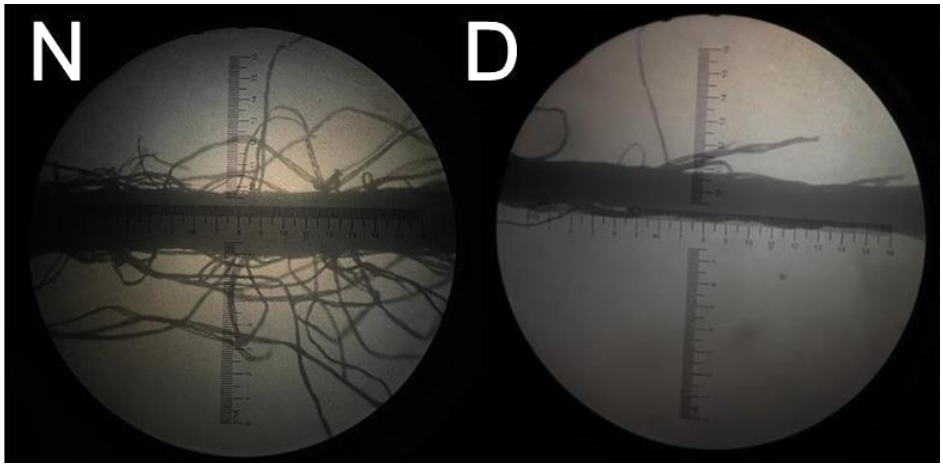

Figure -5: Structural attributes & appearance of existing yarn sample (N) and Double apron system yarn sample (D)

4. CONCLUSIONS

The Double apron guidance system was implemented successfully in compact ring frame with carded feed material. The following conclusions were made from the various yarn quality results.

Here D = Double apron drafting system, N – Existing Drafting system

- Comparatively the yarn U%, CV% (m), CV% (1m) found good in D due to low machine added irregularity in D.
- Higher yarn RKM & CSP observed in D, due to higher fibre guidance, reduction of floating fibres, and higher no of fibre presence in yarn axis, uniform drafting and fibre distribution leads to reduction no weak places. As per microscopical image, no of hairiness on yarn surface was low in D, So it will indirectly show about how the fibre are tightly binding inside of yarn, and it may lead to higher backing density of yarn in D. One of the indirect evidence for higher packing density is lower lint shedding waste in D.
- The higher single yarn strength was contributed lot for Higher CSP in D.
- Due to the additional & positive fibre guidance in D, the fibre drafting may happened in uniform manner, it leads to uniform fibre distribution. There is a more possibility of fibre presence inside the yarn outer surface in D, so these are the possible reasons for lower imperfection in both normal sensitivity level and higher sensitivity level in D. Number of Neps also reduced in D.
- Lower elongation% found in D due to the positive & entire surface guidance to fibres in 2 drafting zones leads to improvement in the possibility of fibre de crimping - elongation - sliding. Higher fibre orientation in yarn axis, presence of floating fibres and its contributed less for fibre sliding operation. So these are all the possible reasons for lower elongation in D.
- So as a final concluding point, if we need higher mechanical attributes & lower imperfection level, and good evenness results on yarn we can implement Double zone apron guidance in Ring frame. And most the quality parameters have a significant difference from existing yarn quality results.

5

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ANDROID APPLICATION WITH COMPLETE COLOR-BLIND ASSISTANCE FOR E-COMMERCE PLATFORM AND VIRTUAL TRIAL ROOM

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ABSTRACT

When within the world of eCommerce, it is important to make sure all corners are covered when catering to customers. But at present, the eCommerce platforms are designed so that they cannot be easily used by colorblind people .Color blindness occurs when you are unable to see colors in a normal way. It is also known as color deficiency. Color blindness often happens when someone cannot distinguish between certain colors. Approx. 40 million people in India suffer from complete or partial color-blindness out of which 20 million people are youth who share the same fashion goals or look trendier. Due to lack of proper perception of colors, fashion is many-a-times limited for colorblind people and they are often dependent on others for their fashion needs. This paper discusses the existing problems being faced by the color-blind community on E-commerce .platforms and presents 'Vizija'- an android application that provides LMS Algorithim based several unique and configural filters so that the colors are more visible to the color-blind . Ishihara Test (color-blindness test) is available on the application as well. It has a color-blind friendly virtual trial room, that takes into account one's body posture and fits the clothing accordingly. Vizija also provides an audio description to the visually-impaired user to make shopping easier.

KEYWORDS :- *Color-blindness, Protanopia, Deuteranopia, Tritanopia, Daltonization, LMS , Virtual Trial Room*

1. INTRODUCTION

Color blindness affects approximately 1 in 12 men and 1 in 200 women in the world. Most people with color blindness have an ability to see things as clearly as other people but they unable to see red, green or blue light clearly. There are extremely rare cases where people are unable to see any color at all. There are different color blindness causes. For the most people with color vision deficiency, the condition is genetic and has been inherited from their mother. Also, there are some diseases causing color blindness such as diabetes and multiple sclero- sis or acquiring the condition over time due to the aging process, medication and so on .

For human vision, there are two types of photoreceptors: rods and cones. Rods are sensitive to light while cones are sensitive to colors. Cones have three types; L-cones which are sensitive to long wavelength (red), M-cones which are sensitive to middle wavelength (green), and S-cones which are sensitive to short wavelength (blue). Ac- cording to these cones, there are three types of color blindness 1) Mono- chromacy, in which no cones or only one cone type exist, 2) Dichromacy, in which one cone type is missing, which can be of three types: Protanopia, in which L-cones are missing, Duteranopia, in which M-cones are missing, and Tritanopia, in which S- cones are missing, and 3) Anomalous Trichromacy, in which there is a reduction in the sensitivity to a particular color, which can be of three types: Protanomaly

which corresponds to a reduced sensitivity to red light, Deuteranomaly which corresponds to a reduced sensitivity to green light, and Tritanomaly which corresponds to a reduced sensitivity to blue light. Protanopia and Deuteranopia are the two types of red-green color blindness. Tritanopia is known to be blue-yellow color blindness. [1]

2. LITERATURE REVIEW

The Color-correction mode available on phones is not satisfactory as this technology is not meant to correct colors, it's meant to change them to colors you can see so that you can differentiate them more clearly from one another.The screen shows highly saturated colours, appears tinted, or has colour cast. It makes the red a pink shade and keeps the green fairly normal. This way if a person is looking at a red and green image, these color would be shifted apart to a dark green and light red which shows up much better. (which can be achieved with LMS Daltonizaton) [2]

Overviewing the existing color-blindness assistance apps,they usually offer naming and identification of the colors or works on adjusting the contrast and saturation or highlighting the pixels.They don't offer much help for a color blind person who wants to shop online. [3]

As colour vision deficiencies affect men substantially more than women, one area of the web where it's extra-important to pay attention to colour choices and design decisions is in online shopping, especially if you sell clothing for men.One of the most common annoyances from people with colour vision deficiencies is that they may have difficulty understanding the true colour of a piece of clothing and they'll have to ask another person to confirm the colour for them. While it's easier to shop online than in a physical store, there are still accessibility issues to consider on shopping websites. The color 'Filter' feature provided on the websites adds to the difficulty by use of color names like "mist," "loganberry," or "woodrush" which are used to make the product sound fancier rather than focusing on serving the purpose. [4]

LMS daltonization is a procedure for adapting colors in an image or a sequence of images for improving the color perception by a color-deficient viewer. The process of LMS daltonization uses the information lost in the CVDs so as to improve the original image .

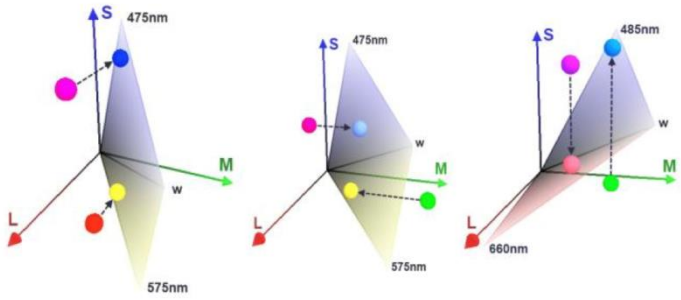

Figure -1: Illustrations of the technique for simulating (a) protanopia (left), (b) deuteranopia (center), and (c) tritanopia (right).

Daltonization is a procedure for adapting colors in an image or a sequence of images for improving the color perception by a color-deficient viewer. The process of LMS daltonization uses the information lost in the deuteranopia simulation so as to improve the original image . Here, the lost information from the original simulation undergoes conversion from the LMS color space to RGB and then it is mapped to the wavelengths perceptible to the viewer, in this case long and short wavelengths (mostly red and blue). Now this information is shifted to colors that can be seen by the viewer and it is then added back to the image. For this the conversion from LMS to RGB color spaces is to be done. The lost information, now as RGB pixels, is mapped using the following matrix multiplication. [5]

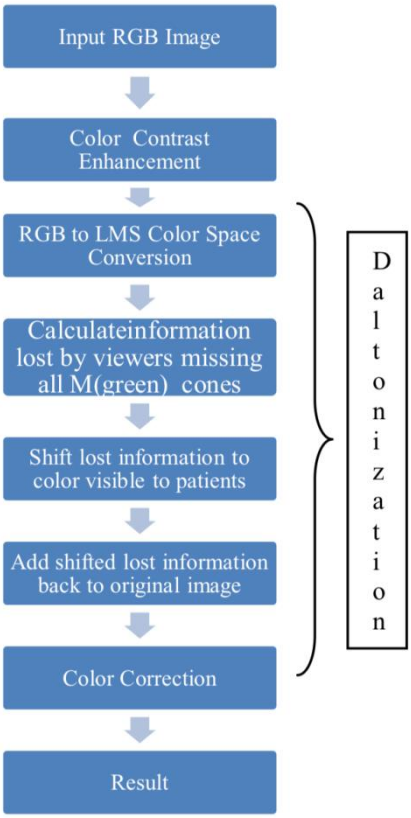

Figure -2 : Process flow of LMS Daltonization

3. METHODOLOGY

3.1 Working of the color-blindness correction models

The LMS algorithm in the developed application is implemented for Protanopia, Deuteranopia, and Tritanopia conditions respectively. It is the most famous algorithm used for color-blindness correction due to reliable results. It's idea is to use the information lost in the simulation of color blindness and use LMS color space to compensate colors missing in each group/type of cones, long (L), medium (M), and short (S) in order to be predictable to the viewer and provide accurate results . [6]

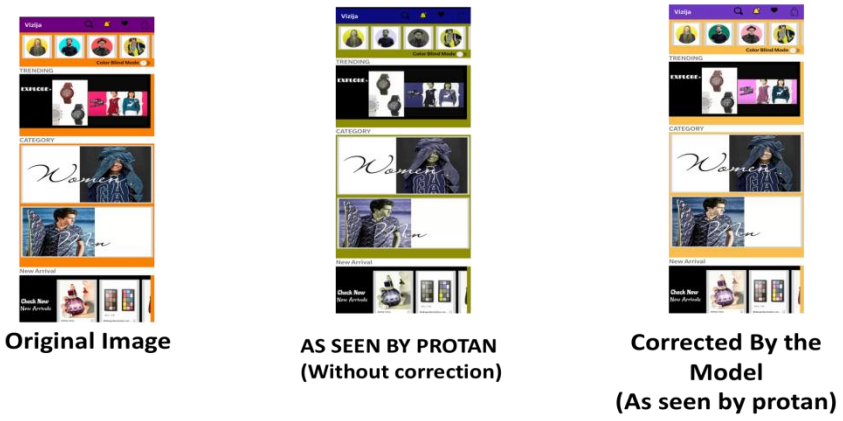

Figure -3 : Correction for protanopia

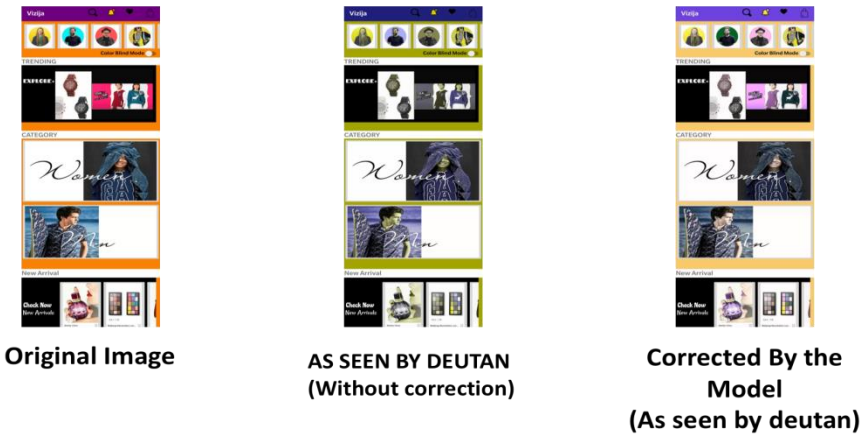

Figure -4 : Correction for deutranopia

Figure -5 : Correction for tritanopia

Key Technologies used in the Virtual Trial Room: OpenCV, Pretrained MPI openpose model: For detecting key points on the body; Pillow: Opening, manipulating and saving different image formats; Detecting and sizing of body: Techniques -Filtering with thresholding, Canny edge detection. Motion and Skeleton Detection by analysing various frames for movement; Face Detection: Using Haar-Cascade Classifiers; Image Masking; Edge Detection: Canny edge detection using Gaussian filters to remove noise; Scaling of attire: According to circumstances takes into account your body posture and fits the clothing accordingly.

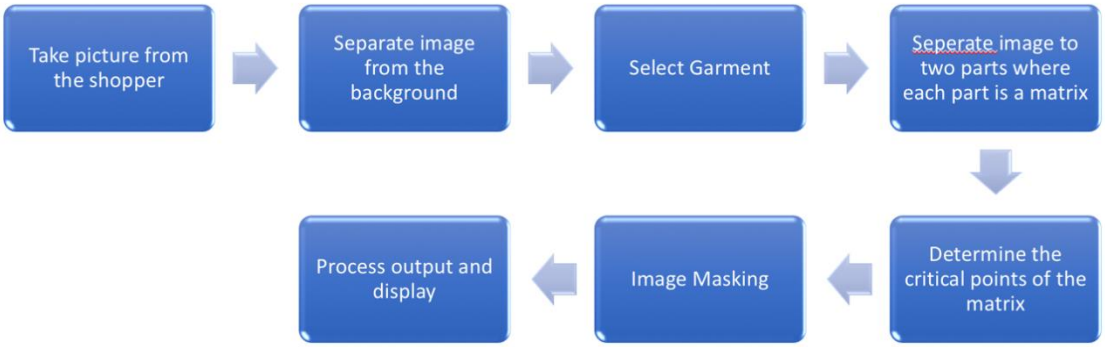

Figure -6 : Process flow of Virtual Trial Room

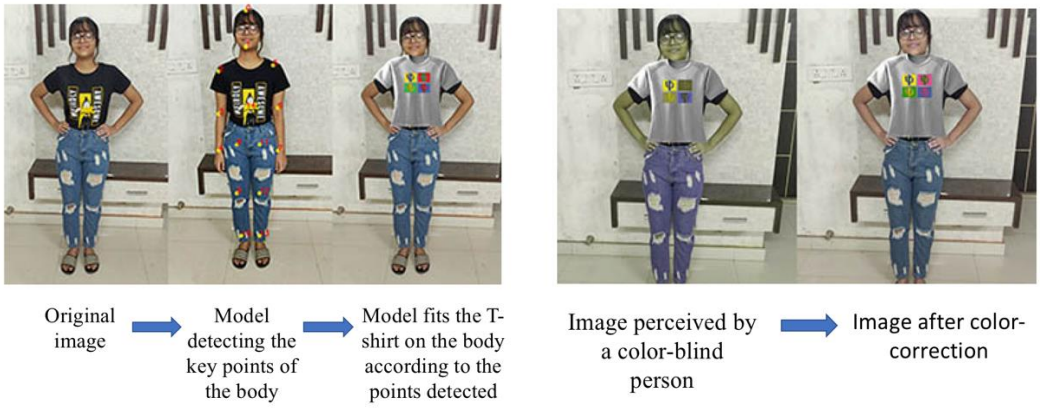

Figure -6 : Working of the Virtual Trial Room

4. CONCLUSIONS

Being the first mover in this spectrum, this will be able to acquire the majority of color blind people. Ultimately, this solution will result in increase of Gross merchandise value significantly.The color-blind population is not only limited to India. If we talk in terms of the world, the colorblind population increases significantly, and hence, our target audience.The color-blind population is not only limited to India. If we talk in terms of the world, the colorblind population increases significantly, and hence, our target audience. The Virtual Trial Room can be made more precise in the future . Through research and communication through blind people, the accuracy of colorblind conversion can be further improved.

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INVESTIGATING THE EFFICACY OF HERBAL SAMBALPULU LEAF EXTRACT, SYNTHESIZED SILVER NANOPARTICLES ON THE COTTON BASED WOUND DRESSING

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ABSTRACT

Silver nanoparticles was synthesized by bioreduction method using an soxhlet extraction of barley grass powder (Hordeum Vulgare lin). The prepared AgNPs were characterized by various techniques including particle analysis, SEM and FTIR. Further these nanoparticles were used for treatment of wound dressing by Pad-Dry-Cure method. Finally the AgNPs finished fabric sample was found to be greyish brown in colour. Then it show good antibacterial activity against two test bacterial (Escherichia coli, Staphylococcus aureus) (EN ISO 20645) test method.

KEYWORDS: *AgNPs ,Hordeum vulgare lin , SEM ,FTIR, Medical application ,antibacterial.*

1. INTRODUCTION

Silver nanoparticle is a good suggestion for applications in medical, pharmaceutical and textile industry due to its good antibacterial properties. Among the different methods to synthesize silver nanoparticles, the green methods have been extensively investigated. The non-toxic materials are used in the green synthesis procedures , and therefore the method is an environmentally friendly . In this process two components are required to concern in the synthesis of silver nanoparticles; silver salt and reducing agent like plant extract, besides it has a stabilizing agent role .

In the current study, the cotton wound dressing was treated with the green synthesized AgNps to obtain antibacterial property. AgNPs were synthesized using *Barley grass* extract as a reducing and stabilizing agent.

2. EXPERIMENTAL SECTION

2.1 Collection of Barley grass plant (Powder)

Barley grass leaves were collected from a Nursery garden, Coimbatore, Tamil Nadu, India. The leaves were pre-washed in deionised water and dried with dry towel and then cut into smaller pieces. The leaves were pre-treated with blanching. The leaves were blanched in hot water (96–98°C) for 90s.

2.2 *Sample preparation – Drying and milling of leaves* (Lin et al., 2012)

The blanched leaves were separated and arranged in aluminium trays in each drying method. The leaves were dried using oven drying (40 °C for 7h, 50 °C for 6h, 60 °C for 4h and 120°C for 15min) using oven dryer until both the blanched leaves reached a moisture content of below 10%. The moisture content of 10% and below is the recommended value for drying of leaves and for powder production. The dried leaves were grounded to powder and the powder was then sieved manually by using sieve with size 250mm. Sieved particles were stored at room temperature prior testing.

2.3 Soxhlet extraction of Barley grass plant powder

Extraction is the separation of medicinally active portions of plant using selective solvents through standard procedures. The purpose of all extraction is to separate the soluble plant metabolites, leaving behind the insoluble cellular residue. The initial crude extracts contain complex mixture of many plant metabolites, such as alkaloids, glycosides, phenolics, terpenoids and flavonoids. The initial stage in studying medicinal plants is the preparation of plant samples to preserve the biomolecules in the plants prior to extraction. Plants samples such as leaves, barks, leaves, fruits and flowers can be extracted from fresh or dried plants material. Other pre-preparation of plant materials such as grinding and drying also influences the preservation of phytochemicals in the final extracts. Some of the initially obtained extracts could be used as medicinal agents however most of plant extracts need further processing.

For the present study, soxhlet method which follows the principle of infusion method was chosen to extract the content from the given herbs (*Barley grass* leaves). In the Soxhlet extraction method, finely ground sample - *Barley grass* leaf herbal powder was placed in a porous bag or "thimble" made from a strong filter paper or cellulose, which is placed, is in thimble chamber of the Soxhlet apparatus. Extraction solvent (acetone) is heated in the bottom flask, vaporizes into the sample thimble, and condenses in the condenser and drip back. When the liquid content reaches the siphon arm, the liquid contents is emptied into the bottom flask again and the process is continued. For the study, infusion method of Soxhlet Extraction had been adopted. The powdered herbs of *Barley gras* leaves were filled in the thimble and placed in the soxhlet extractor. The extractor had been filled with solvent solution of petroleum ether and the temperature of 60^0C was set and left for 6hours. Slowly and steadily the temperature was increased upto 100^0C. The extract from the thimble was collected in the round bottom flask kept in the heating mantle below by passing through a side arm tube. Thus collected extract was taken in a separating funnel and dried in hot air oven at 50 to 60^0C until the extracts become semi-liquid. The dried extracts are stored at room temperature prior to testing.

2.4 Green synthesis of silver by reduction method and Preparation of silver nanoparticles (Gopinath et al., 2012)

Barley grass leaf powder extracted from soxhlet apparatus was used as a reduction medium for green synthesis of silver nanoparticles. About 300ml of soxhlet extract was taken in a 1000ml flat bottom standard flask. To this extract, 200ml of 0.2 M AgNO3 (silver nitrate) solution was added. The entire setup was placed on a magnetic stirrer (kept at 150 to 250 rpm) for 6 to 8 hours. The stirring condition should be kept constant at room temperature preferably in dark condition. Appearance of dark silver grey colour after 2 hours indicated the green synthesis of silver; reduced from silver nitrate due to the reaction with leaf extracts. After 8 hours of incubation period, dark grey coloured precipitates settled in the bottom of flask. The formed precipitates were collected in a separate conical flask and stored for finishing the fabric samples. Excess precipitates were separated using filter cloth or filter paper. The silver nanoparticles thus formed are dried in an oven at 60°C for 4 to 6 hours. Dried powder are collected in vials or eppendorf tubes for further testing like particle analyser, FTIR, SEM, etc.

2.5 Finishing silver nanoparticles on to test fabrics (Haroon et al., 2016)

The samples were prepared by dipping fabrics in 100% silver nanoparticles suspension at room temperature for 2 hours keeping material to liquor ratio 1: 25. Then it was dried in shade without squeezing. Finally, the silver nanoparticles finished fabric samples was found to be greyish brown in colour.

2.6 Antibacterial activity testing of finished fabrics against TWO test bacteria (EN ISO 20645) test method

The test specimens (silver nanoparticles (AgNPs) finished fabrics) were cut into pieces (20mm in diameter). Sterile Nutrient agar plates were prepared. Using 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 petridish. For each test organism, separate Nutrient agar plates were used in a sterile zone. All the inoculated plates were incubated at 37°C for 24 hours. The test plates were examined for the clear zone of inhibition around the AgNPs finished fabrics. The average width of the zone of inhibition around each type of fabric specimen was calculated and presented in Table-1 separately. The zone of inhibition was measured in millimeter (mm).

3. RESULT

3.1 Antibacterial activity-EN ISO 20645 Test Method:

Table-1: Antibacterial activity-EN ISO 20645 Test Method

Samples	Zone of Inhibition (mm)	
	Escherichia coli	***Staphylococcus aureus***

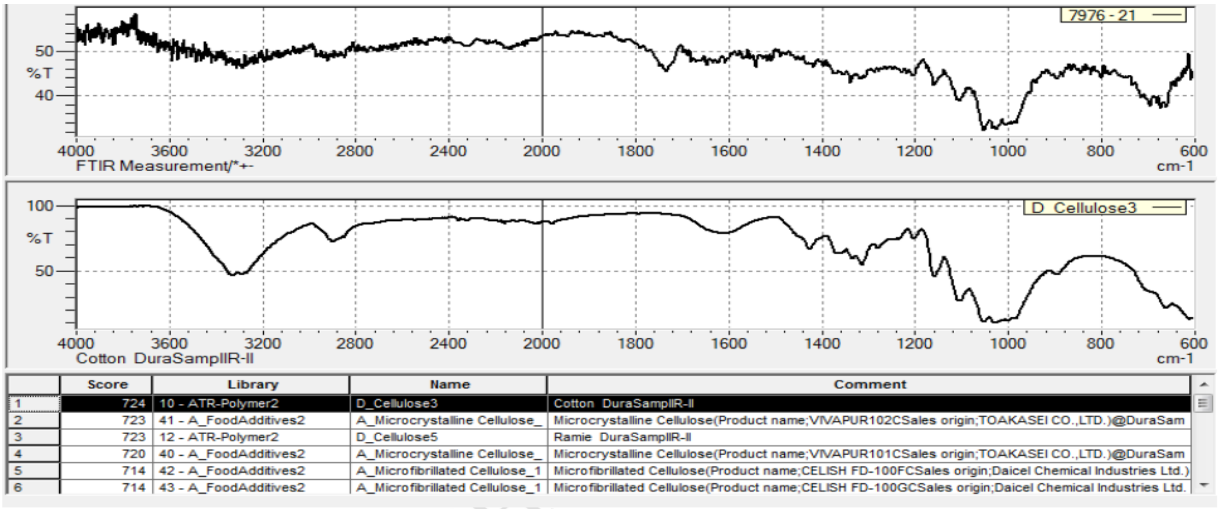
AgNPs finished sample	28	29
Unfinished control sample	0	0

Inference: Silver nanoparticles finished fabric showed **GOOD** antibacterial activity against test bacteria

Fig. 1: Antibacterial activity-EN ISO 20645 Test Method - AgNPs finished sample

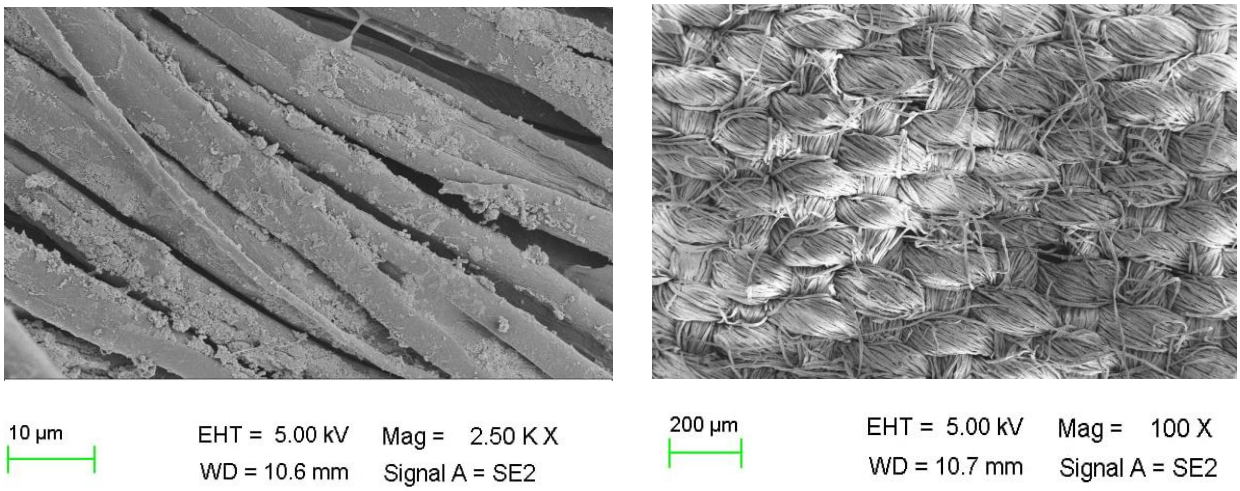
3.2 Characterization of Biosynthesized AgNPs:

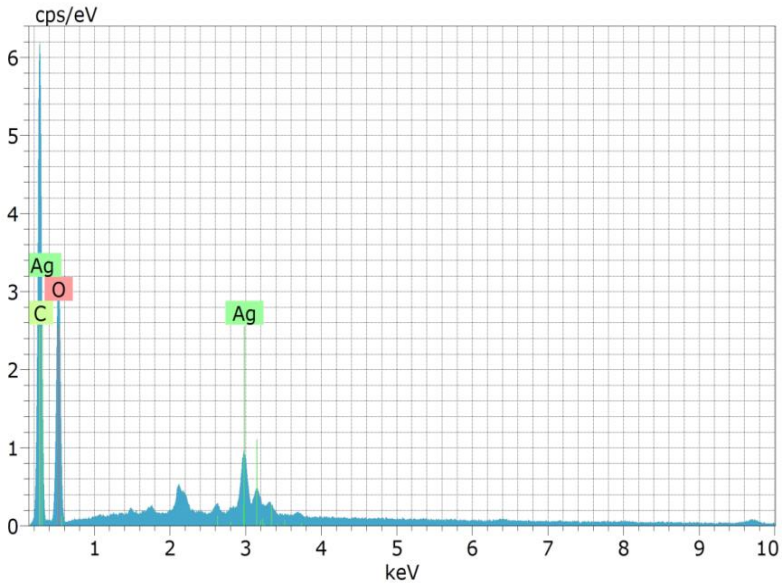
3.2.1 FTIR – Customzied Test Method:



	Score	Library	Name	Comment
1	724	10 - ATR-Polymer2	D_Cellulose3	Cotton DuraSamplIR-II
2	723	41 - A_FoodAdditives2	A_Microcrystalline Cellulose_	Microcrystalline Cellulose(Product name;VIVAPUR102CSales origin;TOAKASEI CO.,LTD.)@DuraSam
3	723	12 - ATR-Polymer2	D_Cellulose5	Ramie DuraSamplIR-II
4	720	40 - A_FoodAdditives2	A_Microcrystalline Cellulose_	Microcrystalline Cellulose(Product name;VIVAPUR101CSales origin;TOAKASEI CO.,LTD.)@DuraSam
5	714	42 - A_FoodAdditives2	A_Microfibrillated Cellulose_1	Microfibrillated Cellulose(Product name;CELISH FD-100FCSales origin;Daicel Chemical Industries Ltd.)
6	714	43 - A_FoodAdditives2	A_Microfibrillated Cellulose_1	Microfibrillated Cellulose(Product name;CELISH FD-100GCSales origin;Daicel Chemical Industries Ltd.

3.2.3 SEM image and EDX ANALYSIS:





Spectrum: BROWN-2

Element	Series	unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (3 Sigma) [wt.%]
Carbon	K-series	45.60	45.60	55.93	16.29
Oxygen	K-series	46.72	46.72	43.02	17.45
Silver	L-series	7.68	7.68	1.05	0.82
Total:		100.00	100.00	100.00	

4. CONCLUSIONS :

Thus the AgNPs has synthesized by green synthesis of barley grass (Hordeum vulgare linn).It has characterised by SEM analysis,FTIR analysis and particle analysis.Then Synthesized AgNPs coated on a fabric to test antibacterial activity which shows good inhibition to bacterial growth . Coated synthesized silver nanoparticles fabric has been used for cotton wound dressing.

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EXTRACTION, CHARACTERIZATION AND IMMOBILIZATION OF SERICIN PROTEIN FROM SILK FILAMENT

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1. INTRODUCTION

Sericin is a protein created by Bombyx mori (silkworms) in the production of silk [1]. Silk is a fibre produced by the silkworm in production of its cocoon. It consists mainly of two proteins, fibroin and sericin. Silk consists of 70–80% fibroin and 20–30% sericin; fibroin being the structural center of the silk, and sericin being the gum coating the fibres and allowing them to stick to each other [2]. Sericin has also been used in medicine and cosmetics. Due to its elasticity and tensile strength, along with a natural affinity for keratin, sericin is primarily used in medicine for wound suturing. It also has a natural infection resistance, and is used variably due to excellent biocompatibility, and thus is used commonly as a wound coagulant as well.[3] When used in cosmetics, sericin has been found to improve skin elasticity and several anti-aging factors, including an anti-wrinkle property. This is done by minimizing water loss from the skin. Silk is a protein fiber that consists of sericin and fibroin [4].Fibroin protein comprises approximately 70% to 80% of the silk fiber. It has amorphous and crystalline domains with short amino acidic chains that allow it to maintain its compact structure[5]. Sericin is a globular protein that constitutes about 20-30% of the silk fiber. Its role is to coat and link the fibroin filaments together in the worm cocoons[6]. Furthermore, the sericin protects the cocoon against UV radiation, wind, rain and low temperature[7]. Figure 1 shows silk fibers obtained via scanning electronic microscopy (SEM). In the figure, sericin and fibroin proteins are indicated to provide a clear comprehension about the structure of the silk fiber.

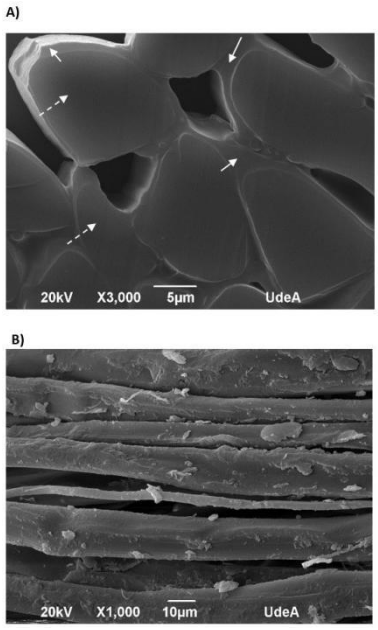

Figure 1 Silk fiber images obtained by scanning electron microscopy – SEM– in the Microscopy Department from Universidad de Antioquia (UdeA). (A) Transversal view; white solid arrows refer to the sericin which surrounds the fibroin fiber, while fibroin is indicated with white dashed arrows; (B) Longitudinal view.

The antioxidant potential of the sericin is related to its high content of amino acids with hydroxyl groups (mostly serine), which act as chelators as described in the following sections [8] The presence of phenolic and flavonoid compounds in the adjacent layers of the sericin protein not only provide coloration to the cocoon, but they also contribute with the sericin's antioxidant activity[9][10][11].

In the silk industry, sericin is removed from the fibroin and subsequently discarded. However, it has been shown that this protein presents interesting properties which may allow its application in several fields. Due to its moisturizing and anti-wrinkling abilities, sericin is an interesting compound to the cosmetic[12]. Additionally, sericin has been studied with biomedical purposes, as biomaterial and drug delivery[13], mainly because it was reported to be immunologically inert [13].The sericin's antioxidant activity is one of the most significant property because it could provide positive effects on people health and in the food industry as a natural food preserver [14].

In the body, the antioxidants maintain a balance between formation and elimination of reactive oxygen species (ROS) and nitrogen. High ROS levels can be detrimental for the cell, affecting proteins, lipids and DNA, and consequently to the physiological functions of the organism. This process is known as oxidative stress [8] and is associated with neurodegenerative diseases, aging, arthrosclerosis and cancer [15]. The human body possess an antioxidant system that involves enzymatic complexes, vitamins and other specialized molecules. In addition, there are exogenous antioxidants provided by food such as fruits, vegetables and dietary supplements, which contribute to the body antioxidant defense. These type of antioxidants becomes more relevant when the person is exposed to high levels of oxidative stress[15]. Besides the concern of consuming antioxidants in terms of health benefits, there is a trend from the food industry to include natural antioxidants to foodstuff. This is possible because antioxidants can retard and prevent the lipid oxidation and therefore improve the food quality and its nutritional value. This approach substitutes the use of synthetic antioxidants, some of them associated to carcinogenic effects[16].

Therefore, sericin could have multiple attributes as a food ingredient due to its role in food preservation and in human health promotion as well. Furthermore, there are evidence about other positive effects due to sericin consumption. For instance, it has been reported that sericin ameliorates the constipation in rats, it increases the intestinal mineral absorption and it also possess a prebiotic function[17]. Further details about these effects are given below.

This review collects the different methods and conditions to extract sericin described in the literature and provides an updated overview of the antioxidant potential of the sericin in terms of human health and food preservation.

2. EXTRACTION OF SERICIN

2.1 Extraction with detergents and alkaline compounds

Detergents and soaps lead to protein denaturalization and partial hydrolysis of the silk filament chains [7].Sodium carbonate [18], calcium hydroxide[19] and non-ionic detergents [20]have been utilized for the degumming process. Even though this method is widely used by silk processing industries, it is considered as a non- desired approach due to the presence of these alkaline compounds in the residual water[20].Furthermore, the subsequent isolation of the sericin from the detergent is a complex process [13].

2.2 Extraction with steam using autoclave

This process consists of the removal of sericin through high temperature and pressure. Due to the high temperature applied, hydrogen bonds between hydroxyl groups become unstable allowing the water to interact with polar amino acids of the sericin[21]. The molecular weight of the samples obtained is in the range of 27 to 200 kDa[22]. This method is quite simple, likewise a good quality and clean product is attained [13]. However, some studies argue that this method could degrade the sericin protein. Furthermore, factors such as the temperature and the extraction time are involved in the variation of the molecular weight obtained[21]. The yield obtained through the use of steam is lower compared to extraction by alkaline compounds (for instance, 0.5% calcium carbonate)[23]. On the other hand, the absence of chemical

compounds and the lower water consumption that required this method, contribute positively to the environment and consequently, to the sustainable feature of the method [24].

2.3 Extraction with enzymes

This process comprises the elimination of sericin from the silk fiber assisted with proteolytic enzymes. Alkaline and neutral proteases have shown an efficient degumming. After removed, sericin is recovered by drying. The enzyme dosage and treatment time influence the kinetics of the process. Moreover, chemical properties of soluble sericin peptides varies as according to the enzyme utilized. Peptides in the range of 5 to 20 kDa are obtained and these are free of alkali and fatty acids [25].Whereas this approach is slightly more expensive than the technics described above, less energy is required. Consequently, this process becomes more sustainable [24].The combined use of enzymes (savinase and alcalase) and ultrasound to extract the sericin from the silk fiber was also assessed. In this case, the efficacy of the degumming process increased along the treatment time. However, the integrity of the sericin isolated have not been studied by the authors [20]. Interestingly, an extracellular protease isolated from *Bacillus sp.* has shown a high specificity to remove sericin from the silk at a pH slightly alkaline. The peptides obtained from the proteolytic activity by the purified enzyme consists in 10 to 12 kDa.Similarly, a thermostable alkaline serine protease from a bacterium (*Bacillus hallodurans*) capable of remove sericin from the silk was recently isolated. This novel protease has exhibited a higher degumming ability than commercial alcalase proteases

2.4ULTRAFILTERATION METHODS

The sericin solution obtained from the extraction process was treated in an Ultrafiltration system. It was fixed the sericin concentration in 0.1 g L-1 and 1.0 g L-1to evaluate the effect of the sericin mass variable in the permeate flux. The feed flow rate presented statistically significance in permeate flux for transmembrane pressure above 0.03 MPa ($p < 0.05$ while the sericin concentration showed statistically significance for all range of transmembrane pressure studied. In this study, the increased of the feed flow promoted the small reduction of the permeate flux. For the feed flow of 1.0 L min-1 and 2.0 L min-1, the cross-flow velocities estimated were 0.1 m s-1 and 0.2 m s-1, respectively. The difference between feed flow proposed did not change the Laminar flow regime, thus the surface renewal did not change. However, the amount of sericin near the membrane surface for the feed flow 2.0 L min-1 was higher than 1.0 L min-1, what could have increased the resistive effects and promoted the small slight of the permeate flux. The profile of molecular weight of sericin extracted with pure water at high temperature showed peaks between 200 kDa and 100 kDa and sericin peptides fractions lower than 100 kDa, while the sericin [30] solution extracted with Na2CO3 showed molecular weight lower than 50 kDa, thus indicating further chemical hydrolysis of sericin.

3. CHARACTERIZATION OF SERICIN

Sericin extracted from fabric at 100°C for 15 min using infrared heating is found to give the better quality and quantity of sericin. Therefore, this liquor is converted to powder and the characterization data for its composition, spectroscopic and thermal properties and molecular weight are generated. The sericin powder extracted from fabric and the standard sericin sample are characterized in terms of moisture, ash, nitrogen and protein content and the results are compiled in Moisture content of the standard sericin sample is found to be slightly higher than the sericin extracted from fabric. The ash content of standard sample is also found to be higher than the sericin sample recovered from fabric. This may be because a different method of extraction may have been used for the standard, resulting in higher residual matter[26]have reported that ash content can vary from 0.8% to 5.2% in sericin extracted from cocoons using HTHP and alkali method respectively. Wu et al.28 report an ash content of 4.2% in sericin extracted from cocoons using HTHP method. The nitrogen content of the sericin powder is also estimated and the protein content is calculated by multiplying the value by 6.25. Sericin sample obtained from the fabric shows higher nitrogen content (14.13%) and hence higher protein content (88.31%) as compared to the standard sericin sample. Similar values (14.65% nitrogen) have been reported earlier[27].

4.FTIR (FOURIER TRANSFORMS INFRARED SPECTROSCOPY)

In FTIR spectra, proteins show characteristic vibration bands in the range 1630 - 1650 cm−1 for amide I (C-O stretching), 1540 cm−1 –1520 cm−1 for amide II (secondary N–H bending) and 1270 cm−1 –1230 cm−1 for amide III (C–N and N–H functionalities). In addition, the positions of these bands conform the protein materials, such as 1650

cm−1 (random coil) and 1630 cm−1 (β-sheet) for amide I; 1540 cm−1 (random coil) and 1520 cm−1 (β-sheet) for amide II, and 1270 cm−1 (β-sheet) and 1230 cm−1 (random coil) for amide III. Sericin extracted from fabric shows absorption between 1600 cm−1 and 1700 cm-1, confirming amide I absorption which arises predominantly from the C=O stretching vibration and is most useful for determining proteins secondary structure. The peak of sericin at 1540 cm-1 belongs to amide II which arises because of the random coil structure. Signature peak for sericin at 1400 cm-1 is observed in case of both samples. In addition, the amide III characteristic peak, which arises mainly from the C-N stretching vibration coupled to the N-H plane bending vibration, is found to shift in the range 1240 cm−1 - 1250 cm-1 corresponding to a change from random coil conformation to β-sheet structure. No major difference is observed in IR spectra of standard and test samples extracted from different sources and prepared from different methods[28][29].

5.PROTEIN ASSAY

To calculate the total yield of all the performed by Lowry method 8 . For standard curve, various amounts of BSA was taken (10, 20, 40, 60, 80, 100µg) in a total volume of 250 µl of distilled water, incubated for 10 minutes with alkaline copper sulphate Solution and 0.125ml of 1:1 diluted Folin-Ciocalteu reagent was added and incubated for 30 min in dark at room temperature. OD was read at 750nm and graph was plotted.

6.MOLECULAR WEIGHT

The molecular weight distribution of the different sericin samples was determined using SDS-PAGE method.The molecular weight of standard sericin is found to be much lower than that of extracted silk. When the two samples are dissolved in water, their solubility is also found to be different. While standard sericin with lower molecular mass (< 50 kDa) is found to be readily soluble in cold water, extracted sericin with a higher molecular mass between 50 kDa and 200 kDa could only be dissolved in hot water (90°C). This large difference in molecular weight can have a significant effect on the properties and applications of sericin. It has been reported that sericin consists of a group of protein molecules of molecular weight ranging from 20 kDa to 400 [34**]** estimated the molecular mass of sericin to be 309, 177, 145, 134 and 80 kDa, whereas [35] reported at least 15 different polypeptides having molecular weight ranging from about 20 kDa to 200 kDa in the anterior portion of middle silk gland. [36] showed that sericin appears in a continuous distribution between 97 kDa and 14 kDa, while some bands are observed above and below 97 kDa and 14 kDa respectively.

7.THERMOGRAVIMETRIC ANALYSIS

Thermal behavior of sericin samples was examined by TGA. The weight loss trace indicates that the initial weight loss occurred because of the evaporation of water. Thereafter, an abrupt decrease in weight is detected in the wide temperature range from 220°C upward for both the samples. Similar weight loss pattern has been reported for sericin by [37]. It is clear from the weight loss pattern in the thermograms that sericin extracted from the fabric exhibits higher weight loss as compared to the standard sericin, thus indicating that the sericin prepared from fabric is relatively unstable to temperature. Higher residue is obtained in standard sericin powder (9%) as compared to the sericin powder recovered from fabric (5%). These results are in a good agreement with per cent ash content as reported above.

8.UV ABSORPTION

The main composition of silk sericin is protein. The amount of protein in sericin is almost 90% of its composition. The sericin contains 18 kinds of amino acids. Among the 18 kinds amino acids, serine, aspartic acid, and glycine are very important amino acids attributed to the physico-chemical and functional properties of sericin. In addition the 18 amino acids contain 70% hydrophilic amino acid which is responsible for good solubility and water absorbability of sericin. On the other hand, the amount of aromatic amino acids is only 6.6% of 18 kinds of amino acid which were identified by UV spectrum [32]. The proteins generally have two absorbance peaks in the UV region, one between 215-240 nm and other 260-290 nm. The peptide bonds of amino acid absorb 215-240 nm regions UV light. In the range of 260-290 nm UV radiation absorbed by aromatic amino acids like tryptophan, tyrosine and phenylalanine [33]. The silk sericin solution shows absorbance peak at 216 nm and 275 nm which indicates that sericin has UV resistance capacity

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Water Soluble Mask

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ABSTRACT

In our day-to-day life covid is a hot topic among us. COVID-19 is mainly transmitted through droplets generated when an infected person coughs, sneezes, or exhales. These droplets are too heavy to hang in the air and quickly fall on floors or surfaces one of the precautions that we are taking right now to protect ourselves is a face mask. The most affordable step that we are taking right now is to sensitize ourselves and put a mask on our faces.

KEYWORDS: *Dissolve, pollution control,*

1.The reason why we need to have mask innovation.

- According to the 2020 study from the World Economic Forum found "Some 220 million Indians sustained an expenditure level of less than Rs 32 / day and it's not possible to afford the mask of rs. 20 i.e the minimum cost of the fabric mask.

- Another reason of the pollution. It can be expected that around 75 percent of the used masks, as well as other pandemic-related waste, will end up in landfills, or floating in the seas. Aside from the environmental damage, the financial cost, in areas such as tourism and fisheries, is estimated by the UN Environment Programme (UNEP) at around $40 billion.

Combining both the crucial factors in mind I came up with a solution for the affordable and disposable mask. In this document, there is a solution for this upcoming environmental problem that may be created on land and ocean degradation. In this document there are 2 parts, the first part is all about function and the process of how the material is dissolved in water. And the second part which is most important is the function of the masks to protect from the virus and comfortable to wear on the face.

1. Part A

Before the lockdown of the economy due to the Covid-19 pandemic, extreme poverty in India was continuing its decades old downward trajectory. As a result of the lockdown, the labor force dropped by more than 60 million workers in April 2020 as compared to both March 2020 and April 2019. The impact of the lockdown on employment seems to have been paralleled by a strong

impact on household consumption. Mean per capita consumption is estimated to have dropped by 36 percent during the lockdown months (April-July 2020) when compared to the same period in 2019. The end of the lockdown in July-2020 has mitigated some but not all its impact on labor markets. In the post-lockdown months from July-2020 to February-2021, Indian unemployment rates have recovered to an average of 7.3 percent. This is in fact slightly lower than the 7.6 percent observed during the same months in the previous year (Vyas, 2021[1]). However, the improvement in the overall unemployment rate has occurred due to shrinking of the labor force. Compared to the same months in 2019/2020, the overall size of the labor force was reduced by 12.2 million people in the post-lockdown months of July-February 2021/2020.

The national poverty estimates for India are based on rounds of Household Consumption Expenditure Surveys conducted by the National Sample Survey Office (NSSO). The round conducted in 2011/12 is the most recent for which consumption data is available. In 2014/15 and 2017/18, the NSSO conducted two surveys that did not collect comparable consumption data but did include information on several correlates of household consumption. This information is used to compute household consumption for the two years by utilizing the relationship between household consumption and its characteristics in past years. Reported poverty rates at the international poverty lines use pass-through factors (from household final consumption expenditure to survey consumption) implicit in these imputations. Because the poverty estimates are based on imputations, shared prosperity related indicators are not reported in this Brief. State-wise poverty lines are estimated using the methodology prescribed by the Tendulkar Committee. The all-India poverty ratio is obtained as a state-population weighted average poverty ratio. The international poverty estimates are based on the $1.90 per person per day in 2011 PPP terms. The national PPP is disaggregated into rural and urban PPP to reflect cost-of-living differences in these areas.

How face masks, gloves and other coronavirus waste is polluting our ocean:

- Coronavirus waste has become a new form of pollution as single-use personal protective equipment (PPE) floods our ocean.
- COVID-19 has had several unexpected impacts on the environment, curtailing recycling and increasing the use of plastic around the world.
- Governments need to act now to ensure a green recovery that incentivizes sustainability.

That is millions of gloves and masks being used then thrown away every single day - just in UK healthcare settings. So, it is not difficult to see why conservationists around the world are sounding the alarm over where all these single-use products are ending up.

Waterlogged masks, gloves, hand sanitizer bottles and other coronavirus waste are already being found on our seabed’s and washed up on our beaches, joining the day-to-day detritus in our ocean ecosystems.

Figure 1. Divers on a clean-up mission around the ocean and finding increasing amounts of COVID-19 waste.

Figure 2. A face mask found during a beach cleanup in Hampton Beach

2. Part B

Design solution 1

Water Soluble paper:

About

Traditional purge systems present significant limitations as they are inefficient, costly, and labor-intensive. Additionally, conventional purge systems must be placed far from the weld zone (10-20 ft.) adding unnecessary inconvenience and costs to the welding process.

To overcome these limitations, Aquasol Water Soluble Paper and Tape were introduced. Together these components can be constructed by hand into unique purge dams. They can be placed within close proximity of the weld zone, thereby increasing efficiency of the entire welding process.

Aquasol Water Soluble Paper provides an excellent barrier used to retain noble gases such as argon and helium within the weld zone during TIG welding of stainless steel and aluminum pipes.

Composed of sodium carboxymethyl cellulose and wood pulp, Aquasol Water Soluble Paper dissolves quickly and completely in most liquids, including water. Its 100% biodegradable composition leaves no residue behind in the pipeline.

Aquasol Water Soluble Paper is available in a wide range of grades and sizes permitting the construction of purge dams for any pipe diameter. Extremely easy to store, non-toxic and environmentally friendly, Aquasol Water Soluble Paper is ideal for the nuclear, petrochemical, and food and beverage industries.

Low Air Permeable Purge Gas Barrier for Any Pipe Diameter

- Creates excellent barrier for retaining noble gas.
- Simple and fast construction that can be customized to fit various pipe schedules and sizes.
- Saves money on gas consumption as paper can be placed near the weld zone, thereby using less inert gas to displace oxygen in the purge chamber.
- Easily secures to inner pipe wall with use of Aquasol Water Soluble Tape, creating an air-tight seal.

Biodegradable & Safe

- Made of sodium carboxy methyl cellulose & wooden pulp.
- EPA and CE approved
- 100% biodegradable
- Safe and accepted choice by nuclear, petrochemical, food and beverage industries

Easy Removal

- Dissolves effortlessly and rapidly during water or steam hydro-test
- No residue remains in the pipeline.

Convenient

- Paper rolls are individually packaged for convenient storage and shipping.
- Available in a wide range of sizes, grades and forms permitting construction of any pipe diameter.
- EZ Peel available with 2-inch(5cm) Tape rolls for quick peeling of roll edge.

How Aquasol Water Soluble Paper and Tape Work:

Trace and Impress

Trace the pipe inner diameter by pressing paper along the pipe edge, creating an impression. Then fold to form a 90° angle.

Cut

Cut in a circle around the impression, approximately one-third times greater than pipe diameter.

Slit

Slit approximately 1" to 2" segments perpendicular to the impression on paper making first slit at 12 o'clock position followed by 3 o'clock, 6 o'clock and so on.

Position Inside Pipe and Tape in Place

Cut Aquasol Water Soluble Tape into pieces. Position slit Aquasol Water Soluble Paper dam inside pipe. Secure dam with tape pieces along the entire circumference.

ACTIVATE WATER SOLUBLE TAPE

Moisten Sponge

Moisten an ordinary sponge with water and squeeze out excess water until the sponge is damp.

Moisten Sponge

Moisten an ordinary sponge with water and squeeze out excess water until the sponge is damp.

Introduce Gas

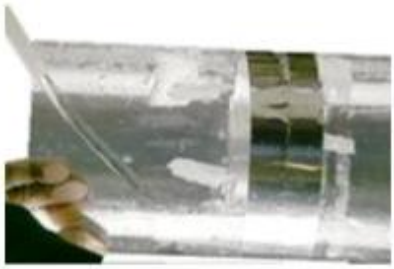
Insert purge gas needles into the root gap and introduce noble gas, while ensuring connection to the gas line.

Lightly Dab

Lightly dab sponge along the water soluble tape portion of the dam. The dampened sponge will reactivate the adhesive to ensure low air permeability.

Weld

Carry out the welding process.



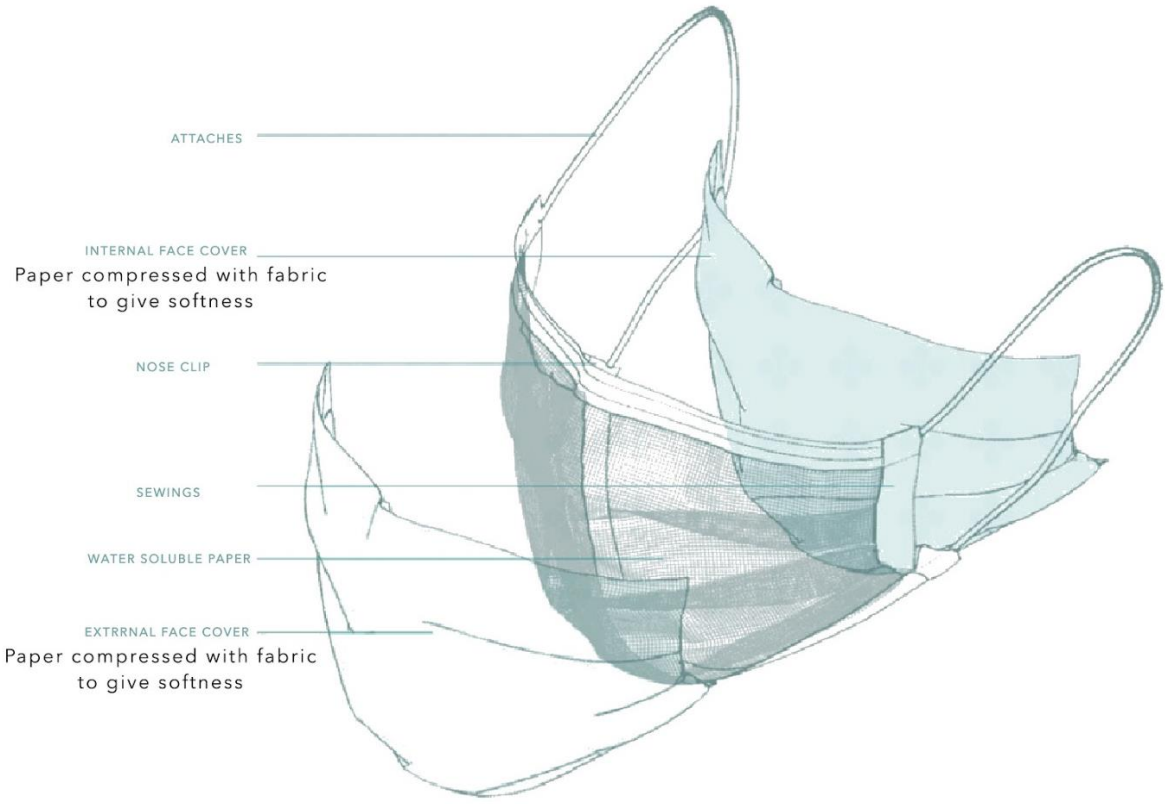
Dissolve

Dissolve Aquasol Water Soluble Paper and Tape by introducing water when performing hydro-test.

3. Part C

Design solution 2

Now we have the water-soluble paper and tape with us, here the pollution factor is controlled but, in the mask, there are two more factors: i.e comfort and safety.



Exploded view of subparts with material specified.

5.CONCLUSIONS

This project or documentation helped me to gain knowledge and expand my horizon in terms of innovative material, finish, processing, manufacturing processes which in future will help me future studies. This project also gave me a broad perspective of how things are procured and then R&D is done to manufacture as a system design getting to know each and every sub-parts & process at systemic level.

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TITLE: DESIGN AND DEVELOPMENT OF ECO-BANNERS

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ABSTRACT

In the 1960s, when government across the planet started prohibiting industrial chlorine, companies turned to alternatives and thus, there was in a very rise in PVC production. Poly-vinyl chlorine material kind of like plastic is most typically utilized in a banners. Polyester, nylon and lycra also are commonly used one. This materials are quite expensive and there's a crease formation.The presence of poly-vinyl chloride which is comparable to plastic is toxic to nature. As per the times of India, 90% of all advertising in India in 2017 was done on PVC. On a median around 18tonnes of PVC flex is consumed per month. It's non-biodegradable. When burnt, they release toxic fumes that have serious implications on public health.Poly vinyl chloride (PVC) could be a thermoplastic of about 800-1500 monomer units long. Because of its low cost PVC will be process into large range of short-life products. As a result of increasing consumption of PVC-made products, the amount of used PVC items entering the waste stream is gradually increased. One application of PVC is either a skinny or thick coating for flexible polyester advertising banners. PVC-coated banners are particularly challenging for recycling, because the PVC is bonded to a different polymer, usually polyester. The entire life cycle of polyvinyl resin banner industry release lots of solid waste, air waste, water waste and environmental toxins. In this project we aim to design and develop an eco-friendly banners using natural fibers like bagasse, cotton and bamboo. The heavy canvas like texture is created from bagasse, cotton and bamboo yarn. Bamboo of 30's Ne as the weft yarn and cotton 30's Ne as warp yarns. The woven fabric has good mechanical and physical properties, tearing strength and durability. Finally the banners are made of bagasse, bamboo, and cotton combined with a fabrics and it's 100% recyclable and ecofriendly banner. The immune to temperature and crease formation for the method and its cost efficient. It's easily bio-degradable for environmental impact. Eco-friendly banners doesn't emit any hazardous gases when it comes in grips chemically like solvent ink. It's a zero waste process of banners with eco-chic friendly.

Keyword : - *PVC Banners, Bagasse, Bamboo, Cotton, Fabric, Banner material,Eco-Friendly.*

1. INTRODUCTION

Our environment is at a stage where all peoples , at business & individual levels , should already air a pursuit to cut back our carbon footprint in some or the opposite way . Our quest has led us to supply you our newly launched PVC - Free banners, which we also consult with as eco-friendly banners. Within the 1960s, when government across the globe started prohibiting industrial chlorine, companies turned to alternatives and thus, there was in an exceedingly rise in PVC production.Poly- vinyl chloride material almost like plastic is most ordinary utilized in banners. Polyester, nylon and lycra are commonly used one . This materials are quite expensive and there's a crease formation. The presence of poly-vinyl chloride which is

analogous to plastic is toxic to nature. As per the days of India , 90 % of all advertising in india in 2017 was done on PVC. On a medium around 18 tonnes of PVC flex is consumed per month. Eco Banner Printing products are PVC free and 100% recyclable, providing an environmentally responsible alternative to traditional PVC Banners.Our Eco-Friendly Banners print superbly at high resolution . Eco Mesh Banner is printed using eco-solvent inks, while Eco Banner 300 and Eco Banner 220 are printed using safe Latex inks.Recyclable banners are now much in demand and avoid users from having to send their marketing to landfill. These printable banners are called eco-friendly banners because they're made using sustainable PVC Free material only. The banner material doesn't include any quite toxic polymers. They're not just environment friendly but highly durable and cheap too . The PVC free flex material that's wont bio-degradable material , which could be a great alternative to the regular PVC banners.

For trade shows/event advertising and short-term retail marketing. It's always a struggle to decide on an ideal banner that works for the business and is ecological safe too. This had led to an ever-increasing need for printable PVC-free banner materials . With the increasing demand, it becomes crucial for print manufacturing like us to return up with a mindful solution . The absence of such substantial marketing alternatives may be an obstacles in fulfilling the wants of the many businesses, especially within the retail industry.We introduced environmentally- friendly banners . These recyclable banners are very lightweight, yet durable and low-costing too the most effective part , they provide an excellent quality print finish. Our full color , 720DPI , UV Printing can further turn your marketing dreams to reality like never before, plus the added advantage of investing in nature-friendly marketing material. In other words, these eco-friendly banners are an entire win-win! Though these banners are an excellent solution for short-term retail marketing. They're a good print advertising solution for each business industry. Every business, big or small , must invest in these sustainable banners to assist reduce their carbon footprint while taking care of assorted marketing activities.

It is non-biodegradable .when burnt ,they release toxic fumes that have serious implications on public health. Poly vinyl chloride (PVC) may be a thermoplastic of about 800-1500 monomer units long. Thanks to low cost PVC are often processed into a large range of short-life products. As a results of increasing consumption of PVC-made products, the number of used PVC items entering the waste stream is gradually increased. One application of PVC is as either a skinny or thick coating banners are particularly challenging for recycling, because the full life cycle of polyvinyl resin banner industry releases lots of solid wastes, air wastes, water wastes and other environmental toxins.In this project we aim to style and develop an eco-friendly banners using natural fibres like bagasse, cotton and bamboo. The heavy canvas like texture is created from bagasse, cotton and bamboo yarn. Bamboo of (30's Ne) because the weft yarn and cotton (30’s Ne) as the warp yarns.The woven fabric has good mechanical and physical properties. Tearing strength and dyeability. Finally the banners are made of bagasse, bamboo and cotton combined with a fabrics and it's 100 % recyclable and eco-friendly banner. The immune to temperature and crease formation for the method and its cost efficient is low. It's easily bio-degradable for environmental impact. Eco-friendly banners doesn't emit any hazardous gases when it comes in touch chemically like solvent ink.Its a Zero waste process of banners with eco-friendly .

1.1 OBJECTIVES:

- Identification of the natural fibres which has good temperature resistance and solvent absorbtion.
- Test for the properties of bamboo, cotton and bagasse fibers.
- Development of a heavy canvas like texture from cotton, bamboo, bagasse yarn.Bamboo of (30 Ne) as the weft yarn and cotton (30's Ne) as warp yarns.
- Development of eco-friendly banners at low cost.
- With the sample banner material, analysis will be made whether they perform good at the end use.

2. LITERATURE REVIEW

The chapter discusses the review of literature related to the various topics related to the project and it summarizes the various topics.

2.1 The use of sugarcane bagasse based green materials for sustainable packaging design (L.pereiraa, R.mafaldaa, J.M. Marconcinib , G.L.Montovania).

The aim of this paper is to investigate the linkages between properties of green materials and its impact on sustainable design. Partially , we have an interest in learning more on the utilization of sugarcane bagasse cellulose fibres within the production of composite materials at the nanoscale and its application in packaging design . So as to guage this new material , we have got used an interdisciplinary approach applying the results obtained by researchers on materials and style . We tetsed the material s specification inputs on software solidworks sustainability to estimate green attributes like carbon footprint and total energy consumed , knit along with lifecycle thinking . Translated into the practice of design , they assist evaluate the relative greenness of various materials as on instrument for design alternatives , ensure a high product performence wih very cheap possible environment impact .

Sustainability may be a comparative process , which mean that during a situation where the emission of greenhouse gase and energy consumption are at a specific level , we must incorporate practice that reduce these values as lower as possible albeit slowly . The CAD tools available have state to faster sustainable practices as now designer have the choice to line the share of recycled materials still as take under consideration the whole life cycle . During this case , we were able to evaluate the environment impact of packaging design that simulates the employment of a nanocomposite supported sugarcane bagasse . These analyses include the sustainable design practices should account for levels of power consumption compatible with product life cycle .

2.2 Development and characterization of bamboo gauze fabric coated with polymer and drug for wound healing (O.L.Shanmuga Sundaram , R.V.Mahendra Gowda).

The bamboo yarn of ne 40's was used for the preparation of the gauze fabric . The physical properties like areal density and stiffness of materials were measured . The materials was then scoured and bleached as per the quality procedure using H2O . Chito-sodium alginate , calcium-sodium alganite polymer and their mixture were coated separately on the gauze structure to boost the antibacterial and wound healing property of the bandage . Scanning microscope (sem) analysis was dole out to look the uniform distribution of polymers within the samples .

The antibiotic drug were selected supported the antibiotic sensitivity test . The drugs like tetracycline hydrachloride (250mg) , chloramphenicol (250mg) and ritampicin (250mg) were immobilized on the polymer coated fabrics to extend the speed of wound healing and anticmbacterial activity . The drug loaded samples were subjected to drug release study for about four days during a static condition . The results show that good amount of drug was released during all the four days , further , the antibacterial activity of the drug loaded and polyemr coated samples were evaluate against s,aureus and Proteus bacteria . The results show excellent antibacterial activity .

2.3 Development and characterization of bamboo and organic cotton fibre baby diapers (O.L.Shanmuga Sundaram , R.V.Mahendra Gowda).

Absorbent disposable products , like diapers and sanitary napkins , are mostly one time use items and designed to soak up and retain body fluids and solid waste . This research work deals with the event and characterization of baby diapers made up to four different fibrous compositions namely , pure bamboo , pure cotton , bamboo/cotton (70/30) and bamboo/cotton (50/50) . Antibacterial activity tests are disbursed on baby diapers against s.aureus and E.coli . The strongest antibacterial activity in terms of reduction of the organism is found in diapers produced from pure bamboo fibre and therefore the weakest antibacterial activity is found in cotton diapers . Super absorbent polymer (sap) , namely , sodium polyacrylate is incorporated into the diapers to reinforce their absorption capacity . The diapers are subjected to tests like absorption capacity , liquid strike through , acquisition time under load and diaper rewet under load to check their performance . Upon an analysis of this results , it's found that the performance of diapers produced from a bamboo/cotton

(70/30) fibre blend is superior compared to the opposite ones .

2.4 Sugarcane bagasse fibre reinforced composites : Recent advantage and applications (Deepa.G , Devadiga ,
K.Subrahmanya Bhat).

The use of agriculture crop residues for material development and fabrication offers various advantages like easy and safe disposal at the tip of service life, lightweight alternative materials with desirable acoustic properties , creation of pleasing environment and possible value addition to the agricultural products. Agriculture crops like sugar cane, wheat , paddy , flax banana , pineapple , etc ., are utilized by researchers to process them into materials with desirable properties. Such fibrous sources are often used as reinforcement in various forms like woven mats , chopped fibres , and powders wih polymers to make the polymer matrix composites (pmcs) . Composite are basically mode of one or more discontinuous phase embedded in an exceedingly continuous phase . Matrix acts as continuous phase and therefore the phase which is stronger and harder than continuous phase is termed as discontinuous phase , which is that the reinforcement . Properties of continuent materials highly influence the properties of the stuff into account . The composite properties are approximated because the sum of volume fraction of the properties of the constituent materials . There are often factors that influence within the enhancement of the properties of the composite like geometry . This review paper relies on the works meted out using sugarcane bagasse as filter with different binding materials to create composite materials . The results of volume fraction of bagasse wih different matrix systems , chemical modification methods applied and their effects on formed material properties are discussed under dedicated sections within the paper. This review brings together the process use of sugarcane bagasse as filler or reinforcement with different synthetic polymers and construction materials. The subsequent conclusion are drawn from the published work as on date. Fiber loading up to twenty in most of the studies resulted in improvement in mechanical properties like durability , modulus of elasticity , flexural modulus , flexural strength , and impact strength .
Fiber treatment methods like alkali treatment, carboxylic acid , silane treatment have shown improvement in adhesion between the matrix systems and also the bagasse fibers. Bagasse ash as filler in composites leads to improvement in mechanical properties with hybrid composites .
Bagasse ash as binder in concrete gives adequate thermal stability to the concrete structures at elevated temperatures.

2.5 Preparation of chemical treated sugarcane bagasse fiber reinforced epoxy composites (Duc pham).

Material having two or more distinct constituent raw materials is taken into account as a stuff . Such materials contains one or more discontinuous phase which is embedded during a continuous phase . The discontinuous phase which is named the reinforcement phase and therefore the continuous phase is termed matrix . This innovative the composite is that the basic structure that gives strength and tenacity. Supported the reinforcement used , composite are broadly termed as fibre (glass l, carbon,kevlar,boron,graphite,etc.,)and fibre (sisal , hemp,flax,bamboo,jute,etc.,) reinforcement composite. The composite are classified supported the form and sort of the reinforcement into two types namely , particle-reinforced and fibre-reinforment composites.composites during which reinforcement is of particle nature is named particle-reinforced composites .particles aren't very useful in improving the dimension. Particles are not very useful in improving the stiffness of the composite to some extent . Bagasse raw fibres were chemically treated with caustic soda, alkaline KMno4, and oxyacid .These fibres were subjected to surface analysis using scanning microscope which revealed the roughness of the surface improved . Further , alkaline KMno4 and phosphoric acids were effective in improving the thermal characterization of fibres and their fabricated composites with synthetic resin. The tensile properties showed improvement for the samples improvement for the samples after KMno4 treatment when put next thereupon of emraw fibre reinforced composites and neat epoxy polymer. Therefore optimization of processing conditions using KMno4 might be explored further to know the change within the bonding characteristics within the fibre and its contribution in composite properties . Further , chemical changes that may occur must be analysed by FTIR technique and extent by BET measurement. Exploring of these properties and can be reported by us in our future publications. Such composites may find utility in low load-bearing application where biodegradability is one in every of the necessity.

2.6 Bamboo an alternative raw material for wood and wood based composites (Pannipa chaowana).

Bamboo is becaming a widely used material in various industry.Nowadays bamboo utilized in textile field also, especially as a staple for wood-based composite like particle board (PB) , medium density fibreboard (MDF),hard fibreboard (HB),plywood, oriented strand board(OSB), Zephyr board ,laminated bamboo lumber, parallel strand lumber (PSL) and oriented strand lumber(OSL), wood plastic composite (WPC), thanks to this high productivity, quick maturity and high strength with an advance in processing techniques and increased market demand .

The suitability of bamboo because the alternative staple for wood composite products, and tackles about the very fact of bamboo, distribution of bamboo resources, bamboo situation within the world, its extraordinary productivity and uses etc.

Bamboo could be a quite fast - growing and natural resources, china include a high harvest bamboo plant in each year . Which is reasonable and widely available . Moreover , it's the benefits of straight grain , beautiful color , high strength and toughness , and excellent abrasion resistance . Bamboo composite have similar properties to wood composite . They need Been widely employed in the fields of car , construction , ship building , furniture , and decoration to partially take the place of wood , steel, plastic etc . Than that of steel , and aging resistance is superior thereto of plastic additionally , it's easy to process and acceptance in price . Then, bamboo based composites will became a highly competitive alternative to wood based composites and can become a vital forest based product within the future .

3.1MATERIALS

The chapter discusses the materials and methods adopted for the project work. It describes the samples specifications, standard test procedures, process followed in the work.

This is the methodology followed in this project.Methodology is a systematic,theoretical methods applied to the field of study and it is defined as the systematic study of methods that are, can be, or have been applied within a discipline.

3.2 MATERIALS

- Cotton yarn of 30’s Ne is used for making a woven fabric
- Bamboo yarn of 30’s Ne is used for making a cotton and bamboo blended woven fabric.
- Bagasse fibre for making bio-plastic coating
- Acetone; N, N-Dimethylformamide; PVA (Polyvinyl alcohol)

3.3 PRODUCTION OF BAMBOO AND COTTON BLENDED FABRIC

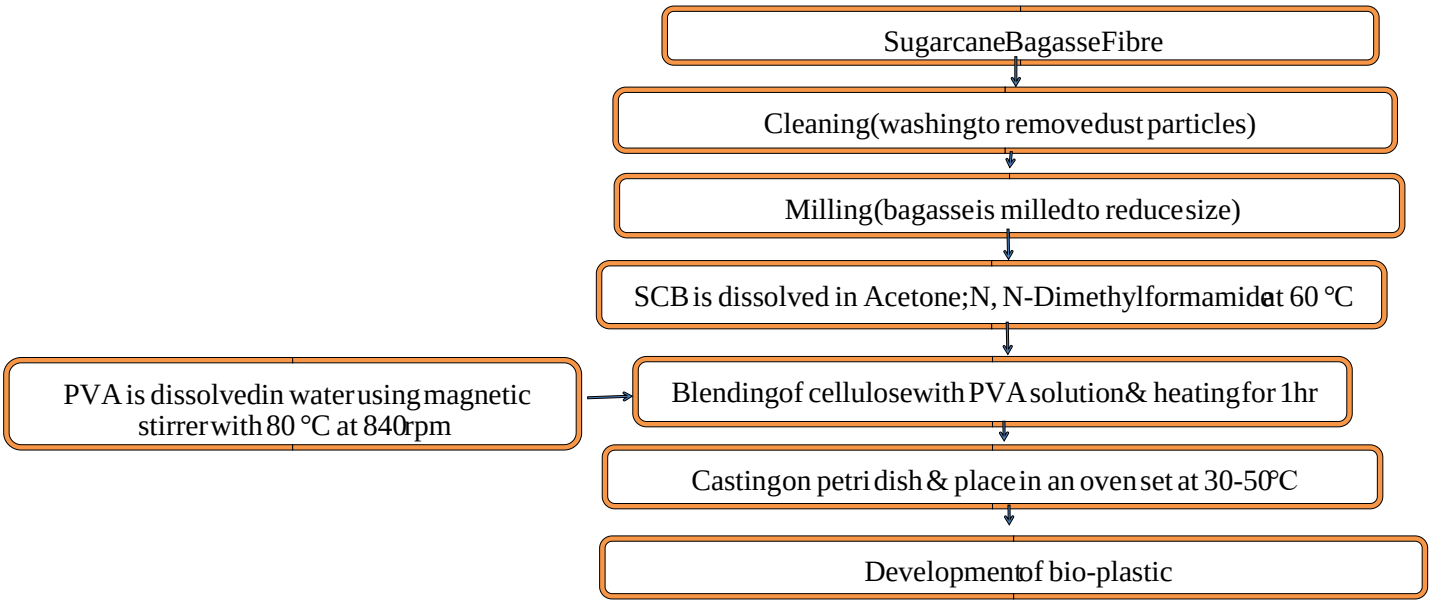
Cotton 100% and regenerated bamboo 100% was mixed. 2kg of every fiber was taken , and mixed ratios were calculated as per the wants of the yarns. Bamboo : Cotton 50 : 50 were mixed and calculated to feed the fabric to blow room and carding machine was set at 20 m/min and size of silver was set at 4.5 g/m and twist arrangement was kept on S-twist . After carding machines , slivers were doubled in a very drawing frame. The drawing machine was set at 10 m/min and size of silver was set at 4.5 g/min and twist arrangement was kept on S-twist . Then , the roving frame was wont to produce the roving sliver . The machine speed was set at 500 rot/m and count of roving was fixed at 0.8 hanks . The yarn parameters were kept under the identical twist and linear density . The spinning machine parameters were also kept constant like twist at 500 tpm (no/m) and spindle speed at 10,000 rot/min . The yarn samples were tested on different testing machines . The ASTM standard method ASTM D1907-07 was employed. The lea method was wont to calculate the linear density. The yarn mass variation was tested on electronic tester FB-198. The delivery speed was set at 10 m /min and total 400 meters of length of yarns were used for every sample . The ten tests were performed for every individual sample . The strength of yarn sample was calculated on Electronic tester XL-2 . The warp yarns were used as cotton and weft yarns were used to manufacturing of complete plain woven fabric samples . The plain woven fabric was produced. The plain-woven fabrics were examined and has a mean warp of 285

g/m2 and weft count 60 Tex , ends/inch 224 and picks/inch 112 , respectively. All fabrics construction parameters were kept precisely the same during the material manufacturing process .

3.4 PREPARATION OF BAGASSE BIO-PLASTIC

The experimental procedure for the development of bioplastic paste is depicted in the Figure below. Detailed description of the process is given in the text that follows.

Raw materials used for this research were locally available sugarcane bagasse fiber and PVA.



3.5 PRODUCTION OF CANVAS TEXTURED FABRIC

The prepared bio-plastic paste material is coated on the surface of the bamboo/cotton blended fabric. It was kept at room temperature for 24 hours and it was allowed to stick on the fabric material.

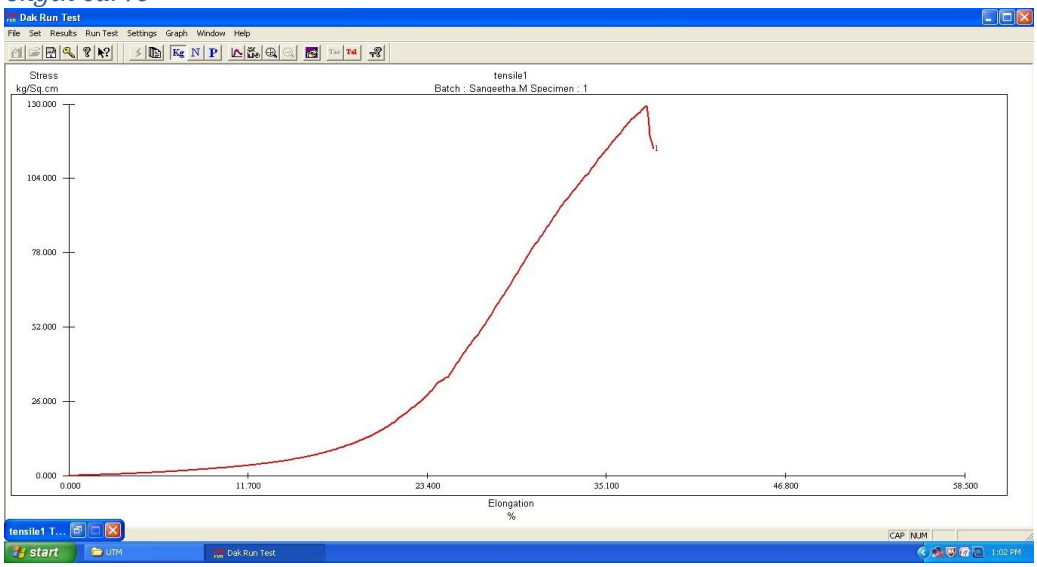
3.6 TENSILE STRENGTH TEST

Tensile strength is a measurement of the force required to pull something such as rope, wire, or a structural beam to the point where it breaks.The tensile strength of a material is the maximum amount of tensile stress that it can take before failure, for example breaking.Tensile strength, maximum load that a material can support without fracture when being stretched, divided by the original cross-sectional area of the material. Tensile strengths have dimensions of force per unit area and in the English system of measurement are commonly expressed in units of pounds per square inch, often abbreviated to psi. When stresses less than the tensile strength are removed, a material returns either completely or partially to its original shape and size. As the stress reaches the value of the tensile strength, however, a material, if ductile, that has already begun to flow plastically rapidly forms a constricted region called a neck, where it then fractures.

The developed banner material is test for the tensile strength under the load cell of 500kg with the speed of 10.000cm/min in tensile strength tester the peak load in kg was maintained at 21.3280. The detailed test results are given in the following table.

C.S.A. Sq.cm		**Peak Load kg**		**T.S kg/Sq.cm**		**Elong.@brk %**	
0.1650		21.3280		129.2606		38.1732	
Mod@5 % kg/Sq.cm	**Mod@10 % kg/Sq.cm**	**Mod@15 % kg/Sq.cm**	**Mod@20 % kg/Sq.cm**	**Mod@25 % kg/Sq.cm**	**Mod@30 % kg/Sq.cm**	**Mod@40 % kg/Sq.cm**	**Mod@50 % kg/Sq.cm**
0.9070	**2.6781**	**6.0697**	**14.6903**	**36.3633**	**77.1988**	**34.5251**	**11.0639**

Tensile strength curve



3.7 ANALYSIS OF TEARING STRENGTH

A fabric tears when it is snagged by a sharp object and the immediate small puncher is converted into long rip by what may be a very small extra effort. It is probably the most common type of strength failure of fabrics in use. It is particularly important in industrial fabrics that are exposed to rough handling. (e.g. sacks , parachute,tarpaulin) In some applications low tear strength is require, e.g. Adhesive tape, bandages, etc. The tear strength is measured as per the ASTM D412 standard test method, which is also used to measure tensile and elongation.

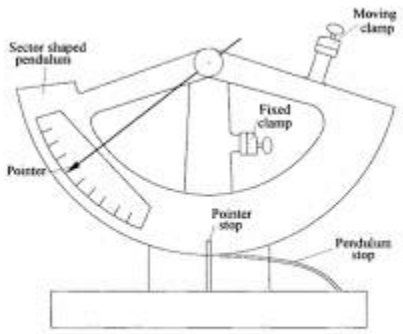


Figure: Elmendorf tear test.

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- First we take specimen of 100 ×75 .
- The template is placed on the specimen and cut according to the template, which are given below.
- A slit is created at the middle point of the specimen, which range is 20 mm.
- In the test, the Elmendorf continuous to tear the fabric from the end of the slit to the opposite edge distance of 43mm.

Pendulum lever principle is used here.

- The apparatus consists of a sector shaped pendulum carrying a moving sample clamp & a fixed clamp on the frame.

- When the pendulum is in the raised to starting position, the specimen is transferred between the two clamps.
- The tear is started by a slit cut in the specimen between the clamps.
- The pendulum is then released & the specimen is torn as the moving clamp, moving away from the fixes clamp.
- The pointer attached to the pendulum, which is graduated to read the tearing force directly.

Tearing strength of the cotton/bamboo blended fabric is 5*64 after bagasse bio-plastic coating on the surface of the fabric the tearing strength of the fabric banner material is increased to 16*64 while testing in the elmendorf tearing strength tester.

4. CONCLUSIONS

This project report deals with the development of eco-banners.The banner is made from the bamboo/cotton blended fabric which is coated by the bagasse bio-plastic material. The main objective of our project is waste management.This eco-banners replace the PVC banner which are used mostly for advertising purpose. Using these eco-banners will reduce the consumption of 18 tonnes of PVC flex in india. Let's hope for the better future.

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APPLICATION OF CITRUS LIMETTA ON TEXTILE

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ABSTRACT

Citrus limetta, a sweet lime, also known as 'mosambi', is a citrus fruit found mostly in south-east Asia. Citrus limetta fruits are small, green and of round/oval shape, which turn yellow on ripening. Since Citrus limetta juice contains high amounts of Vitamin C, it is highly recommended for athletes as it reduces muscle cramps and hydrates the body after a rigorous workout. During the extraction of juice from Citrus limetta, huge amount of by-products especially peel is generated. The peel contains good amount of phytochemical having many health benefits. The presence of bitter compound in peel limits its application in human foods. This study has been undertaken to apply peel of Citrus limetta bio extract on woven cotton textiles for antibacterial finish. With a view to understand the effect of various functional groups present in the plant, molecular characterisation was done using FTIR. Chemical groups responsible for antibacterial behaviour and the chemical structure of this plant were investigated through GCMS. Citrus limetta treated fabric has greater colour depth (K/S value) at higher concentration in comparison to fabrics treated with lower concentrations. Zone of inhibition in Citrus limetta treated fabrics reveal that it has excellent antibacterial effect against Escherichia.coli and Listeria monocytogeneus bacteria. Cotton fabrics also generate fragrance after treatment with Citrus limetta. Fragrance intensity ratings of 200 respondents have been documented and evaluated.

Keyword : - *Mosambi , Citrus limetta , FTIR , Escherichia coli , GCMS*

1.Introduction

Citrus limetta, alternatively considered to be a cultivar of *Citrus limon*, *C. limon 'Limetta'*, is a species of *citrus*, commonly known as mousambi, musambi, sweet lime, sweet lemon, and sweet limetta, it is a member of the sweet lemons. It is a cross between the citron (*Citrus medica*) and a bitter orange (*Citrus × aurantium*). The sweet lime (*Citrus limettarisso*), is commonly known as “Mosambi” in Indian subcontinent. It is native to Asia and best cultivated in India, China, southern Japan, Vietnam, Malaysia, Indonesia and Thailand. This fruit is eaten fresh or squeezed to make juice, a rich source of vitamin C and replenish energy [1, 2].

Citrus limetta is a small tree up to 8 m (26 ft) in height, with irregular branches and relatively smooth, brownish-grey bark. It has numerous thorns, 1.5–7.5 cm (0.59–2.95 in) long. The petioles are narrowly but distinctly winged, and

are 8–29 mm (0.31–1.14 in) long. Leaves are compound, with acuminate leaflets 5–17 cm (2.0–6.7 in) long and 2.8–8 cm (1.1–3.1 in) wide. Flowers are white, 2–3 cm (0.79–1.18 in) wide. Fruits are oval and green, ripening to yellow, with greenish pulp. The pith is white and about 5 mm (0.20 in) thick. Despite the name *sweet lime*, the fruit is more similar to a greenish orange in appearance. *C. limetta* grows in tropical and subtropical climates. It begins bearing fruit at 5 to 7 years old, with peak production at 10 to 20 years. It is propagated by seed.

Natural products are chemical compounds found in nature and they possess multiple pharmacological activities. These natural products are used in drug discovery and drug design. Separation of single molecular entity is very difficult from complex mixtures containing fats, oils, alkaloid, tannins and glycoside. In 1803 the first alkaloid nicotine was separated followed by morphine, strychnine, emetine and many others. There are various classes of phytoconstituents like Alkaloids, Glycosides, Flavonoids, Phenolic, Tannins, Terpenes, Saponins, Anthraquinones, Essential oils and Steroids. On a complete basis the phytochemical investigation of a plant involves the selection, collection, identification and authentication, extraction of the plant material (first fractionation), fractionation/separation (second fractionation) and isolation (third fractionation) of the constituents, characterization of the isolated compounds and investigation of the biosynthetic pathways of particular compound, quantitative evaluations and pharmacological activities. After selection, collection, identification and authentication of the plant drug there comes extraction and isolation of the phytoconstituents [3]. Out of many techniques available for isolation of a compound many researchers have taken Gas chromatography along with Mass spectrophotometry of the phytochemicals present in *Citrus limetta* peel essential oil.

Table 1. Chemical composition of the *Citrus limetta* peel as analyzed by GCMS[[2]

S. No	Retention time	Active constituents	Quantity (%)
1	11.32	d-limonene	78.3
2	14.59	Bergamol	6.21
3	9.14	β-pinene	5.6
4	14.51	Linalool	5.15
5	7.54	α-pinene	1.58
6	11.51	1,8 cineole	0.76
7	14.60	α-terpineol	0.51
8	21.50	Neral	0.28
9	22.31	Geranial	0.21
10	31.72	β-Bisabolol	0.10
11	30.03	β-Bisabolene	0.10
12	9.78	β-Myrcene	0.08
13	10.30	Sabinene	0.08
14	16.95	Citronellal	0.07
15	15.06	α-Terpineol acetate	0.06
16	8.07	Camphene	0.06
17	31.72	α-Bisabolol	0.05
18	31.80	Bicyclogermacerene	0.03
19	20.97	Farnesol	0.03

20	51.07	Terpinen-4-ol	0.03
21	14.59	Trans-nerodilol	0.03
22	53.01	β Farnesene	0.03
23	10.29	Nonanal	0.01
24	44.30	Phytol	0.01
25	34.07	Hinesol	0.01
26	10.11	α-phellandrene	0.01
27	17.57	Borneol	0.01
28	42.10	Myrcenil acetate	0.01
29	27.09	β-Santalene	0.01

Various compounds identified by the process of Mass spectrophotometry is adapted from the literature [2] and is shown in Table 1. Limonene is the main component of the citrus peel oils and it ranges from 40-95% in concentration in citrus fruits. It is one of the most common terpenes in nature. It has the molecular formula (1-methyl-4-(1-methylethynyl) cyclohexane. It is a monocyclic monoterpene with a lemon like odor and is major constituent in several citrus oils like orange, lemon, mandarin, and grape fruit. Because of its pleasant citrus fragrance additive in perfumes, soaps, foods, chewing gum and beverages. d-limonene is listed in the code of federal regulations as generally recognized as safe (GRAS) for a flavouring agent [4].

The peel of citrus fruits is a rich source of flavonoid glycosides, coumarins, and sitosterol, glycosides and volatile oils [5, 6]. Many polymethoxylated flavones have several important bioactivities, which are very rare in other plants. In textile finishing, perhaps laundry washing is a main problem on laundered fabric when dealing with antimicrobial finishes. Mostly, the applied finishes removed during repeated washing in daily life [7]. Antibacterial fabrics are important not only in medical applications but also in terms of daily human consumption [8, 9]. The application of antimicrobial finishes to textiles can prevent bacterial growth and it has become increasingly prominent for hygienic and medical applications [7].

Textiles' large surface area and ability to retain moisture enable microorganism growth. This growth leads to a host of unpleasant effects for both the material and the end user. The growth of microorganisms reduces the textile's mechanical strength, stains the fabric and lets other, more pernicious microbes breed. Normally, microbial attacks the textile fibers on the textile products particularly surgical gowns, medical accessories like recovery items and other under garments and socks etc. These textiles are affected by many kinds of microbes and cause the infection in sector where it is used like hospital, medical institutes & dental clinics. Microbes generate the bacteria, fungi and mildew which nourish the infection by odour, staining & deterioration [10]. There ought to be a role of antimicrobial agents or finishes to enhance textiles ability. Antimicrobial finishes were extracted from many sources like natural, synthetic & animals, but for this study the environmental friendly finishes were selected [11].

Citrus limetta has multiple pharmacological effects and its constituents are extensively utilized for many clinical applications. Traditionally it has been widely used in the treatment of the scurvy, indigestion and constipation, diabetes, ulcers, urinary disorder and for improvement of immune system. Though application of *Citrus limetta* in the medical

field is quite common, but limited study has been carried out to use *Citrus limetta* extract as natural antibacterial agent on textile substrate. Thus it was thought worthwhile to study and evaluate the antibacterial potency of phytochemical from *Citrus limetta* extract on cotton woven fabric.

Citrus limetta fruits were purchased from the market in Sathyamangalam, Tamil Nadu. The peel of the fruits were removed and washed for 15 minutes in water. Soil and impurities from the peels were removed. After cleaning, peels of *Citrus limetta* fruits were spreaded and kept at room temperature until complete drying took place. Dried peels were crushed into fine powder by grinding.

Bleached Cotton fabrics with the following specification were used as indicated in Table 2.

Table 2: Fabric specifications

Type	Gsm	Warp count	Weft count	EPI	PPI
100% cotton fabric	90	60^s	50^s	62	50

Potassium alum, which is the hydrated form of potassium aluminum sulfate and has the chemical formula K Al $(SO_4)_2 \cdot 12H_2O$. Potassium alum is a fine white powder was used as the mordant. Ethanol has been collected from department of Biotechnology for required purpose. Ethanol with the chemical formula C_2H_5OH, is volatile, flammable, colourless liquid with a slight characteristics odour.

1.1 Bacterial strains

The antibacterial activity of cotton fabrics treated with *Citrus limetta* extract was evaluated with *Escherichia coli*, a Gram negative bacterium and *Listeria monocytogeneus*, a gram positive bacterium. These two organisms are used for antibacterial susceptibility testing as reference strains in according to AATCC standard method. The strains were cultured on nutrient agar and incubated for 24 hours.

1.2 Methods

The powered form of *Citrus limetta* was extracted with ethanol by adding 150 grams in 250 mL of ethanol. The Ethanolic extract of *Citrus limetta* was prepared with soxhlet apparatus. *Citrus limetta* powder of 250 g was packed in whattman filter paper and placed inside the thimble which was loaded into the main chamber of soxhlet extractor. Distillation flask was filled with 250 ml of ethanol and was placed in the heating mantle. The soxhlet extractor was placed on the top of the flask. The various concentrations of the extract were obtained i.e. at 25%, 50%, 75% and 100%. The ethanol was evaporated from the extract at 78ºC using distillation process for 30 min. The ethanol free filtrate was used for further application and analysis.

1.3 Treatment of cotton fabric with alum and antimicrobial finish application

Fabric was treated with 5 percent of alum. The material and liquor ratio was 1:30. The alum was dissolved in water and was kept at water bath temperature of 70ºC. The fabric was treated for about 1 hour and dried in hot air oven. The fabrics were immersed in the 25%, 50%, 75% and 100% concentration of ethanolic extracted *Citrus limetta* for 30 minutes and padded individually in the presence of citric acid to maintain 5.5 pH. It was again immersed in the solution for another five minutes and repeated and squeezing process to get a wet pick up of 80% on weight of the fabric. The fabric was then dried at 80ºC for 3 min and cured at 110ºC for 2 min on a lab model curing chamber.

2. EVALUATION

Antimicrobial Activity Assessment of Dyed Cotton Fabric

The samples treated with *Citrus limetta* were tested for analyzing its antibacterial properties. The medium was prepared on petri dish. The bacteria used were gram negative *(Escherichia.coli)* and gram positive bacteria *(Listeria monocytogeneus)*. The samples were punched and a small circle of samples were placed in the medium and kept undisturbed for 24 hours. The zone formation indicates the competency of antimicrobial action of *Citrus limetta* on cotton fabric.

Qualitative assessment by Agar diffusion method (ISO 20645) was used to evaluate antibacterial activity. The dyed fabric and undyed control fabric samples were placed in intimate contact with AATCC bacteriostatic agar that was previously inoculated with inoculums of test organisms in petri dishes. The plates were incubated at 37^0C for 18-24 hrs. After incubation, a clear area of uninterrupted growth underneath and alongside of the test material indicates antibacterial effectiveness of the fabric.

Fourier-transform infrared *spectroscopy (FTIR)* of *Hibiscus rosa sinensis*

FTIR (Fourier Transform Infrared Spectroscopy) test of *Citrus limetta* was carried out on FTIR instrument, ABB Bomem, MB 3000, Canada and was available in Bannari Amman Institute of Technology, Sathyamangalam, Tamil Nadu, India.

GC-MS

Citrus limetta was analysed by using GCMS (Gas Chromatography and Mass Spectrometry). It was tested in VIT University, Chennai. India. Perkin Elmer, Clarus 680, US was used in the analysis and employed a fused silica column, packed with Elite-5MS (5% biphenyl 95% dimethylpolysiloxane, 30 m × 0.25 mm ID × 250μm df) and the components were separated using helium as carrier gas at a constant flow of 1 ml/min.

Determination of colour strength

Citrus limetta solution treated samples were tested in a reflectance spectrophotometer (Gretagmacbeth) with D65 light using Colour-i-control software interfaced with IBM PC. The Chromaflash Colour Matching System (ASHCO Industries Ltd. India) was used to evaluate K/S value for comparison of colour between *Citrus limetta* solution treated cotton samples and washed samples treated with different cycles. K/S is the colour value which is calculated from Kubelka-Munk Equation 1.

$$\frac{K}{S} = \frac{(1-R)^2}{2R} \times 100 \quad \ldots\ldots\ldots\ldots\ldots (1)$$

where,

K is the absorption coefficient,

S is the scattering coefficient,

R is the spectral reflectance of the coloured samples at a wavelength of maximum absorption (where the reflection is minimum).

Fragrance intensity test

Life span of a fragrance is based on the concentration of the scent and is completely based on the fragrant compounds. The *Citrus limetta* treated samples were evaluated for fragrance intensity in a subjective test method wherein judges had given the rating on a 5 point Likert scale i.e. 5 stands for excellent and 1 is poor. The experiment was carried out over a period of 4 weeks.

Olfaction China GB test

This method was performed quickly after opening the test samples. The method was conducted in an environment that was free from unconventional scents. Once the test entertainer washed hands and wears gloves, he took the fabric specimen close to the nostril and smelled the aroma in the fabric. Meanwhile the aromatic hydrocarbons were traced and noted subsequently the unconventional scent. The process is carried out by two personnel and the result is obtained by checking the consistency of the results of the two testers.

Result and discussion

Fourier-transform infrared spectroscopy*:*

FTIR spectrum of *Citrus limetta* is shown in Figure 1.

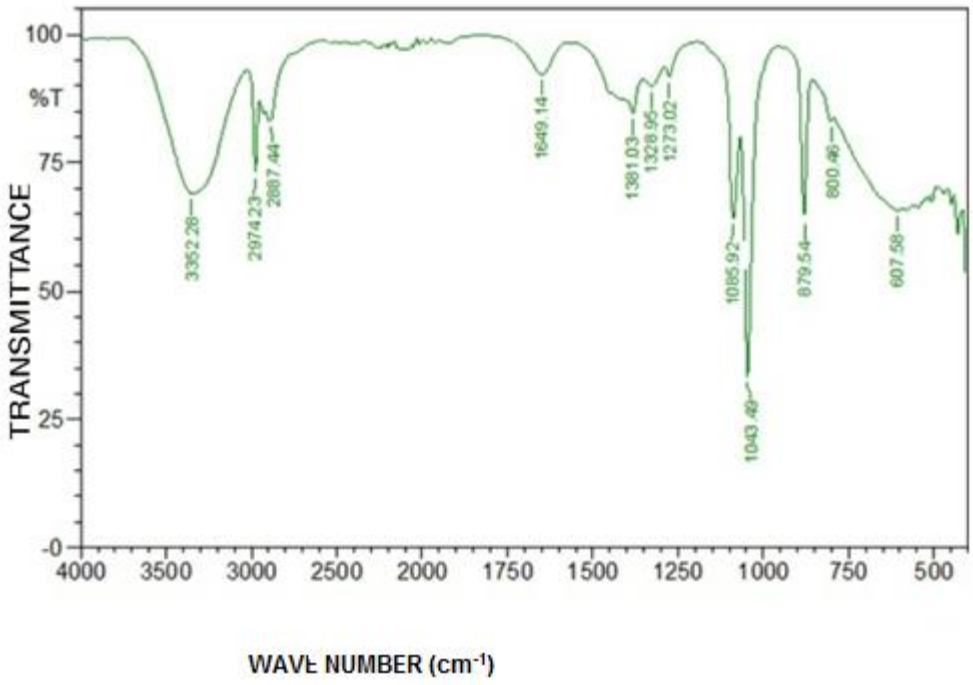


Figure 1: FTIR spectra of *Citrus limetta* extract

Analysis of the spectra is done and chemical groups identified at different frequency range are shown in Table 3.

Table 3: Analysis of FTIR spectra of *Citrus limetta* extract

It has been observed from the analysis of the IR spectra that different functional groups are present in the *Citrus limetta*

BOND	**FREQUENCY RANGE 1/CM**	**TYPE OF COMPOUND**	**INTENSITY**
C-H	3352.28	Hydrogen bonded alcohols, Phenols	Variable, Sometimes broad
C-H	2974.23	Alkanes	Strong
C-H	2887.44	Alkanes	Strong
C=C	1649.14	Alkenes	Variable
C-H	1381.03	Alkanes	Strong
NO2	1328.95	Nitro compounds	Strong
C-N	1273.02	Amines, Amides	Strong
C-O	1085.92	Alcohol, Ethers, Carboxylic acid, Esters	Strong
C-O	1043.49	Alcohol, Ethers, Carboxylic acid, Esters	Strong
C-H	879.54	Alkenes	Strong
C-H	800.46	Alkenes	Strong
C-H	607.58	Alkenes	Strong

such as Hydrogen bonded alcohols, phenols, alkanes, alkenes, nitro compounds, amines, amides, alcohols, ethers, carboxylic acid and esters The spectrum shows major peak at 3352.28 cm^{-1} and other peaks are at 2974.23 cm^{-1}, 2887.44 cm^{-1}, 1649.14 cm^{-1}, 1381.03cm^{-1}, 1328.95 cm^{-1}, 1273.02 cm^{-1}, 1085.92 cm^{-1}, 1043.49 cm^{-1}, 87.54 cm^{-1}, 800.46 cm^{-1} and

607.58 cm^{-1}. It is observed at the bands 3352.28 cm^{-1} corresponds to the Hydrogen bonded alcohols, phenols. The band at 2974.23 cm^{-1}, 2887.44 cm^{-1} and 1381.03 cm^{-1} corresponds to C-H stretching of alkanes. The band at 1649.14 cm^{-1}, *879.54* cm^{-1}, 800.46 cm^{-1}, and 607.58 cm^{-1} resembles to C=C and C-H of alkenes. The band at 1328.95 cm^{-1}, matches to Nitro compounds of NO_2. The band at 1273.02 cm^{-1} relates to C-N of amines, amides. The band at 1085.92 cm^{-1} and 1043.49 cm^{-1} links to C-O of Alcohol, ethers, carboxylic acid and esters.

GCMS

Citrus limetta extract was analysed through GCMS and the chromatogram is shown in Figure 2.

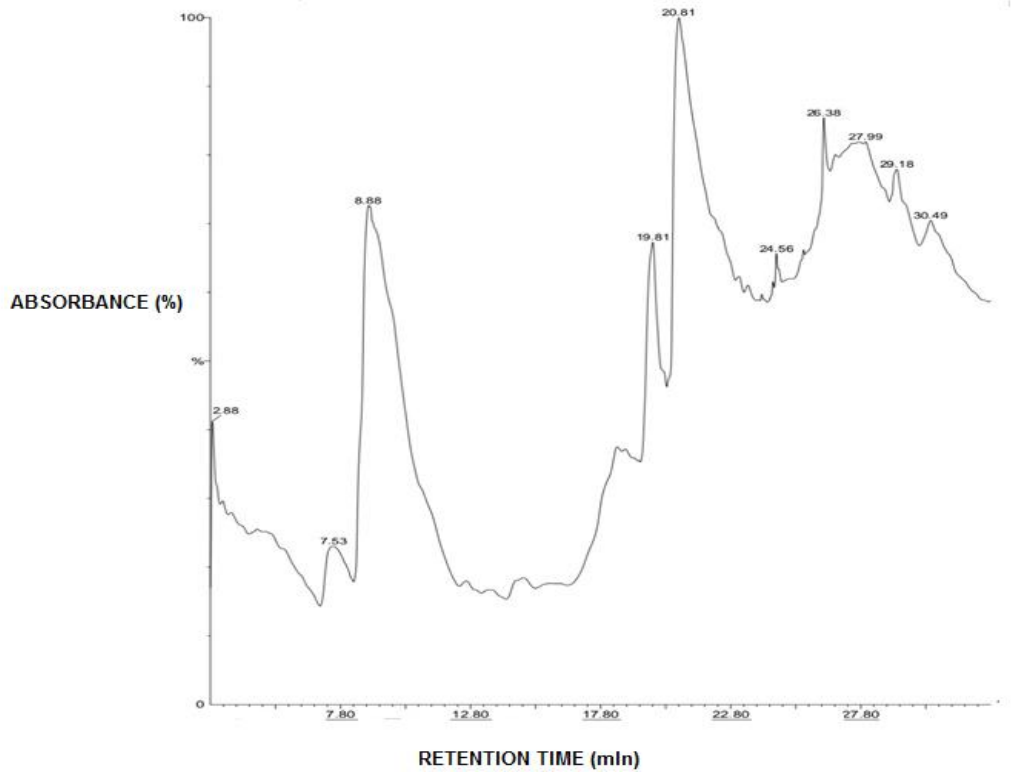
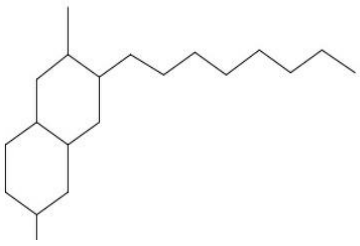
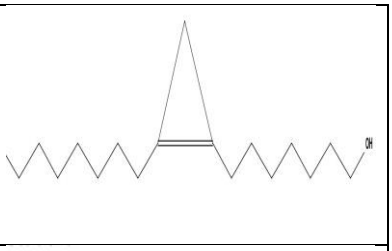
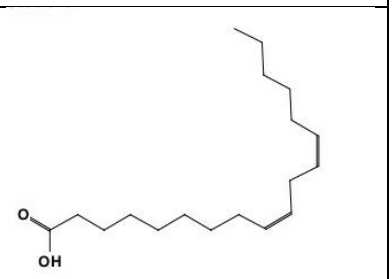
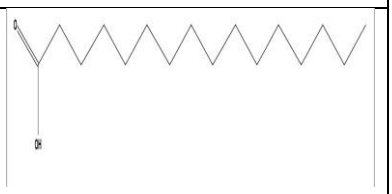
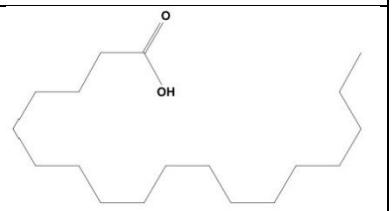
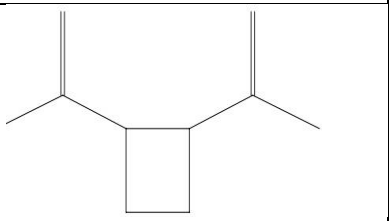
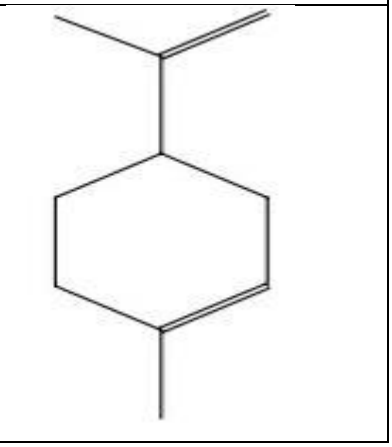


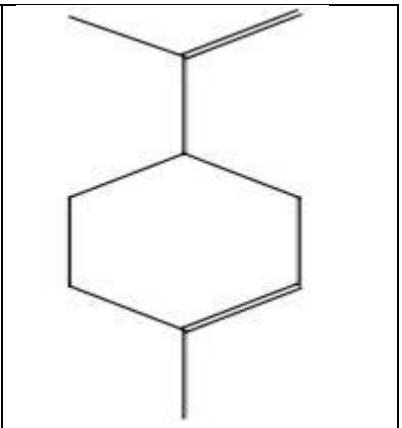
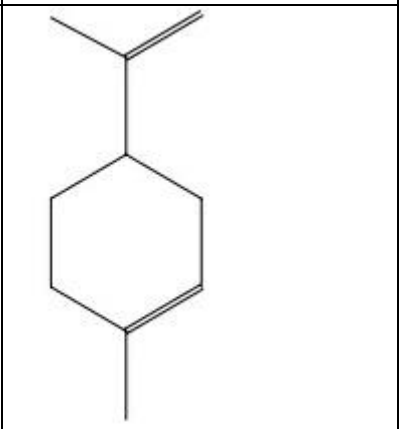
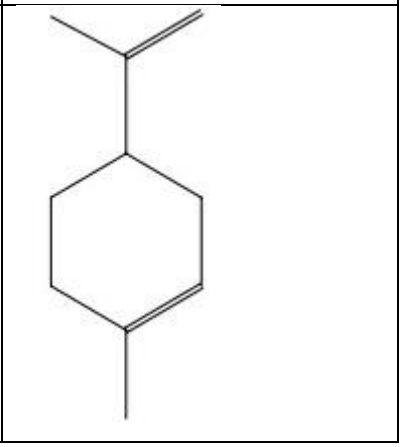
Figure 2: Chromaticity diagram of *Citrus limetta* extract.

The name of the chemical compound, its structure and the molecular weight of the identified compounds are shown in the Table 4.

Table 4 GCMS analysis of *Citrus limetta* extract

S.no	Name of the compound	R.T	Chemical formula	Molecular weight	Structure
1	NAPHTHALENE,DECAHYDRO-2,6-DIMETHYL-3-OCTYL-	2.88	$C_{20}H_{28}$	278	

2	2-OTYLCYCLOPROPENE-1-HEPTANOL	7.53	$C_{18}H_{34}O$	266	
3	9,12-OCTADECADIENOIC ACID(Z,Z)-	8.88	$C_{18}H_{32}O_2$	280	
4	N-HEXADECANOIC ACID	19.81	$C_{16}H_{32}O_2$	256	
5	OCTADECANOIC ACID	20.81	$C_{18}H_{36}O_2$	284	
6	CYLOBUTANE,1,2-BIS(1-METHYLETHENYL)-,TRANS-	24.56	$C_{10}H_{16}$	136	
7	CYCLOHEXENE,1-METHYL-4-(1-METHYLETHENYL)-	26.38	$C_{10}H_{16}$	136	

8	CYCLOHEXENE,1-METHYL-4-(1-METHYLETHENYL)-,(S)-	27.99	$C_{10}H_{16}$	136	
9	D-LIMONENE	2.18	$C_{10}H_{16}$	136	
10	CYCLOHEXENE,1-METHYL-4-(1-METHYLETHENYL)-,(S)-	30.49	$C_{10}H_{16}$	136	

Overall 10 different compounds were identified. The molecular weight of such compounds according to the structure varies from 136 to 284. The lowest molecular weight compound CYLOBUTANE, 1,2-BIS (1-METHYLETHENYL)-, TRANS-, CYCLOHEXENE, 1-METHYL-4-(1-METHYLETHENYL)-, CYCLOHEXENE, 1-METHYL-4-(1-METHYLETHENYL)-,(S)-, D-LIMONENE is having the chemical structure $C_{10}H_{16}$ and one of the highest molecular weight compounds is found as OCTADECANOIC ACID with the chemical structure $C_{18}H_{36}O_2$.

Computer color matching system (CCMS):

The original and *Citrus limetta* treated samples were characterized by spectral reflectance. It has been analysed from the

Table 5 that K/S value of *Citrus limetta* increases with increase in concentration of the extracted solution. It indicates that shade depth depends on the concentration of the *Citrus limetta* treated samples. However, after 75% concentration, K/S value of *Citrus limetta* levels off and that was why no further increase in K/S value was observed for 100% *Citrus limetta* treated sample.

TABLE: 5 CCMS values (*Citrus limetta*)

SL.NO	FABRIC	l*	a*	b*	c*	h^o	K/S
1	ORIGINAL	96.93	3.97	-15.32	15.82	284.53	-
2	25%	93.00	-4.78	21.66	22.18	102.44	0.2197
3	50%	91.85	-4.75	27.41	27.82	99.84	0.3638
4	75%	91.24	-4.83	30.53	30.91	98.99	0.4745
5	100%	0.36	-3.99	27.46	27.75	98.26	0.4101

Antibacterial activity assessment of dyed cotton fabrics with *Citrus limetta* extracts:

The treated samples were subjected to antibacterial testing by using gram negative bacteria *(Escherichia.coli).* Results are shown in Figure 3 which depicts the zone of inhibition of different samples treated with *Citrus limetta* extracts of 25% (Sample A), 50% (Sample B), 75% (Sample C) and 100% (Sample D) concentrations. Zone of inhibition of 28 mm, 31.2 mm, 31.7 mm and 32.5 mm was observed for 25%, 50%, 75% and 100% extracts of *Citrus limetta*.

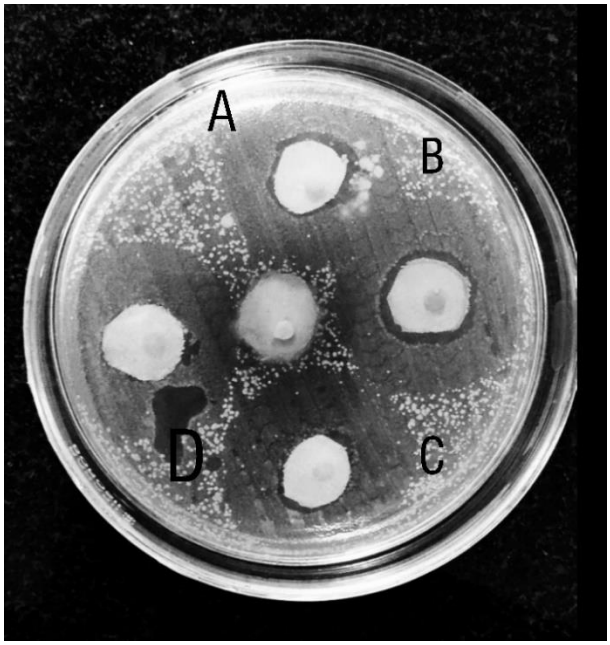


FIGURE 3: GRAM NEGATIVE (*E.COLI)*

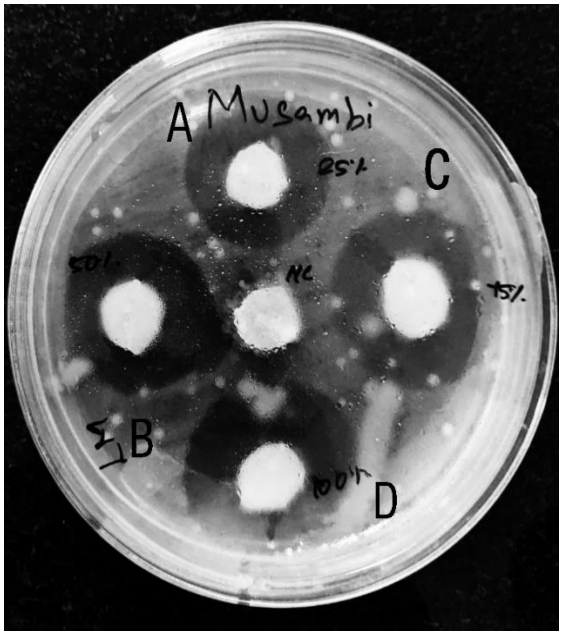


FIGURE 4: GRAM POSITIVE (L.M.)

The treated samples were also subjected to antibacterial testing by using gram positive bacteria *(Listeria monocytgenes).* Results are shown in Figure 4 which depicts the zone of inhibition of different samples treated with *Citrus limetta* extracts of 25% (Sample A), 50% (Sample B), 75% (Sample C) and 100% (Sample D) concentrations. Zone of inhibition of 27.70 mm, 30 mm, 32 mm and 32 mm was observed for 25%, 50%, 75% and 100% extracts of *Citrus limetta*.

Dissimilarities in zone of inhibition are observed between gram negative and gram positive bacteria. The differences between Gram positive and Gram negative bacteria are primarily related to their cell wall composition. The cell walls of Gram positive bacteria differ structurally from the cell walls of Gram negative bacteria. [12].

Fragrance intensity testing:

Fragrance intensity test has been carried out as per the subjective procedure. It had been observed that the intensity of fragrance in the fabric slowly deteriorated with time in natural environmental condition even without washing. At the end of fourth week the rating of fragrance intensity was found to be 2 using subjective method. A graphical representation of fragrance intensity is observed from the bar chart (Figure 5) that the 100% *Citrus limetta* extract treated fabric has higher fragrance rating as compared to 75%, 50% and 25% concentrations. Thus it can be inferred that 100% treated fabric retains the fragrance better than the 75%, 50% and 25% *Citrus limetta* treated fabric due to its better binding property. Based on the subjective analysis it is observed that this fragrance can last upto 20 washes and for more than 4 weeks. This gives opportunity for the apparel and textile industry to use fragrance treated fabric in developing innovative and hygienic apparel products in future**.**

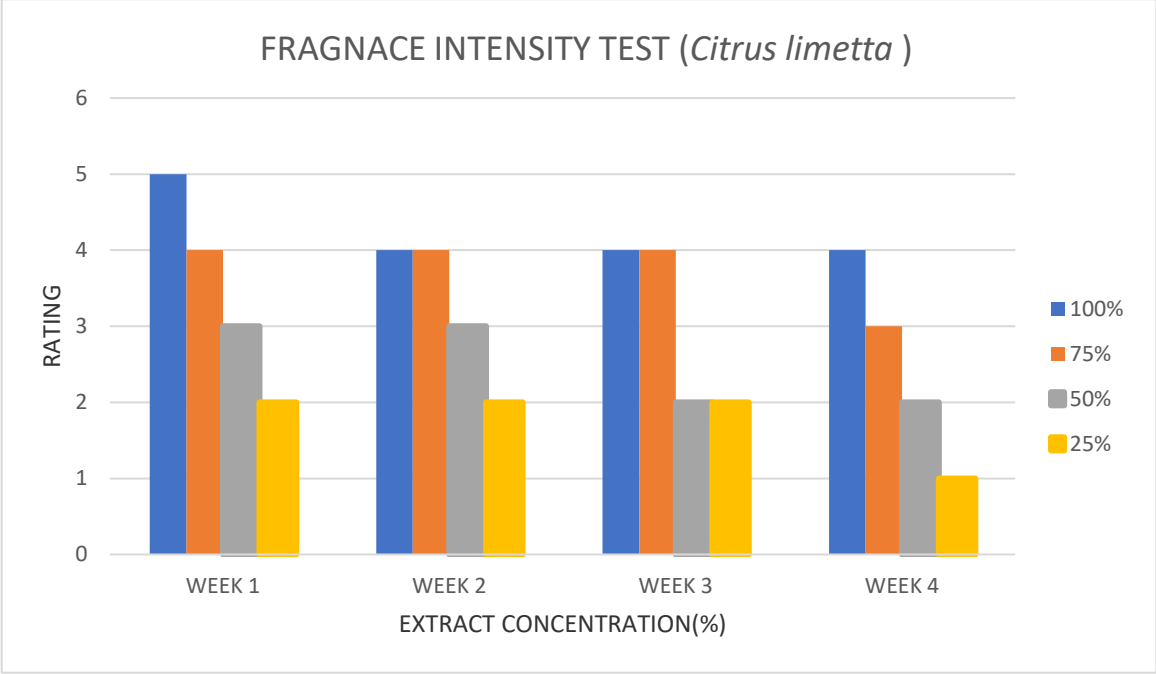


Figure 5*: Fragrance intensity of Citrus limetta treated fabric*

OLFACTION CHINA GB TEST

Peculiar odour of *Citrus limetta* treated fabric was determined through the olfaction method (Table 6).

TABLE: 6 OLFACTION GB TEST

TEST PERFORMER	TYPE OF SMELL	HERBAL SMELL	AROMATIC SMELL	GOOD/BAD ODOUR
1	PECULIAR	YES	NO	GOOD
2	PECULIAR	NO	YES	GOOD
3	PECULIAR	NO	YES	GOOD
4	PECULIAR	YES	YES	GOOD

It is observed that odour of treated fabric is pecular and aromatic in nature with good odour.

CONCLUSION

Citrus limetta was characterised by spectral reflectance, FTIR, GCMS, antibacterial assay and fragrance intensity. *Citrus limetta* powder was purified with ethanol and analysed with GC-MS and FTIR to characterise the chemical compound. GC-MS analysis of *Citrus limetta* extract reveales that, CYLOBUTANE, 1,2-BIS (1-METHYLETHENYL)-, TRANS-, CYCLOHEXENE, 1-METHYL-4-(1-METHYLETHENYL)-, CYCLOHEXENE, 1-METHYL-4-(1-METHYLETHENYL)-,(S)-, D-LIMONENE is having the chemical structure $C_{10}H_{16}$ and one of the highest molecular weight compounds is found as OCTADECANOIC ACID with the chemical structure $C_{18}H_{36}O_2$. FTIR spectrum for *Citrus limetta* shows major peak at 3352.28 cm^{-1} and other peaks at 2974.23 cm^{-1}, 2887.44 cm^{-1}, 1649.14 cm^{-1},1381.03cm^{-1},1328.95 cm^{-1}, 1273.02 cm^{-1}, 1085.92 cm^{-1}, 1043.49 cm^{-1}, 87.54 cm^{-1}, 800.46 cm^{-1} and 607.58 cm^{-1}. The fabrics was treated with ethanolic extract of *Citrus limetta* solution and evaluated for antibacterial activity against gram negative bacteria (*Escherchia.coli*) and gram positive bacteria *(Listeria monocytogenes)* by Agar Well Diffusion method. Zone of inhibition measured for the different treated fabric indicated that *Citrus limetta* extract performed as a good antibacterial agent against gram positive bacteria (*Listeria monocytogenes*) and gram negative bacteria (*Escherichia.coli*) and fabric turned into anti-bacterial to help prevent bacteria and other microorganisms from attaching to the fabric surface. Hence, it protects healthcare personnel with functional clothing as well as fabrics all around the home, including socks, mattresses, baby diapers and coverings. From the olfaction China GB method it was concluded that the treated fabric had peculiar smell with aromatic and herbal flavours with good odour. Thus it can be inferred that ethanolic *Citrus limetta* treated fabric retains the fragrance due to its better binding property. Based on the subjective analysis it was observed that this fragrance could last upto 20 washes and for more than 4 weeks. This gives opportunity for the apparel and textile industry to use fragrance treated fabric in developing innovative and hygienic apparel products in future.

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GROWING SCULPTURE

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ABSTRACT

Garments, since the beginning of time have accommodated the needs of mankind and have evolved according to the climate conditions, purpose, occasion and culture. With the passage of time, we invented skills of weaving and knitting to create garments and have mastered them with the years. Nowadays the market is filled with clothing brands and fast fashion. Along with number of trends, the amount of textile waste is also increasing and most of it is hard to recycle due to the synthetic materials.

This project is to see garments in an unconventional way with a more raw and natural approach. In order to challenge the existing notion that woven fabric, leather or flexible sheets of other non-woven materials only can be used to create an apparel, a lot of different materials has been tried and tested over here. A variety of unconventional materials and techniques were explored to create garments. I sought to understand the intrinsic nature of these material manipulation to create forms. After having explored materials like cane, bamboo yarn and wool felting, conceptually driven wearable-art was created. The garments were sculptured here without any stitching and at the same time it is wearable and completely organic, eco-friendly, and recyclable. The techniques, which are used to manipulate materials were self-discovered and honed over the time.

It is a journey of unknown and exploring n numbers of possibility of doing it. The project is started without any fixed believe of doing thing, different exploration showed this process the path. Environment, Exploration and Endless learning are the key words of this project.

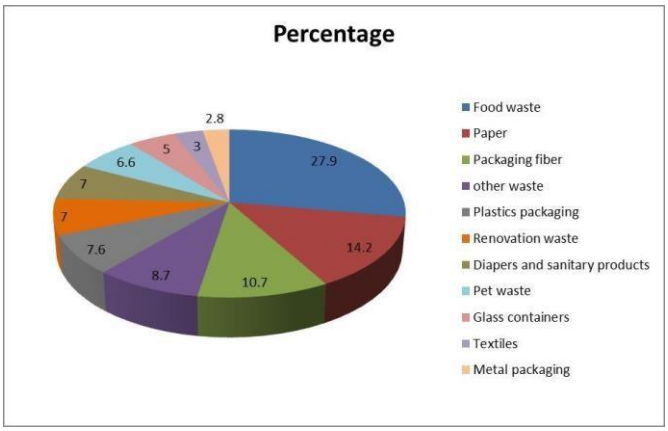
KEYWORDS: - *Unconventional, Growth, organic, sustainable, eco-friendly*

SCEONDERY RESEARCH

TEXTILE WASTE & FAST FASHION

The paper starts with a thorough research of current scenario of garment industry, market and fast fashion brands along with its growing textile waste.

- It is estimated that more than 1 million tonnes of textiles are thrown away every year, with most of this coming from household sources. Textiles make up about 3% by weight of a household bin.

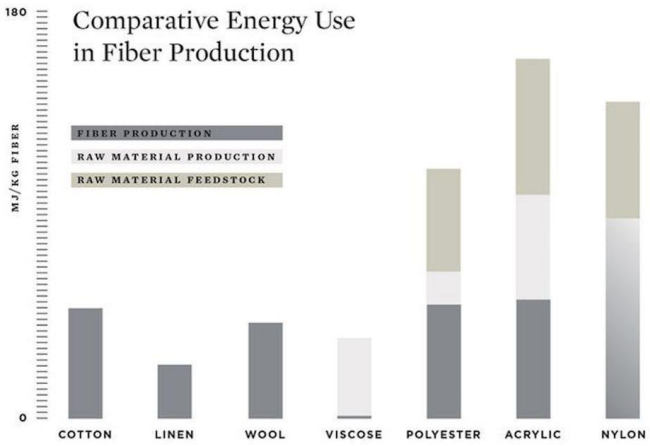


- At the least 50% of the textiles that one throws away are recyclable, but in practical only 25% of wastes are recycled. An outlook on the future market of textiles says that India is expected to grow around 3 - 5% in the area of disposals, and sequentially that will increase such disposal in landfills.
- The fashion industry is the second largest polluter in the world, behind oil. Textiles account for 10% of global carbon emissions.
- Fast fashion and consumerism cause overproduction and wastage. Unsustainable and non-biodegradable synthetic materials are used to produce low cost products.

CONVENTIONAL MATERIALS

Cotton, linen, wool, viscose, polyester, acrylic, nylon is the mostly used materials in clothing industry. Prior to industrial revolution 1770 - 1850, India had an internationally acclaimed cotton textile industry. Throughout the Industrial Revolution, India's traditional textile industry changed drastically.

- Currently textile fabric and clothing commonly consist of composites of synthetic plastics and cotton. The composition influences its method of recycling and durability.
- 60% of our clothing contains polyester, made from crude oil. It emits 3 times more CO2 than cotton.



PRIMARY RESEARCH AND EXPLORATION

production can be easy and process can be more sustainable. The materials I have explored – Cane, Bamboo, Indigo, Wool.

CANE: Cane is a tropical, perennial grass that forms lateral shoots at the base to produce multiple stems, typically three

to four meters hight and about 5cm in diameter. Cane is durable, light weight, flexible, easily available, cost- friendly material. It has excessive use in decor and furniture sector. This natural sustainable material is easy to maintain and long lasting.

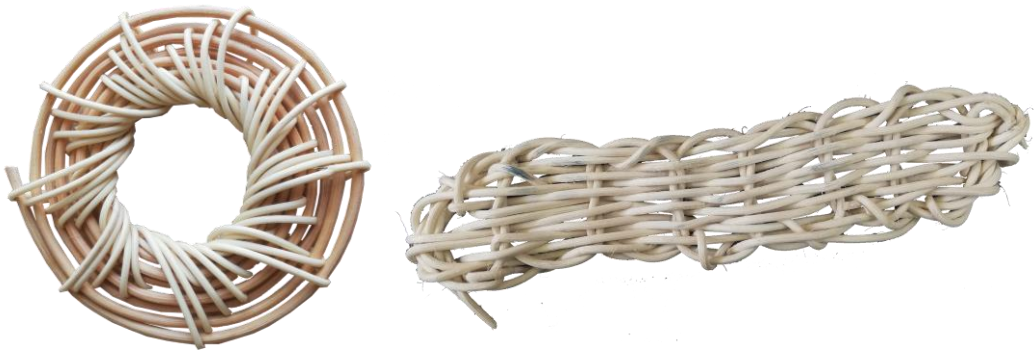


Figure 1moulding different width and colour cane strips once they are wet and flexible.

BAMBOO: Bamboo is a type of grass and it's considered as one of the fastest growing plants in the world. There are more than 1000 different species of bamboo and the stems of bamboo plant can vary from few cm to 40 metre in height. It can grow in any climate. Bamboo is a eco-friendly, durable, strong.

WOOL: Wool is a natural, renewable and biodegradable fibre obtained from animals such as sheep, goats, camels etc. Wool is produced by follicles which are small cells located in the skin. Wool comes in many different qualities. Since ancient period it is being used for clothing fabrics, blankets, rugs. This fibre can be reused and recycled.

Different types of wool fibre Raw wool fibre moulded into product hand felted translucent fabric from raw wool and organic materials.

INDIGO: Indigo dye is an organic compound with a distinctive blue colour. Indigo was a natural dye extracted from the leaves of certain plants (especially Indigofera genus). In the world of textile history indigo played a major role. It's one of the oldest dyes to be used for dyeing and printing. It has a major use in making blue denim.

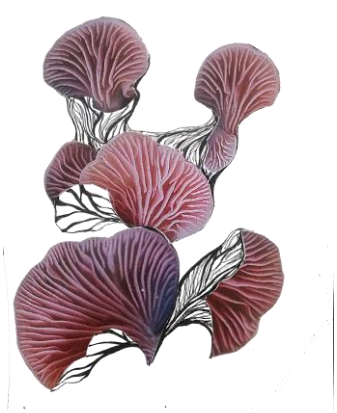
Creating Organic indigo dye

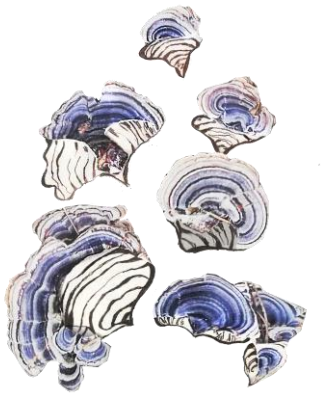
indigo dyed product

DESIGN PROCESS AND PRODUCTS

After going through few experiments and exploration natural material wool was selected for the final concept. I followed a proper design process –

- inspiration,
- concept,
- keywords
- Textile swatches
- form development
- initial sample development,
- Product(garment) development





concept board **few initial form explorations**

INSPIRATION: The inspiration has been taken from the wild fungi. They can survive and flourish in harsh conditions. Wild Fungi generally grow in the vicinity of humid flora such as tree trunks, branches, and meadows. Its organic growth, irregular pattern, layers, linear striations underneath their canopy are the key features highlighted.

CONCEPT: The organic, unconventional, unstructured growth pattern is considered for the garment construction. The fungi structure forms a prominent feature of the garment. Its purely organic and made from raw wool fibre. These garments require no stitching and make like sculpturing on the body. From one layer another layer grows and give a 3d look without any seam in between. It's completely handmade and I used hand felting technique to grow the fabric. Natural ingredients have been used to give it colour.

form and textile sample development

FINAL PRODUCTS:

I have made sculptured art pieces in form of garment which are unconventional also wearable without any

stitching. Here are few photos of the product –

CONCLUTIONS

The approach of this project is to bring the raw natural materials back and explore it in every possible way. We know what is already there but it's more about what else we can do more. Material purity and keeping the process sustainable are very important aspects of this project. It is a initial start, it can be explored in many other ways. So, it will be a ongoing project for more learning.

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Sayantika Dutta

As a Bengali from Kolkata, I am intensely connected to the art, culture and literature it has and that's what the name 'HRID' depicts, Heart. I have keen interest in different crafts, handloom textiles and travelling to different places to learn their culture and working with the artisans. Alongside travelling, I have developed a passion for photography and capturing stories. Working with different materials especially natural biodegradable fibers, zero waste pattern making, exploring crafts and textile techniques, detailing, intricacy and working with hands are the key elements in my design process. I strongly believe along with materials the design process needs to be circular and sustainable.

DEPARTMENT OF TEXTILE TECHNOLOGY

Vision

To be a Centre of Excellence in Textile Technology and Management with basic and applied research for the fulfilment of societal needs.

Mission

- **Develop industry relevant curriculum**, innovative teaching and project based learning methods that enables students to be efficient professionals.
- **Motivate Faculty** to update their knowledge and skills through continuous learning.
- **Provide holistic student development** by creating opportunities for lifelong learning and to develop entrepreneurship skills.
- **Undertake inter-disciplinary research and development/** Internship/Consultancy in the field of Textile Technology to support the industry and society.

B.TECH (TEXTILE TECHNOLOGY)

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

Graduates of B.Tech Textile Technology programme will

- PEO: 1 Hold leadership responsibilities in Textile and related segments such as product development, production, technical services, quality assurance and marketing.
- PEO: 2 Become successful entrepreneur in Textile and related field and contributing to societal, technological and industry development.
- PEO: 3 Partake professional qualifications/ certifications in Textile Technology related areas by pursuing specialized studies in engineering and business.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

- PSO1: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for Process Optimization, Cost and Value analysis, Productivity improvement, Solutions to quality issues and Product development in textile and related fields.
- PSO2: Demonstrate learned techniques, experiments, modern engineering tools and software to estimate the optimum utilization resources such as raw materials, machineries, manpower and to predict the properties of fibre, yarn, fabric and garments as per the end uses.

INDER PUBLICATIONS
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