EXPLORING INNOVATORS IN TEXTILES

KUMARAGURU
college of technology
character is life

TEXPLORER

TEXTILE RESEARCH MAGAZINE

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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. Currently the college, as an autonomous institution affiliated to the Anna University, offers 15 undergraduate (B.E., B.Tech.) and 14 post-graduate (M.E., M.Tech., MCA, MBA) programs of study The College has 15 academic departments and 9 research centers, each headed by a competent and experienced professor. Altogether, the college has over 391 well-qualified teaching faculty and 156 supporting technical staff, in addition to 199 administrative staff. The combined student intake during the current year is 2000 and the total number of students on roll is 6200.

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

EDITORIAL MESSAGE

Prof. Pavendhan A,
Associate Dean-Textile Cluster

I m delighted in acknowledging the national level technical project display context, titled, "K-TEX TECH CHALLENGE 2023" conducted by Department of Textile Technology. This edition brings out all papers that were presented during the context which was held on-line. My heartiest congratulations to all participants. I extend my warm appreciation to the students, faculty and Head of the Department who were behind the success of the context as well as this edition of the magazine. Context of this nature provides opportunities to students to explore research areas of their interest (as the theme has not been restricted to any single topic/ area). There are plenty of problem statements around us, and we only need keen eyes and right interactions with industry, researchers, and our professors to unearth them. Projects pursued in under-graduate level by students help exposed to various phases of research including framing research questions, designing, selecting appropriate methodology, experimenting, analysing, and reporting the results. I am sure all the participants of this context would have been benefitted from such exposure. I am sure this edition would inspire young students to explore more.

EDITORIAL MESSAGE

Dr.V.Ramesh Babu,
Head & Associate Professor

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 the voice of thetextile 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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WASTE TO VALUABLE PRODUCT WITH LED

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ABSTRACT

The methods described in the current invention involve dyeing the cocoon a variety of colors, cutting the colored cocoon lengthwise on one side, removing the silkworm through the cut, and chopping off the end of the silkworm cocoon. It involves the steps of drilling a hole that is smaller than the size of the bulb to be placed inside, placing the bulb within the perforated hole, and constructing the ornamental bulb cover using a cocoon. By painting the cocoon and putting a light bulb inside of it, you may make a bright, eco-friendly, and all-natural lamp. Additionally, by devising creative ways to utilize the cocoon, It is a very beneficial idea that may help to improve money since it can offer a beautiful lamp that is natural and eco-friendly and by finding new ways to use the cocoon. It's the ideal approach to give your house a touch of luxury while simultaneously helping the environment.

Keywords : - *Cocoon ,Decorative lamp, Environmental friendly, luxury.*

1. INTRODUCTION

The Chinese were the first to use silk in textiles during the Neolithic era. The silk rod started to extend once it gradually started to unfurl. Silk is one of the oldest and most widely used fibres today. All fibres are compared to it as the "QUEEN." Silk is a naturally occurring protein fibre produced by insect larvae. The most famous silk is made by the Bombyx mori mulberry, which is reeled in captivity for sericulture. When the worms are prepared to make a cocoon and weigh 1,000 times more than when they were hatched, they are given mulberry leaves. The pupae within are killed when the cocoon is heated during preparation. However, some are still alive and transform into moths, where they can reproduce and produce more caterpillars.

Since the cocoons of the Bombyx mori cannot be preserved or reeled in their fresh and unprocessed condition, Moth pupae quickly emerge from them as adults. The cocoons open when the moth breaks out.can no longer be utilised to create silk filaments due to the bave's loss of continuity. Pierced cocoons are those that have been punctured by moths. Stifling or drying the cocoons before reeling is therefore necessary to kill the pupae and lower the moisture content in the cocoons while maintaining the structure of the silk shell around it in order to produce silk strands of high quality.After going through several processes, the finished silk is produced. The trash, or the perforated cocoons, can then be utilized to create accessories, home décor, and other artistic and beautiful goods. The substance utilized in this application has not undergone any chemical processing, making it environmentally benign. The items created utilizing cocoons are lightweight, robust, water-resistant, and simple to clean. The use of perforated cocoons to create accessories is both environmentally benign and pollution-free, and it adds ornamental and aesthetic value to the manufactured goods.

2. PICTURE

Here is detailed picturisation of our product

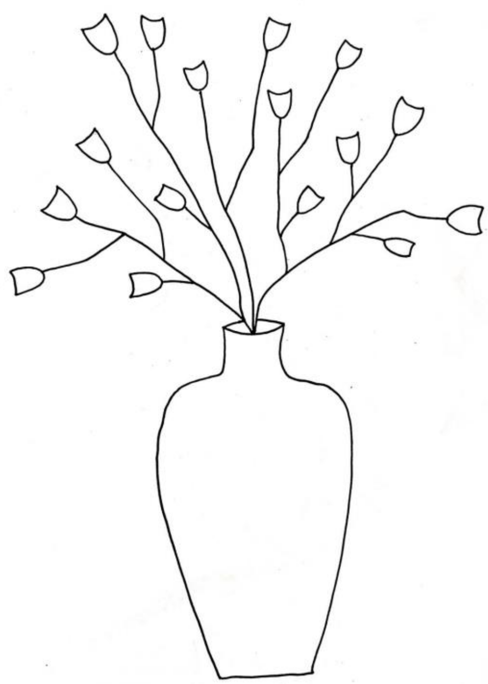

Figure -1: Decorative lamp

The reason for drilling the hole 3 smaller than the size of the bulb 2 is that the light bulb 2 inserted through the hole 3 enters by the pushing pressure when entering, but when the bulb is pulled out by the elasticity of the cocoon This configuration is necessary to prevent the bulb from slipping off.

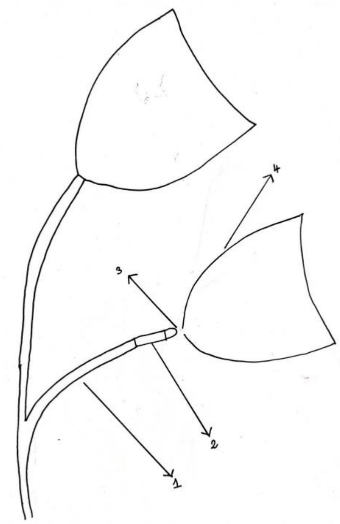

Figure -2: Description

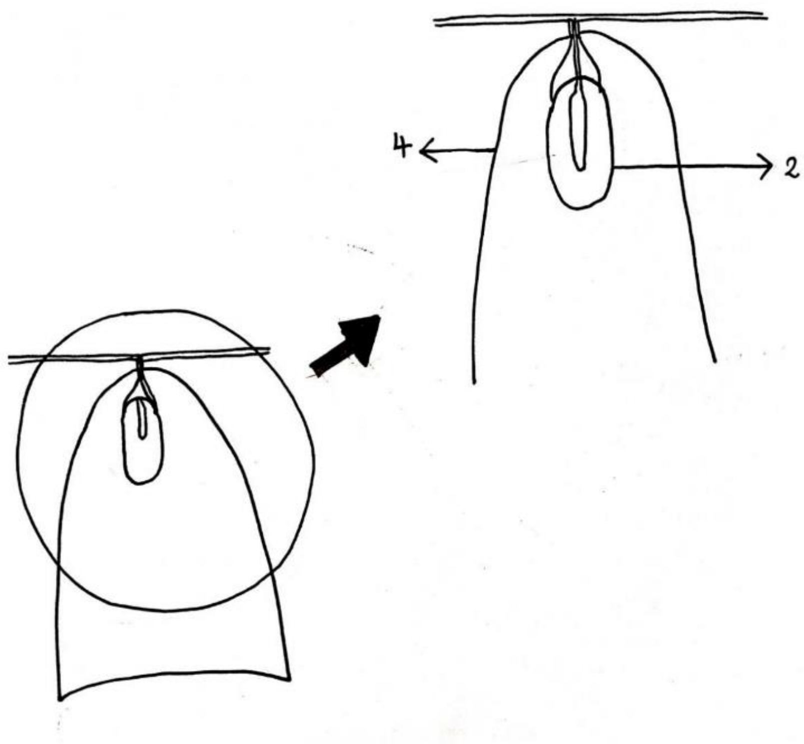

Figure -3: Description

3. DESCRIPTION

The making method of an electric lamp using Cut Cocoons
Figure 1 - reference state of use of the present invention.
Figure 2 - View of Single Cocoon.
Figure 3 - Sectional view of the present invention.
Explanation of symbols for main parts of the drawings
1: Wire used for the present invention
2: LED bulb
3: Hole
4: Colored Cocoon

4. DYEING OF COCOONS

The present invention the cocoons are dyed in order to obtain a cocoon having various colors.The process of dying or coloring is a crucial component of cocoon craft design and gives the cocoons their color shading. Only soft water should be used throughout the dyeing process since hard water uses more dye and may result in uneven colouring.The perfect color powder is added to the water after it has been bubbled. A 1 kilogram cocoon requires about 100 grams of color. First, 100 cc of hot water is mixed with the color powder. If the color is not what is intended, the sample is once more changed by changing the ratio of dye to water. Until the desired color is achieved, this procedure is repeated. Spend around 12 minutes soaking it in the solution.For the finest dying, it is best to soak for 8 to 12 minutes in the dye solution.The alum, a kind of aluminum salt, is utilized in the current innovation. The alum now has the effect of intensifying the color of the cocoon and guarding against fading.

FIGURE 4: Dyeing Process

4. CONCLUSIONS

As such, the present invention can provide a natural and environmentally friendly decorative lamp by dyeing the cocoon to have a variety of beautiful colors and inserting the bulb into the cocoon, and by finding a new method of using the cocoon silkworm It is a very useful invention that can contribute to the high value-adding of cocoons and the income increase of the latent farmer.

5. REFERENCES

	Publication	Publication Date	Title
1.	KR100892060B1	2009-04-06	The making method of an electric bulb cap used a cocoon
2.	KR100757655B1	2007-09-10	The making method of a cocoon lace
3.	CN105900942B	2018-12-25	A kind of silkworm cultural method
4.	KR100785353B1	2007-12-18	The dyeing of a cocoon
5.	CN105918263B	2018-11-20	Method convenient for cocooning and plucking cocoon
6.	KR100936299B1	2010-01-13	Processing Method of Cocoon Products for Art Materials
7.	KR100878442B1	2009-01-15	The making method of a cocoon float
8.	CN211176384U	2020-08-04	Fluorescent L ED color lamp string
9.	TWI432082B	2014-03-21	LED lights, including LED lights lighting devices and LED lights current control method
10.	CN201487754U	2008-08-06	LED ceiling lamp
11.	US20180283630A1	2018-10-04	Decorative Lighting
12.	US8752877B2	2014-06-17	Method and apparatus for installing decorative lights
13.	CN205094031U	2016-03-23	Decorative Flower vase

DEVELOPMENT OF NONWOVEN SORBENT FROM CIGARETTE BUTT WASTES FOR OIL SPILL CLEANUPS

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ABSTRACT

Cigarette butts are a non-biodegradable waste everywhere in our surrounding environment. It mainly comprises cellulose acetate, which has considerable potential use value. Therefore, finding an appropriate method to treat this waste and recover valuable resources is necessary. This work has attempted to produce cellulose acetate-based needle-punched nonwoven fabrics from cigarette butt wastes for the oil spill cleanup process. First, the cigarette butts were collected and cleaned, and cellulose acetate fibres were extracted. Subsequently, the cellulose acetate fibres were opened by carding, and nonwoven fabrics were developed using a needle-punching machine. Oil sorption, oil retention, and water sorption characteristics of the nonwoven textiles were investigated. FTIR, SEM, and surface contact angle are also studied for nonwovens. The oil sorption capacity was 33.5 g/g, comparable to a commercial polypropylene-based oil sorbent pad (29.22 g/g). Therefore, the cigarette filter-derived nonwoven sorbent produced in this study can potentially be a highly effective and more sustainable solution for remedying oil pollution

Keyword: - *cigarette butt, filters, oil sorption, nonwoven*

1. INTRODUCTION

Over 5.4 trillion cigarettes were sold to more than 1 billion smokers globally. Between oneand two-thirds of the cigarette butts from smoked cigarettes are thrown by smokers into the nearby environment. CBs are generally found everywhere in public places such as bus stops, streets, roads, parks, beaches as well as in ashtrays in homes and cars. CBs are the most common littered objects in municipal areas, on beaches and in coastline regions. It is estimated that 1.69 billion pounds of CBs wind up as litter worldwide every year. CBs are persistent in the environmentbecause most cigarette filters are made of cellulose acetate, which is not easily biodegradable. Hence, they are a concern in terms of their environmental, public health, social and economic significance [1].

According to Global Adult Tobacco Survey India in 2016-2017, nearly 267 million adults (15 years & above) in India are users of tobacco and it is estimated that 1.3 thousand tonnes of litter in the form of used filters are being released in the environment.

There have been several spills associated with the exploration, exploitation and transportation of crude oil. Several small spills occur daily during the production and transportationof crude oil, with large-scale spills reported from time to time. Water pollution caused by oil spillshas attracted increasing attention due to increased quantity of industrial oily sewage as well as frequency of oil spill incidents [2,3]. Approaches used in the remediation of spills include natural,chemical and mechanical remediation. Among the other methods, the use of oil-absorbent materials is one of the most economical and effective approaches, because of the low operationalcosts, easy operation and high efficiency [2]. The porosity of non-woven fabric was found to play a vital role in determining the oil sorption capacity

The aim of this study is to develop the commercially viable needle punched non-woven made from cellulose acetate by recycling cigarette butt waste.

2. MATERIALS AND METHODOLOGY

2.1 Fibers

Cellulose acetate fibers to be used in this work. The fibers are extracted from discarded cigarette butts.

2.2 Material Sourcing

Material is discarded cigarette butts. These materials are sourced from bakeries and tea stalls in and around Coimbatore by providing steel and aluminium boxes with a quote of “DROP YOUR BUTTS HERE”.

Figure 1 Material sourcing

2.3 Extraction of Cellulose Acetate From Cigarette Butts

Cellulose Acetate extraction method is based on the washing of the discarded cigarettebutts in hot water (50°C) for 60 min. After external paper removal, CBs have been washed in cold water three times, so to extend CA fiber. Successively to remove potential organic compounds the butts have been washed in ethanol 99% w/w twice. Finally, the obtained samples of CA were dried at 60°C for 60 min in the oven [4].

2.4 Oil

For this research work, engine oil was selected to study the oil sorption characteristics of fibres. Engine oil was sourced from a petrol pump in Coimbatore. The properties of the oil used were viscosity (366 CP), density (0.885 g/cm^3) and surface tension (29 cN/cm).

2.5 Fabric Preparation

Needle punched nonwoven fabrics from extracted cellulose acetate from cigarette butts were developed using DI-Loom OUG-II 6 machine. Required web areal weight was attained with support of carding machine and cross lapper. The nonwoven fabrics developed were cellulose acetate/polyester, cellulose acetate/cotton and cellulose acetate/polypropylene in the blend ratio of 90:10.

2.6 Contact Angle Measurement

Contact angle between the liquid and the sample was determined using Kyowa Contact Angle Meter DMe-211.

2.7 Characterisation of FTIR Spectra

Fourier transform infra-red spectroscopy (FTIR) is used to identify the functional groups present in the sample. Infra-red radiation is passed through the sample. Some of the radiation gets absorbed and some of the radiations gets transmitted. This would produce a spectrum. This spectrum would be unique for different samples. FTIR can identify and quantify the compounds that is present in the sample. SHIMADZU FTIR spectrometer manufactured in Japan was used. The model of the spectrometer used is IR Affinity - 1S. It is a double beam spectrometer with a wave number range from 4000 cm^{-1} to 400 cm^{-1} with a maximum resolution of 0.5 cm^{-1} and scan speed of 32 scans/minute.

2.8 Surface Morphology of Fibers

It is used to study the surface microstructures of the sample. A focused beam of electrons is made to interact with the atoms present on the surface of the sample. This would produce several signals containing information regarding the topography and composition of the sample. These signals are used to produce the image of the sample. Carl Zeiss EVO 18 model with low vacuum manufactured in Germany was used. Images were captured with a voltage (EHT) of 5kV and working distance of 10.3, 10.6, 10.7 and 11.6 mm were used. The images were captured with a magnification of 250X, 500X, 1KX, 2.5KX and 5KX.

2.9 Measurement of Fabric Areal Weight And Thickness

As per ASTM D 6242–98 and ASTM D 5729–97 standards, the areal weight of thenonwoven fabrics and thickness are determined, respectively [5].

2.10 Measurement of Oil Sorption Capacity

Oil sorption behavior of the nonwoven fabrics is measured using ASTM F 716–09standard. To study the oil sorption, samples are dipped into diesel engine oil for 15 min and then wet samples are hung in free air for 1 min to drip out the excess oil absorbed by the samples. Now, the weight of wet samples is measured, and oil sorption capacity is calculated.

2.11 Measurement of Oil Retention Capacity

After samples are taken from the oil bath as mentioned in determination of oil sorption capacity, these are allowed to drain out the oil for 15 min duration. The oil retention capacity wascalculated by dividing the difference in the weight of the oil sorbed (O) and weight of oil remainedin the nonwoven after 15 min of drain (D)

3. RESULTS AND DISCUSSION

3.1 Surface Characteristics of Cellulose Acetate Fibers

The surface microstructures of the cellulose acetate fibers were characterized by using FESEM. The cigarette butt was observed to be composed of smooth and intertwined fibers with an average diameter of about 20µm.

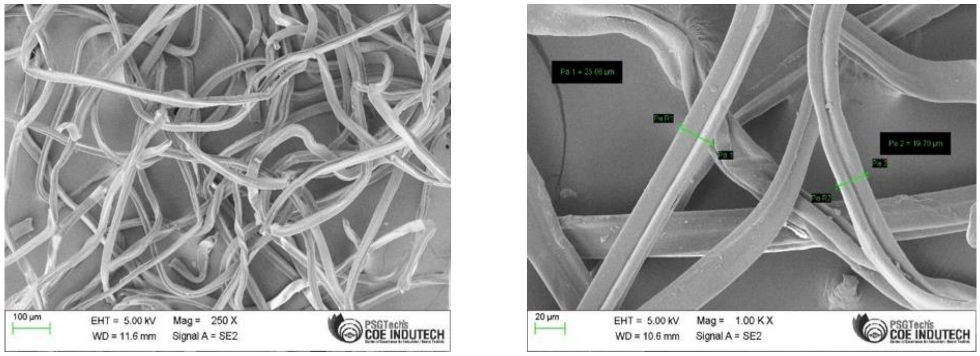
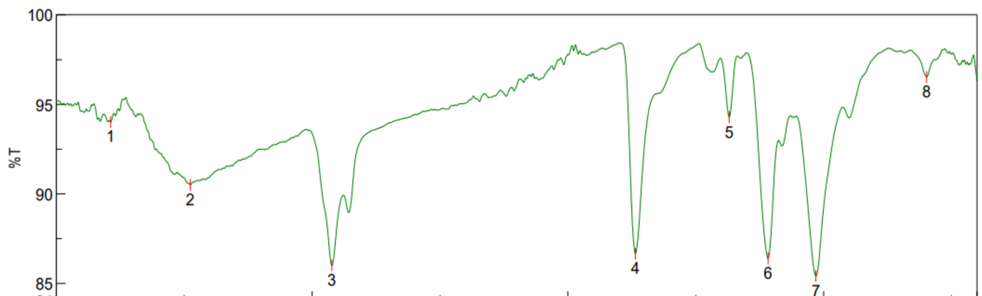


Figure 2 SEM micrographs of extracted cellulose acetate fibers

3.2 FTIR Analysis

The spectra of extracted cellulose acetate fibers from discarded cigarette butts is reported in Figure 3. In the region between 3800 cm^{-1} and 3000 cm^{-1}, it is possible to observe the extended band assigned to OH stretching. Symmetric stretching of C-H methyl group is identified corresponding to 2922.59 cm^{-1}. The characteristic bands of cellulose acetate have been highlighted and typical carbonyl stretching band of acetate group is very intense and can be easily identified. These carbonyl band of acetyl groups is visible and appears in an isolated region of FTIR spectrum at 1735.62 cm^{-1}. Bending of the CH group (belonging to methyl or hydroxyl groups in the plane) at 1369.21 cm^{-1} and 1216.86 cm^{-1} band linked to the stretching of the CO bond of the acetyl groups are identified. Finally, the vibrational modes of the C-O bond in cellulose molecules, that generate a band centered at 1029.8 cm^{-1} are noticed.



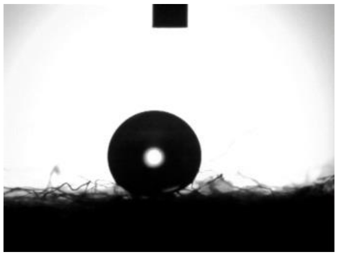
[Result of Peak Picking]

No.	Position	Intensity	No.	Position	Intensity	No.	Position	Intensity
1	3787.51	94.0049	2	3476.06	90.493	3	2922.59	85.9921
4	1735.62	86.6481	5	1369.21	94.2743	6	1216.86	86.3864
7	1029.8	85.4033	8	596.861	96.5248			

Figure 3 FTIR spectrum of cellulose acetate fibers

3.3 Wettability

When water was dropped on the surface of the cellulose acetate, a clear and stable water bead morphology was observed in the ultra-pure water with static contact angle 154.8˚. On the other hand, oil quickly spread on the fiber surface and wetted the fibers. The static contact angle of the fiber against oil was zero.



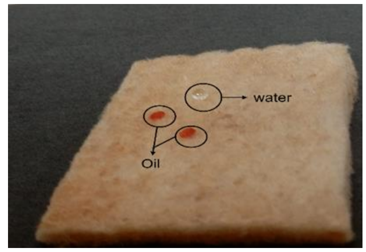


Figure 4 Water contact angle of cellulose acetate **Figure 5** Morphology of liquid droplets

3.4 Oil Sorption Capacity

The oil sorption capacity of the cellulose acetate blended nonwoven depends on combined sorption behavior of cellulose acetate and blended fibers. The oil sorption mechanism for sorbents is deemed to be a combination of absorption, adsorption and capillary action. Adsorption occur through physical trapping of the oil onto the fibre surface, and in absorption the oil enters the inter-fibre voids. Capillary action causes the oil to diffuse into the fibres through the pores present on the fibre surface. Also the chemical structure of cellulose acetate contains acetyl group which is oleophilic helps in chemical adsorption. The maximum oil sorption capacity was 33.5 g/g, comparable to a commercial polypropylene-based oil sorbent pad (29.22 g/g).

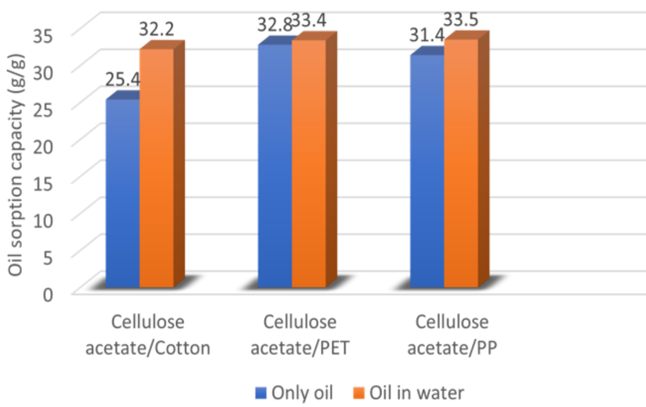


Figure 6 Oil Sorption capacity

4. CONCLUSIONS

In this work, needle punched nonwoven fabrics from extracted cellulose acetate fibers from cigarette butts has been developed and characterized for its suitability in oil spill cleanup process. Cellulose acetate also possesses good hydrophobic-oleophilic properties with static contact angle of 154.8º against water, whereas it has 0º against engine oil. The maximum oil sorption capacity was 33.5 g/g, comparable to a commercial polypropylene-based oil sorbent pad (29.22 g/g). Based on above findings, it is conclused that needle punched nonwoven fabrics produced from discarded cigarette butts can be effectively used as a sorbent material for oil spill cleanups.

5. ACKNOWLEDGEMENT

We wish to express our deep sense of gratitude to our guide **Dr.S.Viju**, Associate Professor, Department of Textile Technology, PSG College of Technology, whose valuable guidance and encouragement throughout the phase made it possible to complete the project successfully.

6. REFERENCES

1. Sina Dobaradaran, Torsten C. Schmidt, Nerea Lorenzo-Parodi, Maik A. Jochmann, Iraj Nabipour, Alireza Raeisi, Nenad Stojanovi, Marzieh Mahmoodi, *"Cigarette butts: An overlooked source of PAHs in the environment?"*, Vol. 249, pp. 932-939, June 2019.
2. Augustine O. Ifelebuegu, Egetadobobari E. Lale, Fredrick U. Mbanaso, Stephen C. Theophilus, *"Facile Fabrication of Recyclable, Superhydrophobic, and Oleophilic Sorbent from Waste Cigarette Filters for the Sequestration of Oil Pollutants from an Aqueous Environment"*, Vol. 6, August 2018.
3. Qiancheng Xiong, Qiuhong Bai, Cong Li, Huan Lei, Chaoyun Liu, Yehua Shen, Hiroshi Uyama, *"Cost-Effective, Highly Selective and Environmentally Friendly Superhydrophobic Absorbent from Cigarette Filters for Oil Spillage Clean up"*, Vol. 10, October 2018.
4. De Fenzo A, Giordano M, Sansone L, *"A Clean Process for Obtaining High-Quality Cellulose Acetate from Cigarette Butts",* Materials, Vol. 13(21), pp. 4710, October 2020, doi:10.3390/ma13214710.
5. Viju Subramoniapillai, G Thilagavathi, *"Utilization of recycled polyester nonwovens as sorbent for oil spill clean ups"*, Research Journal of Textile and Apparel, July 2021

BIOGRAPHIES

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INNOVATIVE PRODUCT DEVELOPMENT IN FASHION-MULTIPLE STYLING IN ONE GARMENT

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ABSTRACT

The concept of multiple styling in one garment refers to the ability of a single piece of clothing to be worn in different ways, offering versatility and allowing the wearer to express their individuality. This abstract explores the design and production process of garments that incorporate multiple styling options, as well as the benefits and challenges of this approach. The use of innovative fabrics, construction techniques, and fastenings are explored as key elements to achieving successful multi-styling designs. The abstract also examines the potential market for these garments, as well as the environmental and ethical implications of producing and consuming multi-styling garments. The advantage of having multiple styling options in one garment is that it allows the wearer to create different looks without having to buy multiple pieces of clothing. This can save time, money, and closet space. Additionally, it can be a more sustainable approach to fashion, as it encourages the use of versatile and long-lasting items .Here we use 4 styles in one garment. A four in one garment is a multi- functional piece of clothing that can be worn in four different ways, offering a practical and convenient solution for various situations. These garments typically have detachable or adjustable components such as sleeves, hoods and pockets that can be removed or repositioned to create different styles or functions. This type of garment is popular in outdoor activities and travel where space, comfortability and versatility are crucial.

Keywords: *Versatility, Ethical implications, Potential market, Closest space, Detachable*

1.INTRODUCTION:

Multiple styling in one garment is a fashion trend that has gained popularity in recent years. It is a design technique that allows a single piece of clothing to be worn in different ways, offering versatility and adaptability to the wearer. This technique involves incorporating various features such as adjustable straps, detachable elements, or reversible fabrics, that enable the garment to be transformed into different styles. Multiple styling not only provides convenience and creativity but also promotes sustainable fashion by reducing the need to purchase several separate garments. In this way, it is an innovative approach that blends fashion and functionality, providing the wearer with endless possibilities for expression and self-presentation

1.1. FASHION PRODUCT DEVEOPMENT STAGES:

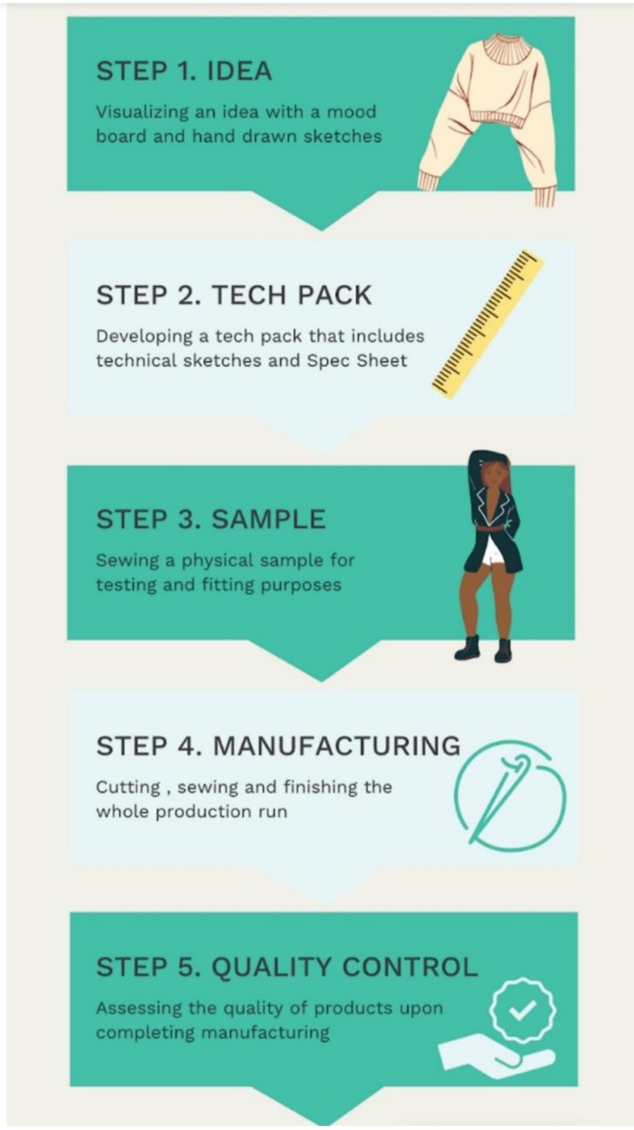

Figure-1: Fashion product development stages

2. MATERIALS REQUIRED:

Creating a shrug with four different styles can be a fun and creative project for those interested in fashion design. Here is a step-by-step guide on how to make a shrug with four different styles:

Materials:
Fabric of your choice
Sewing machine or needle and thread
Measuring tape
Scissors
Pins

3. PROCEDURE:

3.1. PATTERN MAKING:

Step 1: Take measurements: First, take the measurements of the person who will be wearing the shrug. You will need to measure the chest circumference, shoulder width, armhole depth, sleeve length, and back width.

Step 2: Draft the basic pattern: Using these measurements, draw a basic rectangle pattern for the back of the shrug. This should be the width of the back plus a few inches for ease, and the length should be from the base of the neck to the desired length of the shrug. Cut this pattern out of paper.

Step 3: Draft the front pattern: To make the front pattern, draw a rectangle that is the same width as the back pattern, but only half the length. Then, draw a curved line from the top corner of the rectangle to the bottom corner on one side. Cut this pattern out of paper.

Step 4: Draft the sleeve pattern: Draw a rectangle that is the desired length of the sleeve, and the width should be equal to the armhole depth measurement plus a few inches for ease. Then, draw a curved line from the top corner of the rectangle to the bottom corner on one side. Cut this pattern out of paper.

Step 5: Cut out the fabric: Place the back pattern on the fabric and cut around it. Then, place the front pattern on the fabric and cut two pieces (one for each side of the front). Cut out two sleeve patterns as well.

Step 6: Sew the pieces together: Place one front piece on the back piece, right sides together, and sew along the shoulder seam. Repeat with the other front piece. Then, sew the sleeves into the armholes, and sew the side seams of the shrug.

Step 7: Finish the edges: Hem the sleeves and bottom edge of the shrug. You can also finish the raw edges of the neckline and front opening with bias binding or a facing.

3.2. CONSTRUCTION:

Step 1: Prepare the fabric: Wash, dry, and iron the fabric before starting. Lay it out on a flat surface, such as a table or cutting mat.

Step 2: Cut out the pattern pieces: Using the pattern pieces you created (or a pre-made pattern), cut out the fabric for the back, front, and sleeves.

Step 3: Pin and sew the shoulder seams: With the right sides of the fabric together, pin the shoulder seams of the front and back pieces together. Sew the seams together using a straight stitch and backstitch at the beginning and end of the seam.
Step 4: Pin and sew the sleeves to the armholes: Pin the sleeves to the armholes with the right sides of the fabric together. Sew the seams together using a straight stitch and backstitch at the beginning and end of the seam.
Step 5: Pin and sew the side seams: Pin the side seams of the front and back pieces together with the right sides of the fabric facing each other. Sew the seams together using a straight stitch and backstitch at the beginning and end of the seam.
Step 6: Hem the edges: Hem the sleeves and the bottom edge of the shrug by folding the raw edge under and stitching it in place using a straight stitch. You can also use a serger or zigzag stitch to finish the edges to prevent fraying.
Step 7: Finish the neckline and front opening: You can finish the raw edges of the neckline and front opening with bias binding or a facing. To attach bias binding, fold the bias tape over the raw edge and pin it in place. Sew it in place using a straight stitch. For a facing, cut a piece of fabric to match the neckline and front opening, sew it in place with right sides together, and then turn it under and sew it in place.

4. SKETCHES OF FOUR MULTIPLE STYLES:

4.1. OPEN FULL SHRUG:

Figure-2: Style-1

4.2. CENTER PINNED SHRUG:

Figure-3: Style-2

4.3. SHRUG AS DRESS:

Figure-4: Style-3

4.4. SHRUG AS SKIRT:

Figure-5: Style-4

5. CONCLUSION:

In conclusion, multiple styling in a single garment is a fashion trend that offers versatility, creativity, and functionality to the wearer. It allows for the creation of a single piece of clothing that can be worn in different ways, providing endless possibilities for self-expression and self-presentation. The technique involves incorporating various design features such as detachable elements, reversible fabrics, or adjustable straps that enable the garment to be transformed into different styles. Multiple styling also promotes sustainable fashion by reducing the need to purchase several separate garments, making it an innovative approach that blends fashion and practicality. Overall, multiple styling is a trend that reflects the changing needs and desires of modern consumers, and it is likely to continue shaping the future of fashion.

6.REFERENCE:

1. Pattern cutting and making up; Shoben M M; CBS Publishers and Distributors; 1999

2. Threads Sewing Guide; Carol Jean Fresia; Editors of Threads; 2011

OPTIMIZATION AND APPLICATION OF CLITORIA TERNATEA (SHANKU PUSHPI) NATURAL DYE AND ITS EFFECT ON COTTON FABRIC FASTNESS PROPERTIES

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ABSTRACT

The study on Optimization and Application of Clitoria Ternatea (Shanku Pushpi) Natural Dye and its effect on Cotton Fabric Fastness properties was to understand and evaluate the dye from the dried flower of Clitoria Ternatea or Blue Pea. The demand for natural dyes has increased due to the harmful effects of synthetic dyes on the environment and human health. This study focuses on optimizing the extraction process of Clitoria Ternatea (Shanku Pushpi) natural dye and evaluating its application on cotton fabric fastness properties.

The Dye bath method was applied to extract its natural colour. The established natural colour has been studied its dyeing ability on cotton fabric samples by using mordanting and dyeing procedures. The effect on fabric samples were analysed their colour characteristics through colour fastness to washing and other tests are planned. The test results showed that all fabrics samples produced a different range of colours where the most brilliant colours were registered with pre-mordanting method. However, all the fabric samples were poor fastness to washing. Thus, having different method of fixing and dyeing procedures with similar extract and concentration allowed variations of hues and shades of the silk samples

The cotton fabric was then dyed using the optimized conditions and its fastness properties were evaluated. The results showed that the Shanku Pushpi natural dye had good color strength and could produce a range of colors on cotton fabric. The fastness properties of the dyed fabric were also found to be good, with good resistance to washing, rubbing, and light.

This study highlights the potential of Shanku Pushpi as a natural dye for cotton fabric and provides valuable information for optimizing the dye extraction process to achieve the best dyeing results. The use of natural dyes such as Shanku Pushpi can contribute to a more sustainable and eco-friendly textile industry.

Key Words: *Clitoria Ternate, Mordant, Dye Fixer, Natural Dyeing, Anti-allergy, Skin Friendly*

1. INTRODUCTION

Natural dyes are organic compounds with hydroxyl groups [1]in their nucleus and are sparingly soluble in water. Some natural colorants do not have solubilizing groups. In such cases, a temporary solubility group known as mordants is generated at the time of application. Flowers contain carbohydrates, minerals, mucilage, vitamins, and pigments, including flavonol, crocin, anthrocianin, carotene, lycopene, and zigzantin. Pigments from flowers are extracted for coloring, and these extractions are mainly divided into water-soluble pigments (aqueous extraction) and water-insoluble pigments (organic solvent extraction).

The substance acting as a dye must fulfill the following criteria:
i) It must have a suitable color.
ii) It must be able to fix or be fixed to the fabric.
iii) It must be refined after fixing the fabric to be dyed.
Butterfly peas (indigo blue) were chosen as the natural dye source for this study.

Natural colours have been part and parcel of our life since ancient times. The art of dyeing with natural dyes was typical in India. In the 7th century, India monopolized dyed, painted, and printed textiles with natural colours (Parkes, 2002). The Indian dye was famous for its variety of shades with natural mordants. Until the invention of the widely available and cheaper synthetic dye "Perkin Mauve" in 1856 [1] natural sources like stem, bark, leaves, roots, and flowers were used to obtain colours for dyeing clothes. Synthetic dyes are extensively used in textile industries for dyeing nylon, wool, silk, leather, and cotton [1], and they are also used as food coloring agents, food additive and medical disinfectants and anthelmintics.However, some synthetic dyes [1] are harmful due to their adverse ecotoxicological effects and associated hazards, such as skin diseases, lung problems, and environmental problems. Therefore, interest in natural dyes has increased considerably on account of their high compatibility with the environment, relatively low toxicity, and allergic effects, as well as the availability of various natural coloring sources, such as plants, insects, minerals, and fungi [1] Identifying various resources for the extraction of natural dyes is worthwhile as they significantly minimize the amount of toxic effluent from the dyeing process.

Natural colorants are dyes and pigmentary molecules obtained from plant, animal, or mineral sources with or without chemical treatment. Most commonly available raw materials for natural dyes are extracted from different plant parts indispensable for survival. Flowers are dispensable and the most colorful but have yet to be used extensively. In India, vast amounts of flowers and herbal materials are wasted daily. These flowers can be used for dye extraction for textile and other color industries. In addition, the dyes can be used for coloration in the food industry, preparing herbal gulal, and making different colorful candles. The advantages of natural dyes are cost-effective, renewable, non-carcinogenic, and cause no disposal and allergic problems. As a result, there is a great demand for natural dyes since they do not pose health hazards [1].For example, herbal dyes are non-toxic, non-allergic, abundant, and economical. Some natural dyes produce exquisite shades and are cheaper than chemical dyes. Most natural-dyed textiles today are imported from the third world, and India is still the most prominent producer.

Figure 1.1 - Clitoria Ternate (Butterfly Pea)

2. MATERIALS AND METHODS

2.1 Materials

Clitoria ternatea is also known as “bunga telang” (in Bahasa), „blue pea flower, butterfly pea flower, pigeon wings, tropical alfalfa, a mussel-shell climber (English) and Aparajita in Bangladesh and Sankupushpam in Kerala. The plant is a perennial climbing herb that grows abundantly in tropical equatorial Asia. It includes countries such as India, Africa, Australia and America include Angola, Benin, Burundi, Cabinda, Cameroon, Cape Verde Is, Chas, Ethiopia, Malawi, Sudan, and the area of the Indian Ocean[2]. Clitoria ternatea belongs to the Fabaceae family, which is also placed in the Papilionaceae family It has two varieties of colours, white and blue petals, with an average length of about 4 cm (1.6 in) long by 3 cm (1.2 in) wide [2]. In this experiment, the petals of the freshly collected flower which exhibits concentrated cobalt blue color with an average size of 1 cm were dried and used for the experiments. The physical characteristics, quality, and condition of the flower (see Fig. 2.1) were the main aspect to be considered when collecting the source in large amounts. The parameters were set to ensure that only consistent amounts of flowers were applied in each procedure. The collected flowers were thoroughly washed to ensure dirt and other small particles would not affect the result.

Finally, the clean flowers were dried by exposure to sunlight.

Figure 2.1 – Clitoria Ternate Flowers

Fabric

The cotton fabric of count 60s is taken for the experiment. The GSM of the fabric is 112 grams.

Chemicals Used

Lemon Extract (Natural), Alum at 12% weight of the fabric were used as mordant. NaCl is used in dyeing process to improve dye uptake. Dye fixer which is formaldehyde free is used to fix dye on fabric.

2.2 Processing Methods

Dye Extraction Preparation

The dried flowers (see Fig. 4.3) were weighed and put in gauze fabric to ensure that only clean extract would be collected. Then, the samples were gradually dissolved in distilled water at a ratio of 1:20 at room temperature. The mixture was heated up at 100°C for an hour to allow the release of dye into an aqueous solution.

Figure 2.2 – Dried Flowers

Figure 2.3 – Prepared Dye Extract

Mordanting

Alum at 12% weight of the fabric was used as mordant and mordanting procedures were carried out through pre-mordanting methodology. Temperature maintained is 85℃ for 1 hr.

Dyeing

Following conditions are followed in Dyeing

Table – 4.1

Material Preparation	Condition
Material to Liquor	1:20
Alum	12% weight of fabric
Temperature	60℃
Time	45 min

Figure 2.4 – Dyed Fabric

Dye Fixation

Dye fixation on fabric is a crucial process in natural dyeing. formaldehyde free dye fixing agent 0.3-1% to the weigjt of fabric is used at 30-40 C in mild acidic Ph.

2.3 Flowchart

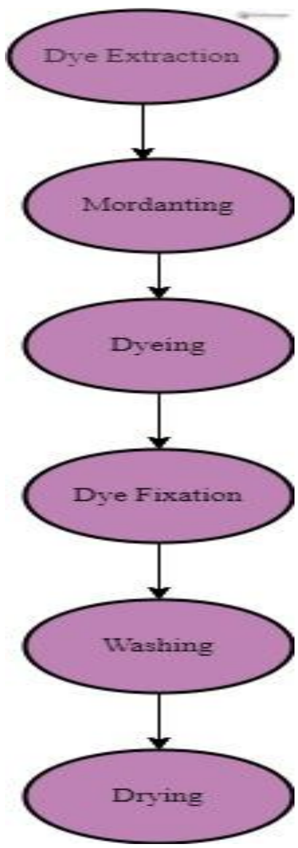


Figure 2.5 – Flow Chart of the Process

3. RESULTS AND DISCUSSION

The extraction process from the Clitoria ternatea‟s flowers had established blue aqueous solution contained anthocyanins. The result proves that the flowers contain variation of dark blue colorant that able to act as natural dyes for fabrics.

The aqueous solution shades obtained from all experimental procedures were in bluish shades. The addition of alum as mordant had made the appearance of colours for the fabric samples varies from one another.

Variables such as the mordanting and dyeing procedures, extract's samples and mordant concentration had confirmed on the establishment of various range of colours on fabric. This result was obtained via visual observation which significantly showed the colour changes that had occurred. Excellent depth and shade of colour appears with pre-mordanting and dyeing procedure. The cotton fabric is dyes with natural dye liquor extracted from clitoria ternate flowers at various processing methods and found that pre-mordanting gives best results. Chemicals mentioned above are used for dyeing and dyes fabric is obtained. Color fastness tests are conducted to understand the color characteristics of fabric. The following table shows grey scale readings of the tests conducted for fabric after treating with dye fixing agent.

Table – 3.1 – Effect of Fastness on Dyeing

Test	**Grey scale reading**
Rubbing in dry condition	4/5
Rubbing in wet condition	¾
Wash Fastness	2/3
Fastness to Light	¾
Fastness to Sun Light	4/5

Figure 3.1 – Wash fastness after 3 washes

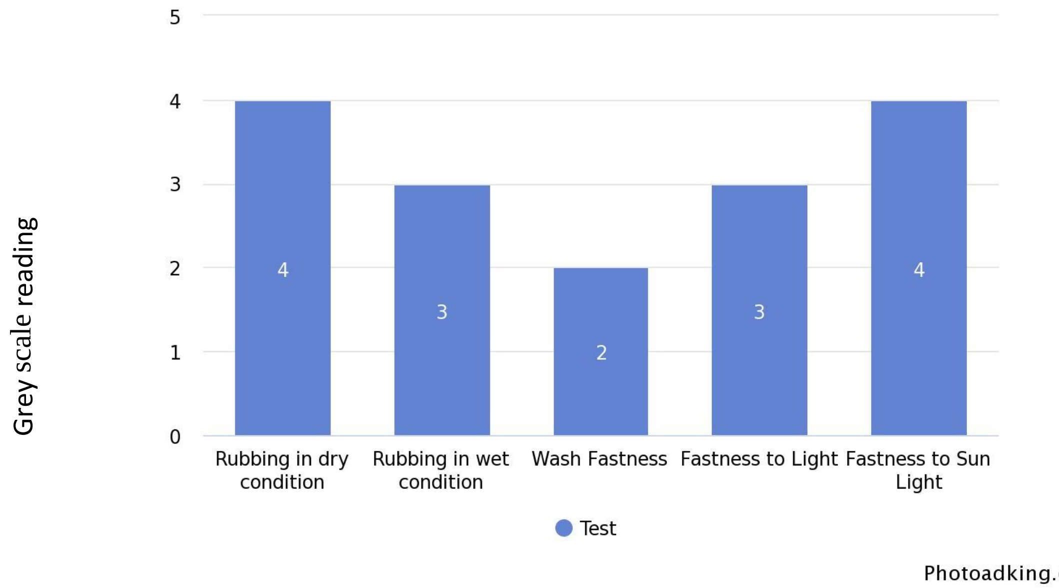
Figure 3.2 – Rubbing at wet condition at 25 cycles

Figure 3.3 – Rubbing at Dry condition at 25 cycles

Figure 3.4 – Colorfastness to Sunlight exposure for 1 day**.**

Table 5.1 Cost Sheet for dyeing fabric

Particulars	**Details**	**Amount**
Yarn Price as per supplier list	Per Meter	250
Woven charges	Per Meter	25
Total Cost	Per Meter	275
Average dyeing cost		70
Weight loss on dyed fabric:	10%	7
Total Cost		325
Dyed Fabic Cost		325



Fastness Properties Result

The Graph shows results of Grey scale readings. The wash fastness is very poor when compared to all other properties. Rubbing in dry condition and Fastness to Sun light shows good results with 4 grey scale readings. Rubbing in wet condition and Fatness to Light has 3 Grey scale reading which is moderate.

4. CONCLUSIONS

•The result suggested that the addition of mordant into aqueous solution during the experimental procedures had altered the fixing properties of dyes onto the fabric.

•Excellent results established through visual observation confirmed the potential of alum to fix the dye onto the fabric, mainly through pre-mordanting and dyeing.

•All samples have lost the brightness of their colours during the wash fastness test. This fastness test confirms that the dyes could not withstand washing which is the cause of colour fading during the washing procedure.

5. ACKNOWLEDGEMENT

I would like to express my profound gratitude to **Prof. Chinta Sailu, Principal, UCT, OU** and **Prof. J.Hayavadana, Head of Textile Technology, UCT, OU** for their contributions to the completion of my project Optimization and Application of Clitoria Ternatea (Shanku Pushpi) Natural Dye and its effect on Cotton Fabric Fastness properties.

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Apart from the efforts the success of any project depends largely on the encouragement and guide lines of many professionals. I take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of the project.

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I would like to acknowledge that this project was completed entirely by me and not by someone.

6. REFERENCES

1. Keka Sinha Papita Das (Saha) Siddhartha Datta , (2012),"INatural Blue Dye from Clitoria Ternatea: Extraction and Analysis Methods", Research Journal of Textile and Apparel, Vol. 16 Iss 2 pp. 34 - 38
2. P.E.Kumar. “A Study on the Extraction of ECO – Friendly Natural Dyes from Hibiscus Rosa Sinensis and Clitoria Ternatea for Dyeing.” IOSR Journal of Polymer and Textile Engineering (IOSR-JPTE) , vol. 6, no. 2, 2019, pp. 26-31
3. Sean Campbell, former doctoral research assistant; Brian Pearson, assistant professor; and Chris Marble, associate professor, Environmental Horticulture Department; UF/IFAS Mid-Florida Research and Education Center, Apopka, FL 32703
4. Mukherjee, P.K., N.S. Kumar V Fau - Kumar, M. Kumar Ns Fau - Heinrich, and M. Heinrich, 2008. The Ayurvedic medicine Clitoria ternatea--from traditional use to scientific assessment
5. Sapiun Z, Wicita PS, Buloto AS, Kamba V, Imran AK, Buana WAA, Hartati H, Banne
6. Y. Preparation and Characterization of Butterfly Pea (Clitoria ternatea L.) Nanoemulgel. Open Access Maced J Med Sci. 2022Apr 14; 10(A):585-589.

ALGAE TEXTILE

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ABSTRACT

A naturally occurring anionic polymer obtained from brown algae has been used for many biomedical applications. Natural fibers comprising of polysaccharides, have been used due to their biocompatibility, non-toxicity, and potential bioactivity at the wound surface. Many commercial wound dressing products such as retention bandages, support and compression bandages, absorbents, guizes, tulle dressings and wound dressing pads are made from such natural polymers and their derivatives, produced from woven cellulose fibres. The present study was carried out to extract alginate from brown algae namely, Sargassum sp collected from river of pachwal from Bhadohi District in Uttar Pradesh. About 350 g of alginate fibre was obtained from 500 g of fresh algae. Which was used to make technical fabrics and textiles and made to apply in the National Technical Textile mission. It will help in the development of biodegradable technical textile and medical textile.

1. INTRODUCTION

A technical project display contest is a competition in which participants present their technical projects to a panel of judges and an audience. The projects can be related to any technical field, such as engineering, computer science, robotics, or electronics. The purpose of the contest is to showcase the participants' technical skills, creativity, and ability to solve real-world problems.

The technical project display contest typically involves a set of rules and criteria for judging the projects. The projects are evaluated based on factors such as technical complexity, innovation, practicality, effectiveness, and presentation skills. The judges may also consider the originality, feasibility, and impact of the projects.

The technical project display contest can be organized at different levels, such as school, college, or professional level. It provides an opportunity for participants to demonstrate their technical prowess, network with like-minded individuals, and gain recognition for their work. Additionally, it can encourage young people to pursue careers in technical fields and inspire them to develop solutions to real-world problems.

2. ALGAE TEXTILE

Algae textile, also known as seaweed textile, is a type of fabric made from seaweed. Seaweed is a sustainable and renewable resource that can be harvested without depleting natural resources or contributing to pollution. Algae textile is considered an eco-friendly alternative to conventional textiles, as it has a low environmental impact and can be produced using minimal resources.

The process of making algae textile involves extracting cellulose fibers from seaweed and spinning them into yarn. The yarn can then be woven or knitted into various types of fabrics, such as sheets, towels, and clothing. Algae textile has several advantages over conventional textiles, including being biodegradable, hypoallergenic, and naturally resistant to bacteria and odors.

Algae textile is still a relatively new and experimental field, but it has the potential to revolutionize the textile industry and reduce its environmental impact. It is being studied by researchers and designers around the world, and some companies have already started producing algae-based products.

2.1 Process of Production of Algae Fiber

The production of algae fiber typically involves several steps, including harvesting, extraction, spinning, and finishing. Here is a brief overview of each step:

Harvesting: Algae is harvested from the ocean or from freshwater sources, such as ponds or lakes. The algae is then washed and dried.

Extraction: The cellulose fibers are extracted from the algae using chemical or mechanical methods. Chemical methods involve using solvents to dissolve the non-cellulose components of the algae, leaving behind the cellulose fibers. Mechanical methods involve grinding the algae and then washing it to separate the fibers.

Spinning: The extracted cellulose fibers are then spun into yarn using a spinning machine. The yarn can be spun using different techniques, such as wet spinning or dry spinning, depending on the desired properties of the final product.

Finishing: The yarn is then washed, dried, and finished using various techniques, such as bleaching, dyeing, or coating. These processes can alter the color, texture, or performance properties of the finished product.

The production of algae fiber is still in its early stages, and there are many challenges to be addressed, such as scaling up production and improving the quality and consistency of the fibers. However, algae fiber has the potential to be a sustainable and eco-friendly alternative to conventional textile fibers, and it is being researched and developed by scientists and entrepreneurs around the world.

2.2 Advantage of Algae Textile

Algae textile has several advantages over conventional textiles, including:
Sustainability: Algae is a sustainable and renewable resource that can be harvested without depleting natural resources or contributing to pollution.
Low environmental impact: The production of algae textile has a low environmental impact, as it requires minimal resources, such as water and energy, compared to conventional textiles.
Biodegradability: Algae textile is biodegradable, which means it can be broken down by natural processes and does not contribute to environmental waste.
Hypoallergenic: Algae textile is naturally hypoallergenic, as it does not contain any synthetic or

chemical additives that can cause allergies or irritations.
Antibacterial: Algae textile is naturally resistant to bacteria and odors, which makes it ideal for use in clothing and other textiles.
Versatility: Algae textile can be used to make a wide range of products, from clothing and accessories to home textiles and industrial applications.
Innovation: Algae textile is still a relatively new and experimental field, which means there is a lot of potential for innovation and development.
Overall, algae textile has the potential to revolutionize the textile industry and reduce its environmental impact, while providing a sustainable and versatile alternative to conventional textiles.

2.3 Economical Benefits of Algae Textile

Algae textile has several potential economic benefits, including:
Cost savings: Algae is a sustainable and renewable resource that can be harvested without depleting natural resources or contributing to pollution, making it a potentially cost-effective alternative to conventional textile materials.

Increased demand: As consumers become more aware of the environmental impact of conventional textiles, there is a growing demand for sustainable and eco-friendly alternatives, such as algae textile. This increased demand can drive growth and revenue for companies producing algae textile.

New markets: Algae textile has a wide range of applications, from clothing and accessories to home textiles and industrial products. This creates opportunities for companies to enter new markets and diversify their product offerings.

Innovation: Algae textile is a relatively new and experimental field, which means there is a lot of potential for innovation and development. Companies that invest in algae textile research and development can position themselves as leaders in the industry and benefit from increased market share and brand recognition.

Job creation: The production of algae textile requires skilled workers and specialized equipment, which can create new job opportunities and stimulate local economies.

Overall, algae textile has the potential to provide a range of economic benefits, from cost savings and increased demand to new market opportunities and job creation.

3. PRODUCTION COST OF ALGAE TEXTILE

The production cost of algae textile can vary depending on several factors, such as the cultivation and harvesting methods used, the extraction and spinning techniques employed, and the scale of production.

Currently, the production cost of algae textile is generally higher than that of conventional textiles due to the experimental nature of the field and the fact that production is still in the early stages. However, as technology improves and production methods become more efficient, the cost of producing algae textile is expected to decrease.

One factor that can impact the cost of production is the type of algae used. Some species of algae are easier and less expensive to cultivate than others, while others may require more specialized growing conditions or equipment. Additionally, the method of harvesting and extraction can impact production costs, as some methods may require more energy or chemicals than others.

Spinning and weaving also play a role in the production cost of algae textile. Currently, the equipment used to spin algae fibers into yarn is relatively expensive, and the process can be time-consuming. Weaving or knitting the fabric also requires specialized equipment and skilled labor.

Overall, the production cost of algae textile is still in flux as the technology and methods continue to evolve. However, as the field grows and more companies invest in algae textile production, it is expected that the cost of production will decrease, making it a more viable and competitive alternative to conventional textiles.

3.1 Companies Producing Algae Fiber and Process of Producing

There are several companies that are currently working on developing and producing algae fiber, including:

Algaeing - A Chinese company that specializes in the research and development of algae-based products, including algae fiber.

Algiknit - A New York-based startup that has developed a process for creating fiber from kelp, a type of seaweed.

Algae-TEX - A European Union-funded research project that is working to develop sustainable and environmentally friendly textile fibers from algae.

Evolved By Nature - A Boston-based company that has developed a technology called Activated Silk, which can be combined with algae to create sustainable and biodegradable fibers.

The process of producing algae fiber can vary depending on the company and the specific method used. However, the general process involves cultivating and harvesting the algae, extracting the fiber from the algae biomass, and then processing the fiber into yarn or fabric.
Cultivation and harvesting can be done in several ways, including open ponds, closed systems, or photobioreactors. Once the algae biomass has been harvested, the fiber is extracted using various methods, such as chemical or mechanical processing. The extracted fiber can then be spun into yarn using specialized equipment, and then woven or knitted into fabric.

The specific methods and technologies used by each company may differ, and the process of producing algae fiber is still in the experimental stages. However, as research and development continue, it is expected that the process will become more efficient and scalable, making algae fiber a more viable alternative to conventional textiles.

4. WHAT IS ALGINATE DRESSING

Alginate dressings are a type of wound dressing made from alginate fibers derived from seaweed. These dressings are highly absorbent and are used to manage moderate to heavily exuding wounds.

When alginate dressings meet wound exudate, they form a gel-like substance that conforms to the shape of the wound and creates a moist wound environment that promotes healing. The gel also helps to prevent the dressing from adhering to the wound bed, making it easier and less painful to remove.

Alginate dressings are often used for a variety of wounds, including pressure ulcers, venous ulcers, diabetic ulcers, and surgical wounds. They are also useful for wounds with irregular shapes or difficult-to-reach areas.

Alginate dressings are available in a variety of forms, including sheets, ropes, and ribbons, and can be used alone or in combination with other wound dressings. They should be changed regularly based on the amount of wound exudate, and the wound should be assessed by a healthcare professional to ensure proper healing.

4. CONCLUSIONS

National Technical Textile mission:

This initiative of Government of India will help in the funding process of Algae produced Textile and will improve the penetration level of technical Textile in country.

It will help in the development of biodegradable technical textile and medical textile.

It will help in the production and market development with an average growth rate of 15 to 20% per annum talking the level of domestic market size of 40-50 billion US dollar by the year 2024.

It will improve the fundamental research, innovation and development process of technical textiles.

It will help in the export using export promotion council for technical textile for effective coordination and promotion.

i) It can be used in combat uniforms protective clothing parachutes, sweaters, ballistic protection, suits, belts, rope, suspended and fill pack it can also be used in defence system and weapon covers, taints, Shelters.

ii) It can be used in camouflage making military uniform in the country. Indian army summer uniform requires 55Lakh meter fabric and navy air force and paramilitary are added to 1.5 crore.

iii) It will also help the poor section of Society because of low cost of production which will ensure proper cloth for poor children.

iv) It will replace foreign import!

v) Market demand of global textile consumption is estimated to expand at a 4% annual rate and reach 87 million tons to 93 million tons and it has been doubled in last two decades and product market demand is 782.9 million US dollar.

vi) It is non-toxic in nature as well as having sufficient strength with other property like elasticity, durability length at least 5 millimeter uniformity and fineness, lustre cohesiveness good texture and insect resistive nature.

Vii) There is very little competition in this field because production of product is very cheap as well as it has high customer acceptance and positive feedback because it maintains healthy skin.

5. ACKNOWLEDGEMENT

In the present investigation alginate was extracted from Sargassum sp collected from river of pachwal from Bhadohi District of Uttar Pradesh. The spinning of alginate into yarn required large quantities of alginate which was not possible in this investigation due to lack of time. The conversion of alginate fibre into a fine yarn afler spinning will be carried out in our future work. An alginate dressing is a natural wound dressing derived from carbohydrate sources released by clinical bacterial species, in the same manner as biofilm formation. These types of dressings are best used on wounds that have a large amount of exudate. They may be use on full-thickness burns, surgical wounds, split-thickness graft donor sites, Mohs surgery defects, refractory decubiti, and chronic ulcers.

6. REFERENCES

[1]. Reference; Dr Himanshu Shehkar Mahaptra (Assistant Professor IICT BHADOHI)

BIOGRAPHIES

Student Photo-1	Nishant Singh from Bhadohi Uttar Pradesh (221401) 3rd Year Student in IICT Bhadohi.
Student Photo-2	Mohit Jatav from Alwar Rajasthan (301026) 3rd Year Student in IICT Bhadohi.
Student Photo-3	KM Alshifa from Lucknow Uttar Pradesh (226005) 3rd Year Student in IICT Bhadohi.

PRODUCT DEVELOPMENT & EVALUATION OF KNITTED FABRIC REINFORCED COMPOSITE

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ABSTRACT

Composites are made by two components matrix and reinforcement. Knitted fabrics are chosen as reinforcement and polyester resin is the matrix. Knitted fabrics are made by intermeshing of the loops, also called as stitch. The stitch density varies according to the stitch length of the loop in the fabric. The stitch density affects the properties of the knitted fabric such as stretch, dimensional stability, porosity, etc. The stitch density or the stitch length also affects the properties of the composite made from it. In this study, knitted fabrics reinforced composites were made from fabrics having different stitch lengths. The stitch lengths chosen are in a manner low, medium and high. This will show the effect of stitch length on different properties of the composite. The composites were manufactured using hand laying technique. The main end application of this composite is roofing and interior furnishing. Based on this application, composites were tested for a number of attributes. The results obtained for all three types of the composite were represented graphically and were analyzed statistically. The knitted fabrics made from cotton fibres were comparatively cheaper and eco-friendly compared to synthetic fibres.

Keyword: *Composite, knitted fabric, cotton fiber, stitch length*

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1. INTRODUCTION

Composites are being manufactured for a very long time due to their properties such as light weight, high adaptability and high specific properties for engineering applications. Mostly the composites are manufactured using woven fabric as reinforcement. In many cases, the fiber material of the reinforcement of the composite is a synthetic fiber. In this study reinforcement material used is cotton knitted fabric. The knitted fabric is a weft knitted single jersey plain fabric. The advantages of using cotton fiber is that it is cheaper and easier fiber as compared to other synthetic fiber. Cotton fiber is also biodegradable. The purpose of choosing this study is very few researches have been carried out using cotton fiber knitted fabric as reinforcement. The matrix is responsible to keep reinforcement materials together. The matrix and reinforcement together are responsible for various properties of the composite. Resin forms most of the part of the matrix. Hardener as well as catalyst are also used along with resin to form the matrix. Hardener will help to harden the composite and the catalyst will help to reduce the curing time of the composite. In the hand laying technique, a metal roller is used to evenly spread the resin across the template.

1.1 Literature Review

According to M. G. Bager, composites are a type of multiphase materials whose phase distribution, cross-section and geometry are purposely tailored to get desired properties [1]. Using natural fiber based textile material as reinforcement instead of synthetic materials helps to reduce the cost of the composite and also natural fibres are biodegradable [2]. K. M. F. Hasan, et. al. explained that the properties of knitted fabric reinforced composite changes by changing the stitch density or stitch length of the fabrics used in reinforcement[3]. Knitted fabrics have excellent resin permeability due to its porous structure and hence hand laying technique which require low pressure can be utilised to manufacture composite from single jersey knitted fabrics [4]. Plain knitted fabric will show better strength properties as compared to other derivatives of weft knitted fabric[6]. Composites made from thermoset set resin show almost straight line graph of stress versus strain as compared to composites made from thermoplastic polymer[7]. The properties of composite will also change when the stitch length of the knitted fabric changes[9]. Due to the use of knitted fabric as reinforcement, composite has enough gel time for performing manual operations on composite and give required shape and dimensions to the composite before it becomes hard[12].

2. PLAN OF WORK

- The project was completed in the steps as discussed as listed follows,
- 1 Manufacturing single jersey cotton knitted fabric
- Sourcing chemicals for matrix
- Manufacturing of the composite
- Testing of composites and statistical analysis
- Results, discussion and conclusion

2.1 Materials

- Cotton Yarn: 30^s Ne
- Reinforcement: Single jersey knitted fabric
  - Stitch length: 2.62 mm, 3.00 mm, 3.15 mm
- Resin: Polyester Resin
- Hardener: Methyl ethyl ketone peroxide
- Catalyst: Cobalt

Table -1: Properties of cotton single jersey knitted fabric

Stitch length	2.62 mm	3.00 mm	3.15 mm
CPI	60	45	40

WPI	33	32	30
Thickness	0.42 mm	0.40 mm	0.385 mm
GSM	138	115	108
Stitch density	1920	1440	1280
Loop Shape Factor	1.875	1.406	1.25
Weight loss due to abrasion	3.4%	5.8%	7.0%

2.2 Methodology

Hand laying technique was used for manufacturing the composite by following steps:-

- Preparation of template on PVC sheet.
- Mixing chemicals in a ratio of 100:3:3 (polyester resin : hardener : catalyst).
- Laying a layer of resin.
- Placing 1st layer of fabric.
- Laying another layer of resin and spreading uniformly using a metal roller.
- Repeat above steps for 2nd and 3rd layer of fabric.
- Applying another PVC sheet on top
- Curing

3 TESTING AND RESULTS

Results obtained from testing of knitted fabric reinforced composites are written in the table 2.

Table -2: Testing results of composites of various properties

Stitch length	Tensile Modulus (MPa)	Flexural Modulus (MPa)	Water Absorption (%)	Moisture Content (%)	Flammability test (sec)	Thermal Insulation Value(%)
2.62 mm	1337.69	1102.72	2.04	0.66	109.4	120.43
3.00 mm	1994.83	1901.36	1.93	0.39	152.2	108.65
3.15 mm	2409.60	2198.49	1.24	0.35	210.1	101.92

3.1 Tensile Test

The tensile test is carried out based on ASTM D3039 starndards. Tensile test of the composite was carried out on Instron 5565 machine. The results are as shown in table -2 and figure -1.

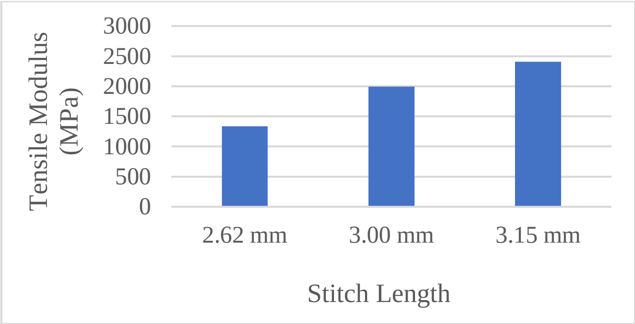

Figure -1: Tensile modulus of composites at different stitch lengths of knitted fabric

It is observed that the tensile modulus is significantly greater for composite having knitted fabric of stitch length 3.15 mm, followed by 3.00 mm and 2.62 mm.

3.2 Flexural Test

The flexural test of the composite was carried out based on ASTM D7264 standards. Flexural test of the composite was carried out on Instron 5565 machine. The results are as shown in table -2 and figure -2.

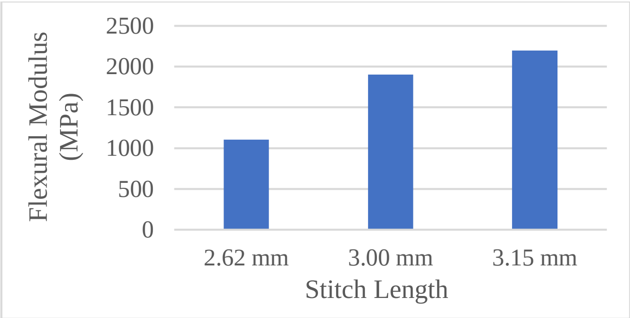

Figure -2 Flexural modulus of composites at different stitch lengths of knitted fabric

The statistical analysis reveals that the flexural modulus is significantly greater for composite having knitted fabric of stitch length 3.15 mm, followed by 3.00 mm and 2.62 mm.

3.3 Water Absorption Test

The water absorption test of the composite was carried out based on ASTM D7264 standards. Initially the weight of specimen was taken, then it was dipped in water for 24 hours. Then the final weight of the composite was taken, and the water absorption of the composite was calculated as percentage of initial weight of specimen. Results are shown in table -2 and figure -3.

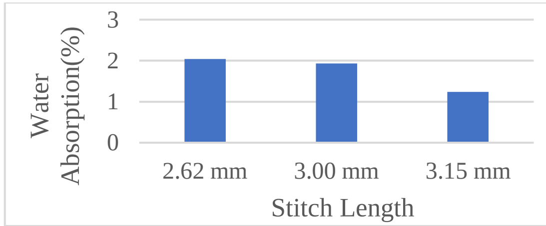

Figure -3 Water absorption of composites at different stitch lengths of knitted fabric

The statistical analysis show that the water absorption is significantly greater for composite having knitted fabric of stitch length 2.62 mm followed by 3.00 mm and 3.15 mm.

3.4 Moisture Content Test

The moisture content test of the composite was carried out based on ASTM D7264 standards. To find moisture content in composite, initially weight of specimen was taken and then the specimen was put into hot oven for about 1 hour at a temperature of 103ºC, then it was taken out and weight was taken and finally moisture content was calculated as percentage of initial weight of specimen, The results are shown in table -2 and figure -4.

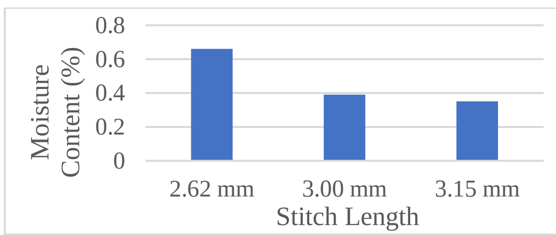

Figure -4 Moisture content of composites at different stitch lengths of knitted fabric

The statistical analysis ensures that the moisture content is significantly greater for composite having knitted fabric of stitch length 2.62 mm followed by 3.00 mm and 3.15 mm.

3.5 Flammability Test

In this test, time required to burn the composite was recorded. The composite was held horizontally and then it was subjected to flame. The results are as shown in table -2 and figure -5.

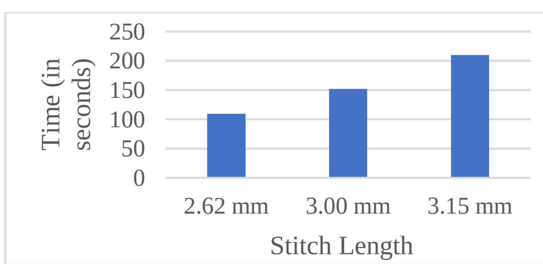

Figure -5 Time required to burn composites at different stitch lengths of knitted fabric

The statistical analysis reveals that the time required to burn the composite is significantly greater for a composite having a knitted fabric of stitch length 3.15 mm followed by 3.00 mm and 2.62 mm.

5 CONCLUSIONS

Tensile modulus, flexural modulus and time required to burn knitted fabric reinforced composite increases with an increase in stitch length of knitted fabric used as reinforcement. Water absorption and moisture content of knitted fabric reinforced composite will decrease with an increase in stitch length of knitted fabric used as reinforcement.

6 REFERENCES

1. M. G. Bager, Short course notes for "An Introduction to composite materials", University of Surrey, 1997.
2. N. Saba, M. Jawaid, O. Y. Alothman, M. Paridahand A. Hassan, "Recent advances in epoxy resin, natural fber reinforced epoxy composites and their applications", Journal of Reinforced Plastics and Composites.
3. K. M. F. Hasan, P. G. Horváth, and T. Alpár, "Potential fabric-reinforced composites: a comprehensive review", *J Mater Sci*, 2021.
4. I. Verpoes *et al.*, "The Potential of Knitted Fabrics as a Reinforcement for Composites", p. 26, 1997.
5. G. Demboski and G. Bogoeva-Gaceva, "Properties of Weft Knitted Composites Affected by Preform Stretching", p. 15.
6. O. A. Khondker, I. Herszberg, and K. H. Leong, "An Investigation of the Structure-Property Relationship of Knitted Composites", *Journal of Composite Materials*, vol. 35, no. 6, pp. 489–508, Mar. 2001.
7. B. Gommers, I. Verpoest, and P. Van Houtte, "Modelling the elastic properties of knitted-fabric-reinforced composites", *Composites Science and Technology*, vol. 56, no. 6, pp. 685–694, Jan. 1996.
8. Z.-M. Huang, and S. Ramakrishna, "Modeling Mechanical Properties Of Knitted Fabric Composites - Part I: Overview And Geometric Description," *Science and Engineering of Composite Materials"*, vol. 10, no. 3.
9. Kononova, Olga & Krasnikovs, Andrejs & Dzelzitis, Karlis & Kharkova, Galina & Vagel, Angelina & Eiduks, Maris. (2011), "Modelling and experimental verification of mechanical properties of cotton knitted fabric composites", Estonian Journal of Engineering.
10. B. Tiber and H. E. Balcıoğlu, "Flexural and fracture behavior of natural fiber knitted fabric reinforced composites", *Polym. Compos.*, vol. 40, no. 1, pp. 217–228, Jan. 2019.
11. W. Ashraf, Y. Nawab, M. Umair, K. Shaker, and M. Karahan, "Investigation of mechanical behavior of woven/knitted hybrid composites", *The Journal of The Textile Institute*, vol. 108, no. 9, pp. 1510–1517, Sep. 2017.
12. Z. M. Huang and S. Ramakrishna, "Development of Knitted Fabric Reinforced Composite Material for Prosthetic Application", *Advanced Composites Letters*, vol. 8, Nov. 1999.

DEVELOPMENT OF SMART GARMENT FOR BICYCLE RIDERS AT NIGHTTIME

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ABSTRACT

Smart light garment for bicycle riders is an innovative solution that enhances the safety and visibility of cyclists on the road. This garment incorporates LED lights that can be controlled by a mobile application or a remote control. The lights are strategically placed in the front, back, and sides of the garment to make the cyclist visible from all angles. Additionally, the garment is made of breathable and moisture-wicking fabric, which ensures maximum comfort during long rides. The smart garment is powered by a rechargeable battery, and the lights have multiple settings that can be adjusted according to the rider's preference. This technology is not only practical for cycling enthusiasts, but it also contributes to reducing accidents on the road and promoting sustainable transportation.

1.INTRODUCTION

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Smart light sensor garment for bicycle riders at night time is a wearable technology that incorporates light sensor technology into clothing to enhance visibility and safety while cycling in low light or dark conditions. The garment is designed to detect changes in ambient light levels and automatically activate built-in LED lights to increase visibility to motorists and other road users.

The garment is typically made with breathable and durable materials, such as high-visibility nylon or polyester, and features strategically placed LED lights that can be powered by a rechargeable battery. The light sensor technology is integrated into the fabric and is programmed to turn on the LED lights when the ambient light levels drop below a certain threshold.

The smart light sensor garment is an innovative solution to improve the safety of cyclists who often face challenges of being seen by drivers at night. The garment not only increases the visibility of the rider but also eliminates the need for additional lighting equipment, which can be cumbersome and inconvenient to carry while cycling

2 OBJECTIVES

A smart light sensor garment for bicycle riders at night time can provide several advantages, including:

Increased visibility: The garment can use LED lights that automatically turn on when it detects low light levels. This can increase the rider's visibility to other road users, reducing the risk of accidents.

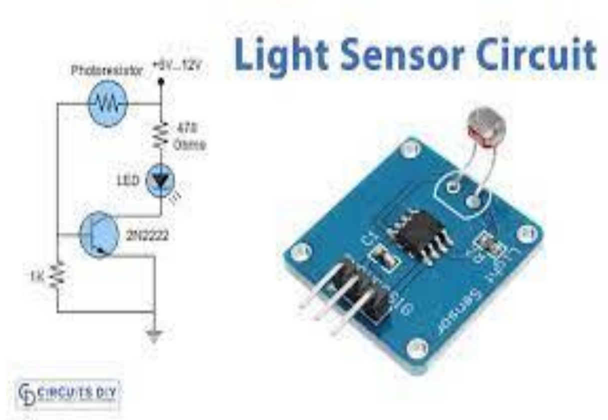
Improved safety: By improving visibility, the smart garment can help prevent accidents, making cycling at night safer. Additionally, the garment can be designed to reflect light, making the rider more visible from different angles.

Convenience: The automatic light detection feature eliminates the need for the rider to manually turn on lights, saving time and effort.

Energy efficiency: The LED lights used in the garment are typically more energy-efficient than traditional bike lights, so they may last longer and require less frequent charging or battery changes.

Fashionable: Smart garments can be designed to be fashionable, allowing riders to express their personal style while also increasing their visibility on the road.

Illumination: One of the primary objectives of smart light garments is to provide illumination to the wearer. This can be particularly useful for runners or cyclists who are out in low-light conditions, as the lights can help improve visibility and prevent accidents.



3 APPLICATIONS

Smart light sensor garments have a variety of applications, including:

Fitness tracking: Smart garments with light sensors can measure heart rate, respiratory rate, and oxygen saturation levels during physical activity.

Sleep tracking: Light sensors in smart garments can track the wearer's exposure to light and darkness, which can be used to improve sleep quality.

Environmental monitoring: Smart garments with light sensors can monitor the wearer's exposure to UV radiation and other environmental factors that may affect their health.

Safety: Light sensor garments can be used for safety purposes, such as in high-visibility clothing for workers in low-light environments or as a warning system for cyclists or runners on the road.

Mood regulation: Light exposure can affect mood and energy levels. Smart light sensor garments can track exposure to natural light and adjust artificial light to mimic natural light patterns, which can help regulate the wearer's mood and energy levels.

Gaming and entertainment: Light sensor garments can be used in gaming and entertainment, such as interactive costumes that respond to light or sound.

Fashion: Smart light sensor garments can be used to create unique and interactive fashion designs that respond to the wearer's environment or movements.

4 CONCLUSIONS

In conclusion, smart light garments have a variety of objectives, ranging from improving visibility and safety to serving as a fashion statement. They can be particularly useful for those who engage in outdoor activities at night or work in jobs that require them to be outside during low-light conditions. Smart light garments can also be controlled remotely and designed to be energy-efficient, which can help reduce environmental impact and save on costs. As technology continues to evolve, it's likely that we will see more innovative and practical applications of smart light garments in the future.

5. ACKNOWLEDGEMENT

"We would like to express our sincere gratitude to the individuals and organizations who contributed to the development of this smart light garment project. Special thanks to our team of designers, engineers, and technicians who worked tirelessly to bring this innovative product to life. We would also like to acknowledge the funding support from [funding source] and the valuable partnerships we have formed with [partner organizations]. Without their contributions, this project would not have been possible."

6. REFERENCES

1. Mr. Paranthaman assisst professor of VFSTR, vadlamudi.

BIOGRAPHIES (Not Essential)

Student Photo-1	Description:
	Name: piskamanoj Address: Vachunur, Thimmapur, Karimanagr, Telangana. Study: B-TECH II YEAR TEXTILE TECHNOLOGY IN VINANS UNIVERSITY, VADLAMUDI, GUNTUR, ANDHRA PRADHESH

MITIGATION OF MICROFIBER SHEDDING OF POLYESTER FABRIC THROUGH SURFACE MODIFICATION

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ABSTRACT

Microfiber pollution is one of the emerging pollutions in the textile domain. Due to the higher utilization of synthetic fibers in the fast fashion apparels, a higher microfiber emission reported in the recent time. This study aimed to evaluate the microfiber shedding/release reduction from polyester fabric on domestic usage. This is done by modifying the surface of polyester structure using chemical TCA-MC (Trichloroacetic acid Methylene Chloride). Through this chemical treatment there is subsequent reduction of microfiber by 85% in knit and 63.64% in woven.

Keyword: - *Microfiber, Microplastic, Woven fabric, Knitted fabric, and Surface modification.*

1. INTRODUCTION

The most intriguing term in global fashion market 'Fast Fashion' has brought huge business to the industry. [1] It is accelerating the huge consumption of textile materials as they focus on delivering new trends faster at affordable price. The fast fashion system has led to a huge resource depletion and low-quality materials. Synthetic textiles are dominant in this fast fashion system. Among the various impacts of synthetic textiles, microfiber soiling is the unnoticed, attention – grabbing impact. Microplastics in synthetic textiles are very small in size that shed from the textile materials when worn and washed.

The sustainability of the textile and fashion industries has become a major concern due to the shedding of fibres from textiles and clothing, particularly microfibers, which are found in the air, soil, rivers, lakes, and seas.[2]Every day, we all put on numerous fibre items including shirts, suits, jackets, pants, and socks without thinking about where they might end up. There is clear evidence that microfibers as emerging contaminants are widely distributed in the marine environment. Eunomia, 2016. Plastics in the Marine Environment.[3] Wet wipes, cigarette filters, and other fibrous goods like wet wipes and clothing can all include microfibers, which are a common environmental contaminant. From the time of creation through everyday use, including cleaning, textiles lose fibres. Additionally, after being disposed of, textiles continue to release fibres.

Among the various sources of microplastics, synthetic textiles are the dominant source.[4] Washing synthetic textiles when exposed to mechanical and chemical agents, is the main cause of shedding. When we dry our garments, the tiny, invisible nanoscale fibres are released into the atmosphere. Every other breath that living organisms take, that's coming from the ocean, so it is very important to understand what we do to land is affecting the ocean environment because that ultimately lead back to the life of living organisms. Microfibres are able to penetrate every ecosystem because they are able to enter the air as well as water and that has all sorts of health implications for living organisms. Microfibre is a synthetic fibre, microfibre mostly sheds from polyester. Therefore, various preventive measures are taken in the washing stage to control shedding by altering washing parameters and using washing aids. Although these are short-term or temporary solutions.

The aim of this work was to analyse the influence of treatment parameters on microfiber shedding and to modify the synthetic textile materials to reduce shedding. Since the textile materials can also shed during other phases of washing, the modification of textile materials could be the long-term solution. The work aims to analayse the effect of different treatment conditions under the same washing conditions on microfiber shedding, with the aim of altering the treatment conditions to reduce microfiber shedding. The second part of the project consists in obtaining optimized parameters of fabric treatment condition and analysing its effect on microfiber shedding.

2. MATERIALS AND METHODS

2.1 Materials

Knitted and Woven fabrics made from 100% polyester were sourced from local fabric stores. These two fabrics consist of different structure and GSM. Commercial washing powder was used to wash textiles. Acids were used to treat the surface of fabrics. Trichloroacetic acid (TCA), methyl chloride (MC) and acetone were used for the acid treatment.

Table -1: Details about the used fabric.

	GSM	Thickness	Fabric Structure
Woven	190	1.20 mm	1X1 Plain Weave
Knit	170	0.44 mm	1X1 Interlock

2.2 TCA-MC Treatment

The fabric is treated with an acidic solution of trichloroacetic acid (TCA) followed by methyl chloride (MC) in different concentrations (0.5 M, 0.75 M, 1 M, 1.25 M) at different temperatures (30 °C, 35 °C, 40 °C) and different durations (1 minute, 3 minutes, 5 minutes) according to the experimental design with an MLR ratio of 1:100. After the treatment, the fabric is rinsed with acetone to neutralize it. Here, the fabric is immersed in acetone for 3 minutes to neutralize it. The fabrics are then subjected to flat drying at room temperature.

2.3 Microfiber Analysis

The treated fabric samples are then washed. Laundering is performed using Lander O Meter, which is used to replicate household laundering of textiles. For all tests, the water volume, detergent concentration, number of steel balls, washing time and washing temperature were kept constant at 150 ml, 4 g/l, 10 balls, 45 minutes and 30 °C, respectively. The residual water obtained after washing the fabric samples is filtered through Whatman Grade 1 filter paper with a pore size of 11 µm. The filter paper is then examined under a 1000X digital microscope. Thirty 2mm x 2mm squares are selected across the diagonal and the fibers in each square are counted and the values averaged to find the average number of fibers in a square. Finally, the total number of fibers in the filter paper is obtained by multiplying the average number of fibers in a square and the number of squares in the filter paper that effectively have microfibers.

a) b)

Figure -1: Microscopic image of a) untreated fabric b) 1M TCA-MC treated fabric

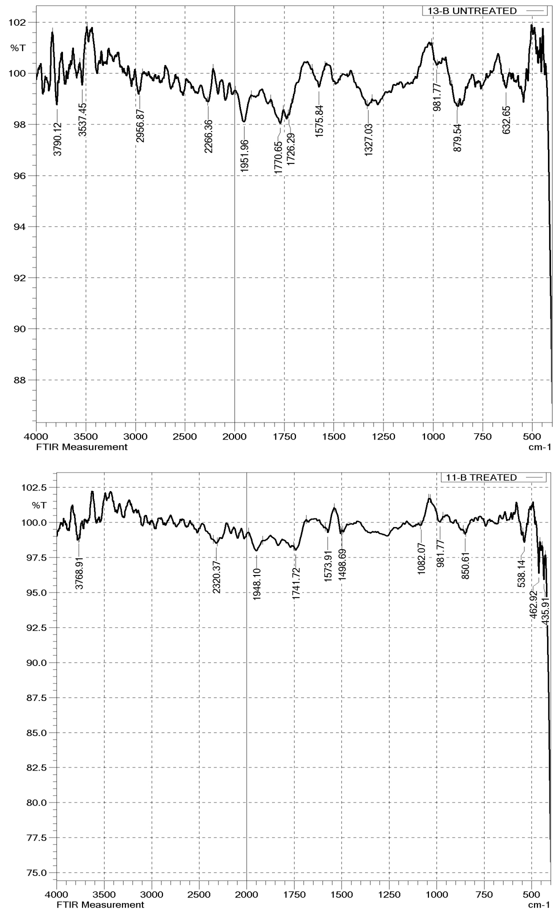
3. RESULT

3.1 Preliminary experiments

Different concentrations were used to treat the fabrics for the preliminary experiments. These concentrations were used 0.50, 0.75, 1.00, 1.25, 1.50.The preliminary experiments of TCA treatment with polyester fabric showed that 1% concentration of TCA-MC treated fabric have better reduction in microfiber shedding property of 38.55 fibers/sq.cm of knit fabric and 15.21 fibers/sq.cm of woven fabric.

3.2 SEM and FTIR Analysis

The surface modification of TCA treated polyester fabric was analyzed using a scanning electron microscope. Here the treated and untreated fabrics are compared. Cracks and irregular surfaces have been found in treated polyester fabric, while untreated fabric has a smooth and regular surface. Due to the treatment of TCA-MC cracks and irregular surfaces are found in treated fabrics. So, this surface roughness of polyester fabric helps to increase the absorbing capacity of the fabric. FT-IR analysis is performed to confirm the presence of TCA-MC and spectral changes in the treated polyester fabric. Various peak changes are found with TCA-MC treatment. The bond order of the ester group (C=O) decreases from 1709 cm-1 to 1706 cm-1 due to the binding of H+ ions. There is an increase in the C-H stretch from 2933 cm-1 to 2975 cm-1 due to the attachment of O ions. The C-O bond order also increases to 1246 cm-1 with the addition of H+ ions. These results confirm the interaction of TCA with polyester fabric.



a) b)

Figure -2: Graph represents FTIR result of a) untreated fabric b) TCA-MC treated fabric

3.3 Water Contact angle

Water contact angle and water absorption test results show that treated polyester fabric has better wettability than untreated fabric. Among all the treated cloths, the cloth treated with a concentration of 1% TCA-MC showed good absorption property.

Table -2: Results of Water contact angle for different concentrations

Concentration	Knit
0.5 M	120.03
0.75 M	92.61
1.00 M	63.01
1.25 M	124.18
1.5 M	120.47

3.4 Physical Properties

The bursting strength and tearing strength properties of knitted and woven treated fabrics were each analysed. It was found that although the strength of treated fabrics was reduced, the reduction in strength could be negligible. The weight of treated and untreated fabrics was compared. There is a weight gain of 0.14% for knit fabric and 0.18% for woven treated fabric.

Table -3: Results of physical strength

	Woven		Knit	
	Untreated	**Treated**	**Untreated**	**Treated**
Bursting Strength	-	-	250 lb/inch^2	240 lb/inch^2
Change in Weight	2.7803	2.7853	3.5762	3.5812
Abrasion Resistance	-0.17%	2.02%	0.33%	0.43%

4. CONCLUSIONS

The three parameters such as concentration, time and temperature, which have a major impact on microfiber shedding, have been optimized. The result of the optimization provides a specific concentration, time and temperature of treatment to reduce the shedding of polyester fabric microfibers. We obtain a predicted microfiber count of 37.38 fibers/cm² of knit fabric when the fabric is treated with a concentration of 1.23% TCA-MC for 1.80 minutes at 30°C. Similarly, when the fabric is treated with a concentration of 0.98% TCA-MC for 1.82 minutes at 35.25°C, we obtain a predicted microfiber count of 5.51 fibers/cm² of woven fabric.

6. REFERENCES

1. Cobbing, M., Vicaire, Y., 2016. Timeout for Fast Fashion. Published by Greenpeace e.v., Hamburg, Germany www.greenpeace.org/international/en/campaigns/detox/fashion
2. Yan, S., Henninger, C.E., Jones, C. and McCormick, H., 2020. Sustainable knowledge from
3. consumer perspective addressing microfibre pollution. Journal of Fashion Marketing and
4. Management: An International Journal, 24(3), pp.437-454.
5. Eunomia Research & Consulting Ltd,
6. Bristol, UK June 2016. www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/, Accessed date: January 2018.
7. The Fiber Year, 2017. The Fiber Year 2017: 2016 World Fiber Market. https://www.nonwovens-industry.com/contents/view_online-exclusives/2017-05-23/the-fiber-yearreports-on-2016-world-fiber-market, Accessed date: May 2018.

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ABSTRACT

This study explores the potential for converting cotton fabric waste into super absorbent polymer through the process of polymerization. Cotton fabric waste was broken down into cellulose and then treated with chemicals to create the polymer chains that make up the super absorbent material. The resulting product was characterized using various analytical techniques such as Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). The super absorbent polymer produced from the cotton fabric waste exhibited high water absorption capacity and retention ability. However, the process of converting cotton fabric waste into super absorbent polymer is currently less cost-effective than using synthetic polymers. This study highlights the potential of using natural materials such as cotton fabric waste in the production of super absorbent polymers for specific applications, such as in environmentally friendly or sustainable products.

Keyword *Cotton fabric waste, Super absorbent polymer, Polymerization, Cellulose, Water absorption, Retention ability, Fourier transform infrared spectroscopy, Scanning electron microscopy, Synthetic polymers, Natural materials,*

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1. COLLECT AND SORT THE COTTON FABRIC WASTE

Cotton fabric waste can come from a variety of sources, including textile mills, clothing manufacturers, and households. The cotton fabric waste should be sorted and cleaned to remove any non-cotton materials, such as zippers or buttons.

2. BREAK DOWN THE COTTON FIBERS INTO CELLULOSE

The cotton fabric waste is then broken down into its component fibers, which are predominantly cellulose. This can be done through a process called acid hydrolysis, which uses acid to dissolve the non-cellulosic components of the cotton fibers.

3. CONVERT CELLULOSE INTO POLYMER CHAINS

The cellulose is then treated with a chemical solution to create the polymer chains that make up the super absorbent material. This typically involves adding a cross-linking agent to the cellulose, which causes the polymer chains to form.

4. DRY AND GRIND THE POLYMER

The resulting super absorbent polymer is then dried and ground into a fine powder, which can be used in a variety of applications, such as in disposable diapers or sanitary napkins, soil.

2.1 Test Results

There are some test results which retain moisture. The below table shows the moisture content with respect to its temperature.

Table 1 Moisture retain

With cotton fabric	Without cotton fabric
6.5	6.6
6.3 (after 2 hrs)	6.2 (after 2 hrs)
6.2 (after 4hrs)	5.7 (after 4 hrs)

2.2 Outcome

- It has a ability to retain it’s moisture
- Stable cell wall
- It promotes the plant grow
- Yield will be more
- 100% SUSTAINABLE

4. CONCLUSIONS

Converting cotton fabric waste into super absorbent polymer has the potential to offer a sustainable and environmentally friendly solution for producing absorbent materials. The process involves breaking down cotton fibers into cellulose and then converting the cellulose into polymer chains through a process called polymerization. The resulting super absorbent polymer exhibits high water absorption capacity and retention ability, making it suitable for a variety of applications, such as in disposable diapers or sanitary napkins. While the process of converting cotton fabric waste into super absorbent polymer is currently less cost-effective than using synthetic polymers, it offers the potential for sustainable production and use of natural materials. Further research and development in this area could lead to the creation of more efficient and cost-effective processes for producing super absorbent polymers from cotton fabric waste.

6. REFERENCES

1. Yang, C., Liu, X., Zou, M., Xie, X., & Zhang, Y. (2019). Superabsorbent polymers from waste cotton fabric and acrylic acid: Synthesis and characterization. Journal of Applied Polymer Science, 136(13), 47458.
2. Zhang, J., Li, Y., Li, H., Li, C., Li, Z., & Li, J. (2017). Preparation and characterization of superabsorbent polymer based on cotton cellulose and acrylic acid. Journal of Applied Polymer Science, 134(38), 45284.
3. Azam, F., Rasul, M. G., Ashraf, M., & Khalid, A. (2017). Superabsorbent polymers based on cotton waste and acrylic acid: A potential application in agriculture. Journal of Applied Polymer Science, 134(36), 45228.
4. Kumar, V., Kumar, S., & Bhalla, T. C. (2017). Superabsorbent hydrogels from natural polymers for application in agriculture: A review. Polymer Bulletin, 74(8), 3217-3245.

INNOVATIVE PRODUCT DEVELOPMENTIN TEXTILES / FASHION
PORTABLE DRESSING TENT

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ABSTRACT

In outdoor circumstances where privacy may be compromised, such as during camping vacations, beach picnics, or outdoor activities, a portable dressing tent offers a flexible and practical solution for changingor getting dressed. The main characteristics and advantages of a portable dressing tent are highlighted in this abstract. The abstract opens with a description of the dressing tent's portability, highlighting its lightweight construction and quick setup procedure. It emphasizes how the tent may be folded to a small size for easy carrying and transportation to various locations. The dressing tent's privacy feature is then highlighted in the abstract, which also points out how it eliminates the need for traditional changing rooms by offering a private area for changing clothing or getting ready for an event. The abstract then goes on to explain the dressing tent'sadaptability, noting how it may be used for a variety of things outside just changing clothes, such a portable bathroom, a shower tent, or a makeshift dressing room for performers or models. Additional features like ventilation windows, storage pockets, and hooks for hanging clothing or other objects are also mentioned. Theabstract also emphasizes the dressing tent's resilience to weather and durability, noting that it is normally composed of premium materials that are waterproof and UV-resistant, ensuring a lifetime even in challengingoutdoor situations. A summary of the advantages of a portable dressing tent's portability, privacy, versatility, durability, and ease in outdoor situations is provided in the abstract's final paragraph.

KEYWORDS: *Portability, Easy setup, privacy, cleaning and maintenance, stability, Affordable,*

1. INTRODUCTION:

For people who require privacy and space for changing clothes or doing other private activities outside, a portable dressing tent is an easy and adaptable solution. It is the perfect choice for outdoor gatherings, camping vacations, beach visits, picnics, and other circumstances where a private changing room may be required because it is a portable, small, and lightweight shelter. Portable dressing tents are made to be compact, portable, and easy to set up while still offering sufficient privacy. They frequently include attributes like easy installation, robust construction, ventilation, and weather resistance. If you enjoy camping, traveling, or other outdoor activities, a portable dressing tent can provide you with a practical and private area to change into new clothes or accomplish other tasks.

1.1 Problem

People frequently view getting dressed as a private action that they like to carry out in a quiet, privatesetting. A person's privacy may be violated if they change in public because other people might be able to see them or unintentionally walk in on them, which can be uncomfortable and embarrassing.

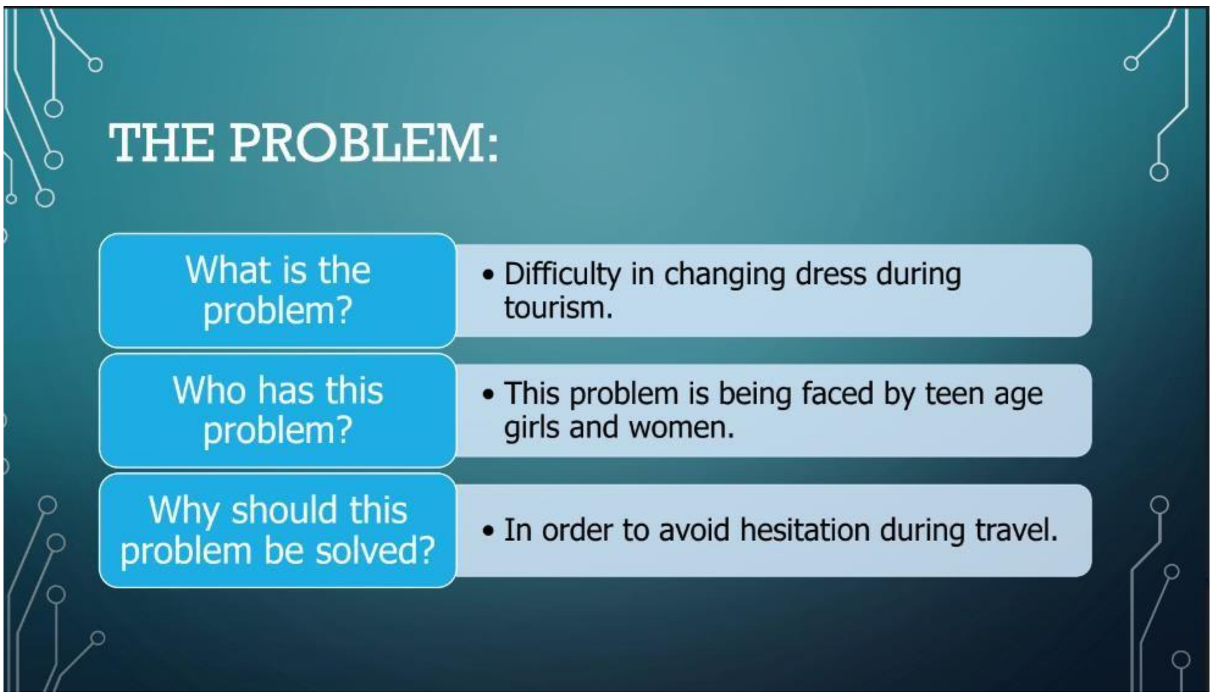

Figure1 Problem statement

1.2 Workable Solutions

A possible solution for changing clothes during tourism could be to carry a lightweight and portable changing tent or pop-up privacy shelter. These are usually easy to set up and provide a private space forchanging clothes, whether it's at the beach, in a park, or at a campsite.

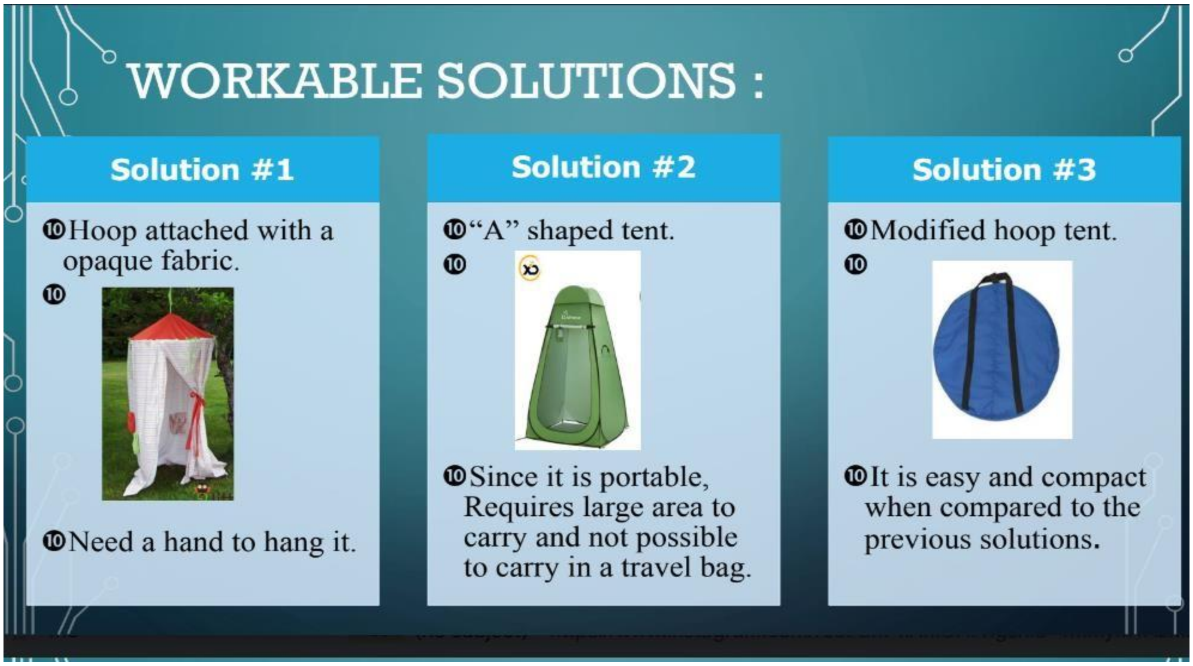

Figure-2 Possible solutions

1.3 ENEFITS OF USING DRESSING TENT:

Convenience: Dressing tents are ideal for changing clothing in a variety of situations because they areportable and simple to put up. Since they are portable and lightweight, they are perfect for outdoor gatherings like concerts, festivals, camping vacations, and beach picnics where restrooms might not be easily accessible.

Comfort: People may easily change their clothing in dressing tents because they provide ample room, whichprevents them from feeling confined or exposed. They frequently contain pockets or hooks for holding items, which makes changing more orderly and effective.

Dressing tents can offer a clean, hygienic area for changing clothing, especially in outdoor locations wherethere might not be adjacent amenities that are suitable for that purpose. Individuals can avoid changing in unhygienic locations, such as on the ground or in public facilities, by using a dressing tent.

1.4 Materials Selection

- Foldable circular hoops, detachable hoops.
- Expandable stick made of plastic (As it will be easy to carry due to its light weight)
- Fabric with less transparency like knitted cotton fabric, nylon, polyester, woollen.

1.5 Materials Used

1.5.1 Detachable hoops
1.5.2 Plastic expandable stick

1.5.3 Cotton knitted fabric
1.5.4 Metal zipper.

2. PROTOTYPE

Typically utilised in outdoor settings or temporary event venues, a dressing tent prototype is a temporary or portable enclosure created for the purpose of changing or dressing in seclusion. Typically, it consists of a privacy-covering fabric or material and a frame or framework that is simple to install and remove. The dressing tent prototype might have attributes like windows for air, hooks or shelves for hanging clothing oraccessories, and zippers or fasteners for entry and exit, as well as a stable base for placing on different surfaces.The prototype could include cutting-edge design components or materials for better use, functionality, and durability. It might also be made to be lightweight, portable, and weatherproof.

2.4 Brief of the Prototype

- First two circular hoops are made, which can be folded to small size.
- One hoop will contain some hooks to hang the fabric.
- Another hoop should be placed on the floor.
- Both the hoops are connected vertically with an expandable stick (i.e., selfie stick).
- Then the top hoop is hung with an opaque fabric.
- Now the opening is sealed with a zipper as like sweaters.

3. CONCLUSION

For numerous outdoor activities that call for seclusion for dressing or changing, a portable dressing tentis a flexible and practical solution. It offers versatility in terms of location thanks to its small size and portability,and it is simple to set up and take down. In outdoor settings like camping vacations, beach outings, or festivals, it offers a secluded and cosy room for changing clothing, enabling people to maintain their modesty and decency. The total outdoor experience is improved by the fact that it provides protection from the weather, including sun, wind, and rain.

4. REFERENCES

1. https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.ploma340.com.tw%2FCounting-Sorting%2FG974&psig=AOvVaw2sN2vJF0aiUNGRJtzOjaTt&ust=1681369894116000&source=ima ges&cd=vfe&ved=0CBEQjRxqFwoTCNDTwYvlo_4CFQAAAAAdAAAAABAE

2. https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.flipkart.com%2Fatirap-expandable-stick-1-walking-stick%2Fp%2Fitm07deba59459a1&psig=AOvVaw2SM0xflX3CwkwNpgf3PMql&ust=16813699658.

COCOON WALL DECORATION FRAME WITH INDICATING SENSOR

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ABSTRACT

The Cocoon Wall Decoration Frame is a unique home decoration item that features an indicating sensor. This innovative wall decoration frame combines technology and beauty to create a stunning art piece. The indicating sensor can detect motion and temperature changes, and the frame will change colors to indicate these changes. The frame itself is made of high-quality materials that add sophistication to any room. With the Cocoon Wall Decoration Frame, you can add a touch of modern technology to your home while also showcasing your personal style.

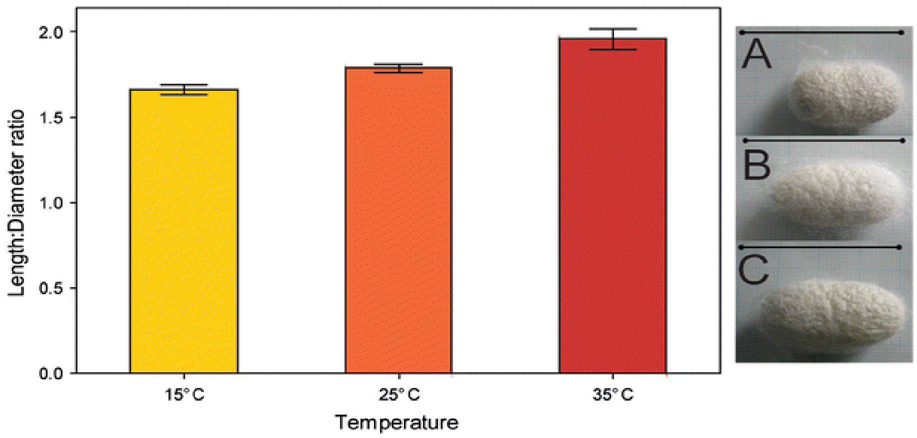
KEYWORD: *cocoon, photoframe,sensor, battery, indicator, receiver, buzzer.*

1.COCOON:

It refers to a protective covering made by some insects to protect themselves during their life cycle. It can also refer to a cozy, comfortable space.

1.1 COCOON IN TEXTILE

In textile, cocoon refers to the protective casing spun by silkworms around themselves during their metamorphosis into moths. The silk fibers of the cocoon are used to produce silk fabric, which is known for its lustrous appearance and soft texture. These cocoons are harvested and unwound to extract the silk threads, which are then spun into silk yarn and woven into silk fabric. The process of silk production has been practiced for thousands of years and is considered a luxurious and high-quality fabric.



2.WALL DECORATION FRAME:

A wall decoration frame is a decorative frame designed to display artwork, photographs, or other ornamental items on a wall. It is a popular way to add a personal touch to any room in the house, office, or any other space. There are different types of wall decoration frames, including wooden, metal, and plastic frames in different colors, shapes, and sizes. Wall decoration frames can be hung on the wall using nails, screws, or adhesive strips, and they come with a glass or a plastic cover to protect the item inside from dust and damage. Wall decoration frames can also be used as a focal point or an accent piece for a room's decor.

2.1.COCOON WALL DECORTION FRAME:

Step 1: Cut a piece of cardboard or foam board to the desired size and shape for your photo frame.

Step 2: Cut pieces of cocoon to fit around the edges of the cardboard or foam board. You can cut the cocoon into strips or smaller pieces depending on the desired look.

Step 3: Use a glue gun to attach the cocoon pieces to the edges of the cardboard or foam board. Be sure to smooth out any bumps or wrinkles in the cocoon as you attach it.

Step 4: Cut out the center of the cardboard or foam board where you will place your photo.

Step 5: Print out your desired photos and trim them to fit inside the frame.

Step 6: Use a glue gun to attach the photos to the back of the frame, making sure they are centered and straight.

Step 7: Optional: You can decorate the cocoon with paint, markers, or other materials to add extra flair to your photo frame.

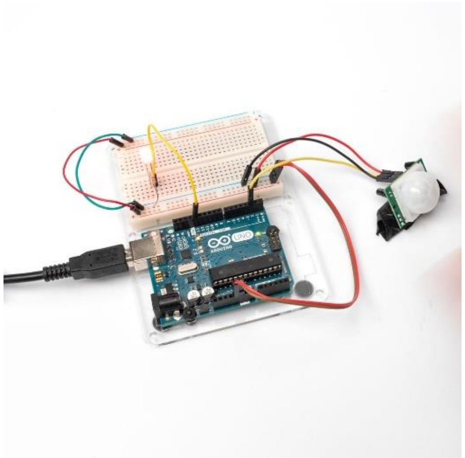
3.ATTACHING SENSOR IN THE WALL DECORATION FRAME:

Step 1:Determine the design of our photo frame. Consider the size, shape, and style of the frame. You will need to decide how the cocoon material fits into this design.

Step 2: I will need to select the appropriate sensor.Now, we are using a sensor that will indicate the object when it cross the photo frame.

Step 3: I want the sensor to trigger the indicator. For example, I might want a light to turn on when motion is detected.

Step 4:Build the frame using the cocoon material, and integrate the sensor and indicator into the design.



4.CONCLUSION:

The cocoon wall decoration photo frame with an indicating sensor could be a useful and innovative product. The indicating sensor could potentially enhance the user's experience by indicating when an object pass by the frame it give signal to us. Additionally, the cocoon wall decoration aspect adds an aesthetically pleasing element to the product.

5.REFERENCES:

[1]. https://medcraveonline.com/JTEFT/identification-of-dry-and-fresh-cocoon-silk.html

[2]. https://www.directindustry.com/industrial-manufacturer/sensor-indicator-108284.html

POLYPYRROLE FUNCTIONALIZED JUTE FOR ARSENIC REMOVAL FROM CONTAMINATED WATER

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ABSTRACT

In several nations, wastewater laws have been enacted to prevent human and environmental exposure to dangerous pollutants. The discharge of wastewater containing heavy metals into the environment is growing day by day because of the rise of industrialization and human activities. The US Environmental Protection Agency (USEPA) and Central Pollution Control Board (India) have set a limit of 50 parts per billion (ppb) for arsenic in drinking water. Because of their intrinsic ion absorption capabilities, conducting polymers like polypyrrole and polyaniline can be utilized to clean wastewater. The removal of arsenic from water can be accomplished using a variety of methods, including adsorption by a suitable adsorbent. One of the most essential techniques described in this article is the adsorption of arsenic from contaminated water by polypyrrole coated jute fabric. Polypyyrole is a conjugated polymer with strong ion adsorption ability in the doped state. Jute is a natural fiber abundantly available in India. It has been observed that polypyrrole has a strong affinity to jute, and polypyrrole-coated jute fabric has been proven to be effective arsenic absorbers from contaminated water.

Keywords-*Polypyrrole, Arsenic, jute fabric, Wastewater treatment, Adsorption*

1.INTRODUCTION

One of the most toxic heavy metal found in wastewater is arsenic, Arsenic is highly carcinogenic & it is known as one of the world's most hazardous chemicals (USEPA, 2001). Contamination of arsenic is a global health problem due to its toxicity and the fact that it occurs at health threatening levels in water supplies, particularly groundwater, more than 70 countries of six continents are suffering from this issue (Ravenscroft, P et al., 2009).It is estimated that approx. 150 million people around the world are affected globally & these numbers are increasing as new affected areas are continuously discovering (Ravenscroft et al., 2009). The soil and water are frequently getting contaminated by this toxic heavy metals and therefore manmade efforts &activities become a key concern in environmental and health problem.

In environment, the inorganic forms of as (such as trivalent arsenite (As III) and pentavalent arsenate (As V)) are more common and toxic than the organic forms of arsenic (As). As reacts with sulfhydryl groups found in cysteine residues to cause high toxicity effects on general protein metabolism (Rai et al., 2011).If human intakes arsenic from drinking water and food, excessively and for long term (such as 5–10 years) it may result in arsenicosis, which is a health-related problems and responsible for skin cancer, skin disorder, internal cancer (bladder, kidney, and lung), blood vessels disease of the feet and legs, diabetes, hypertension, and reproductive disorders as shown in Figure 1.(Mudhooet al., 2011; Santra et al., 2013).

There are various physical and chemical treatment processes available o remove the arsenic contamination from waste water. Few of processes are chemical precipitation / co-precipitation, ion exchange, filtration, reverse osmosis and electro dialysis have been used over the last decades. The conventional techniques are based on chemical intensive and surface chemistry processes by treating wastewater that contains arsenic. A few of the conventional techniques are oxidation, coagulation-flocculation, membrane filtration, precipitation, cementation, ion-exchange, etc. The demerits of these techniques are sensitive operating conditions, low efficiency, and production of secondary sludge that needs to be disposed which increases the additional expenses (Ahluwalia et al., 2005; Kundu, and Gupta 2006; Thomas et al., 2007). Recent advancements in nano science and nano technology found different ways to develop various nano materials which can be used for the remediation for the contaminated water by the mechanism of adsorption. In this line, conjugated polymer such as polypyrrole coated jute fabrics were found to be very promising for adsorption of As when contaminated in ppm level.

Figure 1. Arsenic Poisoning

2.MATERIALS AND METHODS

Raw jute fabric (180 g/m^2, plain weave) was procured from local market. The jute fabric was scoured with 6% caustic soda on the weight jute fiber (owf) and 2 g/l a non-ionic detergent at 90

°C for 60 min. After scouring, the jute fabric was dried in an oven before the coating process with polypyrrole.

Method of coating jute fabric with polypyrrole by in-situ chemical polymerization:
For in situ chemical polymerization of pyrrole, a single bath technique is used, as shown in Figure 2(Maity & Chatterjee 2013, Maity et al., 2014). Monomer (0.2 M pyrrole in water) and oxidant solutions (0.5 M $FeCl_3$ in water) are prepared separately and kept inside a cryostat and cooled to 5 °C. Material to liquor ratio is 1:20.For in situ chemical polymerization of pyrrole, a single bath technique is used, as shown in Figure 2. The jute fabric is first dipped in themonomer solution and stirred for 10 min. Then, $FeCl_3$ solution is added to the monomer solution and stirred for 60 min for in-situ chemical polymerization. As a result, the color of jute fabric turns black which is the color of polypyrrole. After that, polypyrrole coated which is taken out from the solution, rinsed thoroughly with de-ionized water and oven dried for 180 minutes at 110°C.

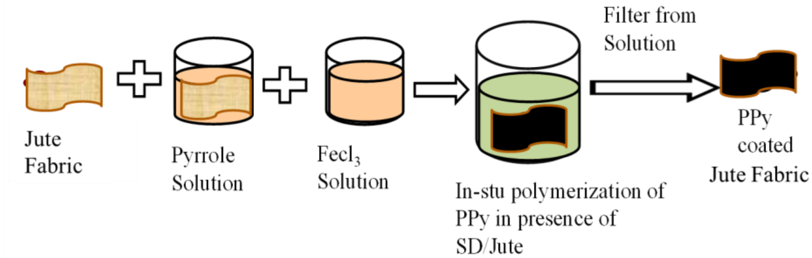

Figure 2. Coating of Jute fabric with polypyrrole by in situ chemical polymerization

Method of *As* removal process from As solution

Arsenic solution was prepared by dissolving As_2O_3 in water (7.5 ppm). 8 g of polypyrrole coated Jute fabricis agitated with 1000 mL As_2O_3 solution at 30±0.5 °C for 15 min.After that, the sorbent was separated from water and the reduction of concentration of As was determined by Microwave Plasma Atomic Emission Spectrometer (MPAES).

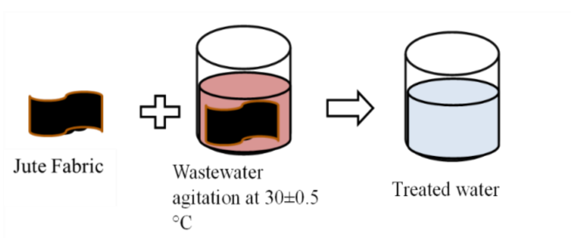

Figure 3. Arsenic removal process

3.RESULTS AND DISCUSSIONS:

SEM images of PPy uncoated and PPy coated jute

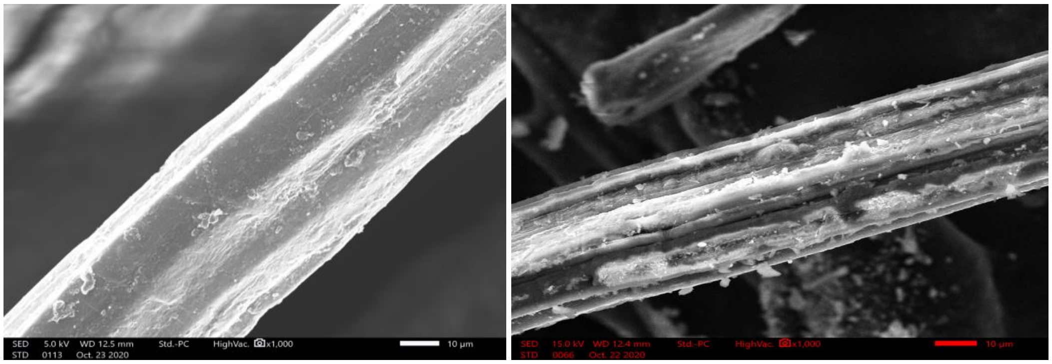

Figure 4. SEM Image of (a) Jute woven; (b) PPy coated Jute

The in- situ chemical polymerization process is used for the coating jute fabric with polypyrrole. After the coating, the PPy add-on percentage is achieved about 15%. The presence PPy over jute fiber surface has been investigated by SEM. Figure4 (a) shows the morphology of the original jute woven textile. The surface was spotless and silky smooth. The morphology of PPy coated jute fabric is shown in Figure 4(b). The PPy coated jute fabric was less clean and less smooth than the original fabrics, and the presence of PPy in the form of globular aggregates on the fiber surface was visible. The substantial deposits found on the surface could be due to a surface coating or PPy and diffusing into the fibers structure, according to SEM.

FTIR spectra of raw jute fabric, coated jute fabric & water treated jute

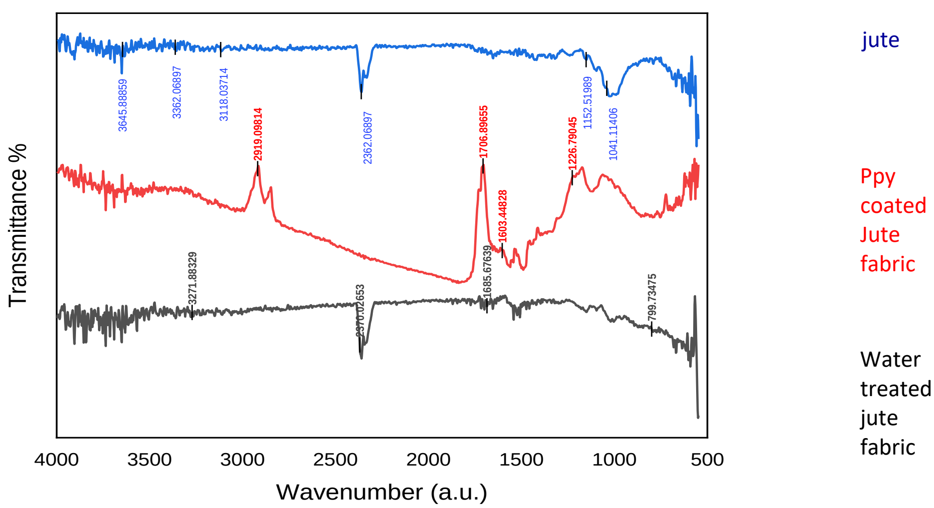

Figure 5- FTIR spectra of raw jute fabric, coated jute fabric & water treated jute

The goal of employing FTIR is to look into the intermolecular interactions between jute and PPy molecules in order to achieve long-term fixing of PPy molecules on the substrate surface. FTIR spectra of the uncoated jute, PPy coated jute& water absorbed jute are shown in Figure5. The spectrum of the raw jute fibers exhibited O-H stretching absorption around 3645 cm^{-1},N-H stretching absorption around 3362 cm^{-1}, O=C=O stretching absorption around 2362, C-H stretching absorption around 3118 cm^{-1}, and C-O stretching absorptions around 1041 and 1152 cm^{-1}. These absorptions are consistent with those of the typical cellulose backbone.

In case of FTIR spectra of PPy coated Jute fiber, little bit different absorption peaks for jute are observed in the spectra which are observed in case of uncoated jute. FTIR spectra of PPy coated jute shows peak around 2919 cm^{-1} which can be assigned to the C-H stretching vibration, the peak at 1706 cm^{-1} is assigned to the stretching vibration of C=O, 1226 cm^{-1} correspondence to C-O stretching vibration of PPy. However, the absorption peak at 3645 cm^{-1}reduced which indicates that the moisture regain of jute reduced after PPy coating. The reduction in moisture regain is due to the anchoring the PPy molecules with cellulose molecules by breaking of intermolecular H-bonds formed by water molecules at the same point.

The FTIR spectra of water treated PPy coated jute fabric &Raw jute fabric is almost similar but it (water treated sample) has few extra peaks around 800 cm^{-1} which may be absorbed due to arsenic attachment. FTIR spectra of water treated PPy coated jute shows peak around 3271 cm^{-1} which can be assigned to the O-H stretching vibration, the peak at 2370 cm^{-1} is assigned to the stretching vibration of O=C=O, 1685 cm^{-1} correspondence to C=O stretching vibration & peak absorbed at799 can be assigned to *As*.

Effect of pyrrole concentration & time for arsenic (*As*) removal efficiency

The effect of pyrrole (Py) concentration of in-situ chemical polymerization and treatment time on removal efficiency of arsenic was studied. The Py concentration was varied from 0.25M to 1.0 M. Table -1 and Fig 6. show the effect of PPy concentration on the removal of arsenic ions and indicated that the maximum efficiency (77.4%) was found using 0.1M of the Py coated adsorbent. It is noticed that the removal efficiency excellently increased from 0.25M to 0.5M Py but after 0.5M Py concentration the removal efficiency remained approximately same as efficiency increased in decimal numbers (0.19%) from 0.5M Py concentration to 1.0 M Py concentration. The efficiency remains almost unaltered due to the reduction of available active sites resulting from PPy agglomeration upon higher dosages of Py. It can also be seen that arsenic removal efficiency increases with increase of treatment time. However, no significant difference in removal efficiency observed between treatment time of 10 and 15 minutes. Therefore, 15 min of treatment time is found to be sufficient for adsorbing arsenic from water.

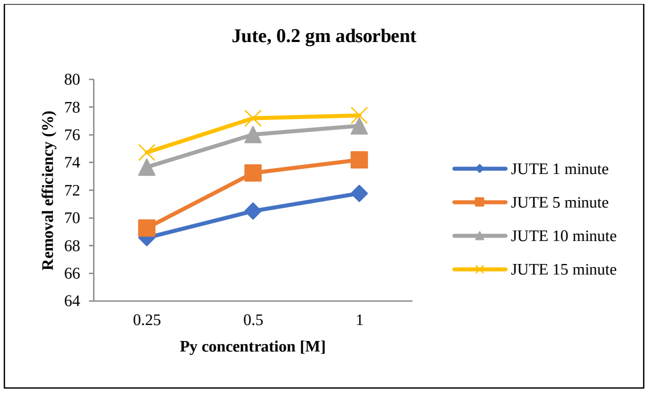

Figure 6.Effect of Py concentration of in-situ chemical polymerization on removal efficiency of arsenic from water by PPy coated jute

Table1. Arsenic removal efficiency of adsorbent (0.4 gm dosage, Jute) at different Py concentration.

Jute, 0.4 gm dosage		
Treatment Time	**Concentration of Pyrrole (Py)**	**Removal efficiency**
1 minute	0.25	73.66157
5 minute	0.25	71.63027
10 minute	0.25	76.2594
15 minute	0.25	74.08371
1 minute	0.5	70.68433
5 minute	0.5	74.09311
10 minute	0.5	74.80273
15 minute	0.5	72.88075
1 minute	1.0	69.75309
5 minute	1.0	73.08908
10 minute	1.0	71.26625
15 minute	1.0	73.67891

Effect of dosages:

Effects of dosage of polypyrrole coated jute fabric on the As removal from the 7.5 ppm solution is studied and result is shown in Figure7. It can be seen that when dosage increases concentration of As in the solution decreases. A dosage amount of 8 g is sufficient for removal of 86.14% of As from the solution and after the treatment the concentration of As in the solution is left as 0.40 ppm.This study shows that the polypyrrole coated jute as a bio-sorbents can be used to treat the drinking and wastewater for removal of harmful arsenic.

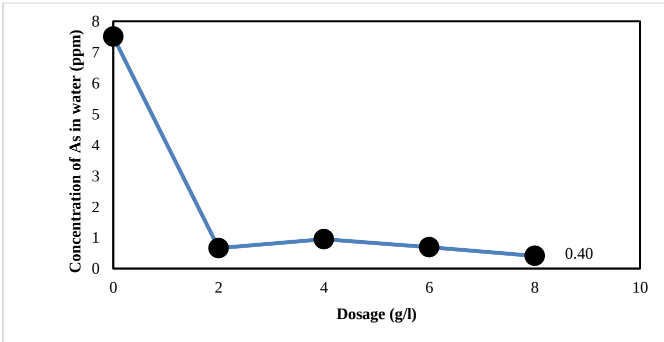

Figure7-Effect of dosage on arsenic reduction in contaminated water

4.CONCLUSIONS

This article offers the extensive information on the removal of *As* metal ions from contaminated water effluents using PPy-based jute fabric as adsorbent. The polypyrrole coated jute fabric can reduce *As* concentration from 7.5 ppm to 0.40 ppm in contaminated water. They exhibit various advantages, such as fast kinetics, high capacity, and preferable sorption towards heavy metal ions in contaminated water. However, the PPy coated jute adsorbents have some limitations. Conducting polymer-based adsorbents will add a new dimension to adsorption technology and help to reduce the problem of environmental pollution, but commercial success depends on further research.

Future scope

Though PPy coated jute was used to remove arsenic from wastewater in this study, these adsorbents can be used to adsorb a variety of other elements, metals, COD, BOD, color, and other contaminants from industrial waste water. As a result, further work for the successful treatment of waste water with these adsorbents can be planned and carried out. Other natural fibers, in addition to jute, can be used as a substrate for polypyrrole coating and waste water treatment.

5.REFERENCES

1. Ahluwalia, S. S. and D. Goyal Removal of heavy metals from waste tea leaves from aqueous solution,Eng. Life Sci., 2005, 5(2), 158-162 .
2. Kundu, S. and Gupta A. K., Arsenic adsorption onto iron oxide-coated cement (IOCC): Regressionanalysis of equilibrium data with several isotherm models and their optimization, J. Chem. Engin.,2006, 122(1-2), 93-106 .
3. Maity S and Cahtterjee A. Preparation and characterization of electro-conductive rotor yarn by in situ chemical polymerization of pyrrole. Fibre Polym 2013; 14: 1407–1413
4. Maity S, Chatterjee A, Singh B, et al. Polypyrrole based elelctro-conductive textiles for heat generation. J Tex Inst 2014; 105: 887–893
5. Mudhoo A., Sharma A. K., Garg V. K. and Tseng C. H., Arsenic : An overview of applications, health, and environmental concerns and removal processes, Crit. Rev. Environ. Sci. Tech., 41(2), 5, (2011).
6. P. Ravenscroft, H. Brammer, and K. Richards, Arsenic Pollution: A Global Synthesis, JohnWiley&Sons,West Sussex, UK, 2009.
7. Rai, P. Tripathi, S. Dwivedi et al., "Arsenic tolerances in rice (Oryza sativa) have a predominant role in transcriptional regulation of a set of genes including sulphur assimilation pathway and antioxidant system," Chemosphere, vol. 82, no. 7, pp. 986–995, 2011.
8. Santra S. C., Samal A. C., Bhattacharya P., Banerjee S., Biswas A. and Majumdar J., Procedia Arsenic in foodchain and community health risk : A study in Gangetic West Bengal. Environ. Sci.,18(1), 2–13, (2013).
9. Thomas, S. Y., Choonga T. G., Chuaha Y., Robiaha F. L., Koaya G., and I. Azni Arsenic toxicity,health hazards and removal techniques from water: an overview. Desal., 2007, 217(1-3) 139-166 .
10. USEPA, "National Primary Drinking Water Regulations: Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring," Federal Register, vol. 40,CFR Parts pp. 141–142, 2001.

DEVELOPMENT OF SUSTAINABLE FABRIC PRODUCED FROM RECYCLED FABRIC WASTES

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ABSTRACT

Sustainability is the world's most requirement at the present world. Production and processing of sustainable textiles not only helps to reduce the negative impacts on the environment, but also support millions of workers to earn fair wages and ensure proper working. The knitting waste fabric from the knitting industry is taken as small pieces of fabric were fed into the willowing machine to convert the fiber called sustainable fibers (SF). The waste has been processed to produce sustainable yarn, spinning process was used to make the yarn. Properties of sustainable fibers are analyzed using high volume instruments. This SF was used as the raw material for the spinning process. This SF was fed to the miniature carding section, by proper opening and feed to the machine; by these fibers are converted into card sliver. Then these slivers were used as the rotor raw material and got sustainable rotor yarn. This rotor yarn is used as raw material for knitting; the fabric of sustainable rotor yarn and virgin cotton fabric are produced by using a hand knitting machine and compared. And this sustainable rotor yarn is used a weft and the fabric are get woven using dobby loom. After the knitting and weaving of fabric, the fabric parameters are analyzed, and results are discussed.

Keywords: Sustainable textiles, Knitting waste, Sustainable fibers, Sustainable yarn, Rotor yarn, Dobby loom,

1. SUSTAINABILITY OF KNITTED FABRIC WASTE IN HOME TEXTILE

The ultimate post-consumer waste management is done by the rag graders. There are many companies emerging in the industry that are involved in the process of sorting wastes. These companies acquire, sort, process, and export the products made from post-consumer to different markets. The first step is sorting from a bunch of waste materials made available through different sources. The textile waste is separated manually depending on the fabric, fibers, and the quality or condition.

Division is done under two categories like Wearable and Non-wearable textiles.

The process gets refined and more systematic as the sorting proceeds to successive levels, for example sorting summer wear from winter wear or men's from women's clothes. In addition to this, the post-consumer category has a market for high fashion garments known as Diamonds; these are clothes that have an added premium value because they belong to a certain brand or style, which are also sorted. Re-sorting is done for grading the materials and to make sure sorting is done color wise. This is necessary to know whether further dyeing and coloring is required or not. The wearable materials go to the second-hand clothing market. Most of the western used clothing is sold in developing countries. The non-wearable textiles depending on the kind of fabric are converted into fibers also known as shoddy, by two main processes. One is the mechanical process, which breaks down fabric into fiber using different methods like cutting, shredding, and carding.

The fibers are spun into yarns or into woven, non-woven or knitted fabrics. Flocking is another technique, wherein the fibers are reduced to fine powdered particles. It is used to give a decorative and soft finesse to products. The finished products are used in fabricating garment lining, home textile upholstery, for insulating and sound absorption in automobiles, carpeting, and toys. [1]

2. SUSTAINABILITY AND CIRCULAR ECONOMY IN KNITTING

As part of the recent trend towards sustainability modern society in general, the knitting sector has also been emphasizing social responsibility and careful use of resources in knitting sector as well. Focus has been placed on reusing, recycling and up cycling raw materials and reducing or even eliminating knitting waste. Knitting machines that offer environmentally friendly manufacturing techniques. with less impact on people, environment and production processes that significantly reduce time losses or unproductive time gaps between manufacturing phases were favored.

On the other hand, in the field of knitting, there is an antithesis to industrial mass knitting—hand knitting, which has recently been revived, especially during the Covid-19 pandemic. Hand knitting is primarily important as a leisure activity with relaxing and therapeutic effects, rather than as an economic activity, although the entry of hand knitting into the street and high fashion is not entirely negligible. Discussing the importance of hand knitting in the highly technical environment of the 21st century seems like a step backwards. However, things need to be looked at in a more comprehensive and far-reaching way. More important is the sustainable aspect of hand knitting, which includes reuse, up cycling and visible mending of knitted items. In fact, DIY fashion trends in knitting raise awareness of unnecessary consumerism and the recyclability of textiles and clothing, and influence awareness of the crucial importance and inevitability of sustainability in modern society The development of sustainable products, processes and concepts is an important factor that has a decisive impact on the economy. In the linear economy with the one-way material flow »take-produce-use-dispose«, the needs of consumers are constantly increasing and therefore more and more new products have to be produced. This leads to increased material and energy consumption, which in turn leads to increase in the amount of waste and pollutants. The circular economy is a closed supply chain with the cyclical material flow »resources-products-renewable resources«, which requires significant changes in consumption and production processes. It defuses the conflict between technological development and environmental conservation. [2]

3. KNIT SOLID WASTE CONFIGURE

The mostly knit solid waste has found the single jersey fabrics with swatches and the edgings. Firstly the cutting section and secondly the sewing section are the main liable unit to produce more fabric. solid waste usually and it is respectively 31% and 24.5% by statistics of full production. According to a study, the knit apparel industry needs at least 3.155 km of disposal ground or pipeline Cleanliness capacity is available to about 40% of the industry only. Thus the solid waste of the remaining 60% or about 90 million people are left to the environment Technologies to work with and improve the waste management system are needed. The massive production accelerates the environmental footprint of clothes through the whole life cycle.

Export of any kind of solid waste requires Government permission Know disposing (selling) all kinds of solid waste or E-waste are needed. there were about to 600 government knit apparel industries 1.600 clandestine knit heavy knit and 1.200 basic knit products in Bangladesh Studies show that huge amount of knit fabric solid waste is generated from these and the waste generated is rising with the increasing population. Projection indicates that the solid waste generation would be 12,512 tons/ year by 2013 and 16,356 tons/year by 2017. According to the study, the sustainably problems are highly visible in the world knit industry as it is the type of fashion which aims to move a trend time to keep up with the current market trends and also emerging the solid waste usually.[3]

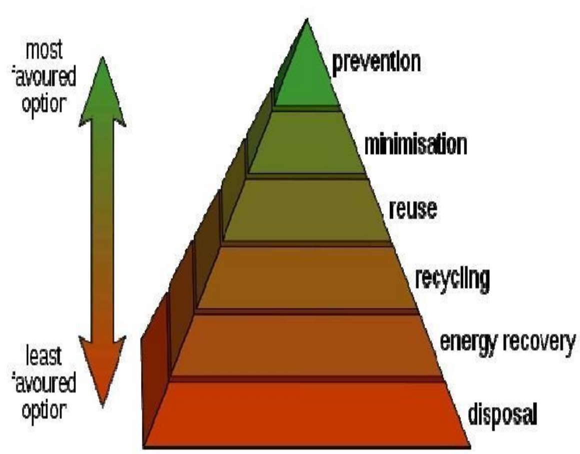

FIG - 1 Solid waste process

4.SOLID WASTE GROUND OF KNIT APPAREL INDUSTRY

Solid waste is the biggest concern for knit apparel industry of Bangladesh. The knit apparel industry is the highest manufacturing unit to export several types of apparel all over the world. As per the higher fabric requirement, the producing rate of knit solid waste per day is significantly higher. It is all about at least 20% to 25% from the total production of required fabric.

In knit apparel industries, like in other developing countries, the materials discarded are usually regarded as industrial liabilities and essentials. This includes manufacturing adhesives and rubbish, commercial refuse cleaning and maintenance refuse of dead garments, labels, finishing residuals and inspectional wastes, bulky and regular wastes and finishing residues. Manufacturing garbage and rubbish are also known as residential refuse or domestic wastes in the apparel industry. Commercial refuses are the wastes of the category that come from stores, manufacturing units and the floors. [3]

5.CONCLUSIONS

Sustainability is the present world requirement. Sustainable yarn production from knitting wastes and converting into usable product with eco-friendly process, low cost production with simple and ease process. From the result we can conclude that recycled fiber has a fiber length of minimum with shorter fiber content, it has a low elongation and strength due to the below span length, it has a very good moisture absorbency property. From the mica value we can say that fiber is coarser. After the production of fabric, the fabric is compared with the 100%cotton fabric. From the result we conclude that the recycled fabric has a higher GSM, the air permeability is also good in recycled fabric when we compare to a 100%cotton fabric. The thickness of the fabric will be more in 100%cotton fabric. From the result due to the short fiber length, recycled fabric it has been chosen for a home textile application.

6.REFERENCES

1. Fang Wang – "**Sustainable design of waste and contemporary textile materials**" Advances in engineering research, volume 94 (2016).
2. Alenka Pavko Čuden - "**Knitting towards sustainability, circular economy and Industry 4.0**" Applied research (2023).
3. Saiful Islam Tanvir, Engr. Md. Tarique Mahmood – "**Solid Waste for Knit Fabric: Quantification and Ratio Analysis**" Journal of Environment and Earth Science Vol.4, No.12, (2014).

UTILISATION OF COTTON WASTE FROM SPINNING FOR MANUFACTURING OF PAPER

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ABSTRACT

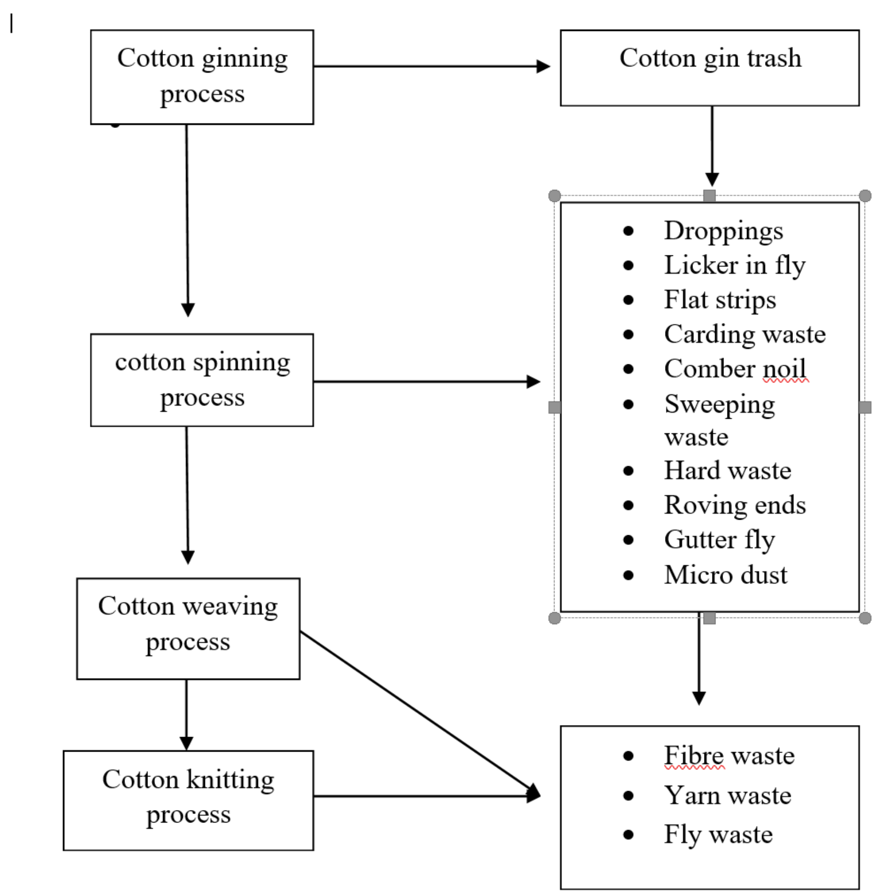
The waste generated by a cotton textile mill can be used to make a variety of products. In this paper, we use waste to create a sustainable packaging product. Waste management issues have become more prevalent in recent years, necessitating the production of sustainable products in order to reduce waste. The materials currently used in packaging are non-biodegradable, and as a result, they are causing environmental pollution. Textile waste is a piece of fabric or fibre that is used in the manufacturing of some products or can be used in some textile processes. This is one of the utilization methods used to produce sustainable packaging, which eventually results in waste management.

Keywords: *Biodegradable, Linter, Paper, Spinning, Sustainability*

1.INTRODUCTION

Utilizing recoverable wastes and making efficient use of natural resources is becoming increasingly important as waste recovery has both economic and environmental benefits. Sustainability, eco-efficiency, industrial ecology, and green solutions are clearly driving the development of the next generation of materials, processes, and products. [1] . Various production wastes can be reused in the textile industry from the standpoint of textile manufacturing. Spinning, weaving, processing, and garment waste are examples of this waste. Textile wastes are divided into two categories: production wastes and postproduction wastes. Production wastes are essentially raw materials from every stage of production that cannot be used to create the finished product for a variety of reasons. Waste materials that are recyclable or recoverable are generated at every stage, from cotton fibre ginning to finished product production. [4]. The blow room and carding section generate approximately 8% of the waste generated during cotton processing in spinning industries, while the combing section generates up to 20% [2]. Postproduction wastes are frequently composed of worn-out textiles that can be recycled and reused in the production of new textiles or other products. The demand for advanced and eco-friendly sustainable packaging materials has grown in recent years. Because the materials currently used in packaging are non-biodegradable, they are causing environmental pollution. As a result, the primary goal of this project is to use textile waste for packaging purposes. This paper considers three aspects of sustainability: the economic or commercial functions of packaging, as well as its social and environmental functions. This waste can be recycled.

1. Waste produced during making of textile



1.1 Spinning Waste

Barker defines spinning as "the art of throwing a number of more or less short fibres together in such a way that, when drawn out, they form a relatively fine filament" [3]. In spinning mills in developed countries, waste generation varies from machine to machine. Spinning equipment generates both soft and hard waste. Soft waste is defined as waste with relatively open fibre structures that can be used at an earlier stage of the feed chain. Hard waste fibres, on the other hand, are packed in a closed structure and must be processed further before being combined with soft waste in the blow room section. The primary stages of soft waste production are the blow room, carding, draw frame, comber, and speed frame.[8] Comber machines typically generate the waste because one of their primary functions is to remove short fibres, also known as comber wastes. The draw frame is the most waste-free spinning mill machine. If the spinner is producing carded yarns, the blow room generates the most waste. Regardless of the ring spinning frame, shorter fibres have the highest waste ratio in blow room machinery and card. Ring spinning frame and comber waste contains longer fibres (up to 1 1/2″) than card and blow room machine waste. [3]

1.2 Weaving waste

Depending on the type of weaving project—shuttle loom weaving, repair weaving, projectile weaving, air jet weaving, water jet weaving, etc. The number of wastes may vary. The current research's objective is to concentrate on and raise the bar of customary procedures used in weaving woven cloth. [3]The winding process transfers yarns from a small reel to a large bobbin to warp during the weaving preparation process; it is important in removing defects in the yarn (thick, thin, or nep), which generates wastes. Throughout the weaving process, warp threads are lifted to insert weft yarns in accordance with the desired design; sources of hard waste at this point include weft and warp yarn breaks, bobbin changes, and set changes. [4] One of the most common causes of waste in the weaving industry is the processing of materials during the weaving process. [3] Some warp (OR weft) strands are lost before beginning to weave a new weaver's beam on the loom before it is properly calibrated to weave the required fabric. Furthermore, a small amount of warp is wasted as sample grey fabric to test, check, and ensure that the proper quality is being woven on the loom [5]. Controlling waste during warp and weft thread weaving is critical for increasing production rates and lowering fabric costs.

1.3 Garment waste :

The garment industry wastes a significant amount of textile during the fabric and clothing production processes. Currently, post-consumer textile waste accounts for 5% of solid waste, and the majority of this textile waste that is disposed of in landfills causes environmental problems. Fabric scraps from cutting, leftover fabrics from rolls, sampling yardage, damaged fabrics, clothing samples, unsold garments, and second-hand clothing waste are examples of this waste. Fabric can also be wasted during the manufacturing process, such as trimming or printing and embroidery. Many of these scarps are dumped in landfills, causing numerous environmental problems. These leftover fabrics can be used for new financial developments and innovations [7].

2.CURRENT UTILIZATION OF WASTE

2.1 Nonwoven technology

Non-woven refers to a method of producing textiles that uses very short fibres and bonds them with heat, glue, chemicals, and ironing to create a material that resembles textiles. Non-woven materials can be produced because systematic fibre length and fabric formation may be impossible due to the heterogeneity of the recycled fibres. The composites used in this technology are made up of a fibre and a polymer matrix that are bonded together under pressure and heat to form a compressed medium that is particularly well suited for textiles used in agriculture, construction, geo, acoustics, and filtration[10].

2.2 Technical textiles

Recycled textiles are used in filtration purposes. Recycled fibres are also utilized in food packaging, upholstery, agro-textiles, geotextile reinforcement, acoustics, textiles for building construction, car interiors, and package textiles.[10]

2.3 Building material

Textile waste cuttings are combined with cement as a binder to create a unique composite material that resembles concrete but can be nailed or cut like wood. It exhibits specific mechanical and physical characteristics that point to its potential for lightweight, low-cost construction. The laboratory test results point to a long-lasting, lighter-than-concrete building material with a wide range of potential applications, including ceilings, walls, substitutes for wooden boards, and low-cost concrete blocks. [1]. Furthermore, textile-reinforced concrete (TRC) is a composite concrete material used in a wide range of applications, including prefabricated structures, repairs, rehabilitation, and structural strengthening of existing structures. This is a building industry innovation that promotes the use of sustainable building materials by reusing textile industry waste [4].

2.4 Composting

Composting is a biological process that converts organic waste, such as cotton waste, into a natural fertiliser. Because of a low, bio oxidative composting method, the volume of organic waste is reduced by up to 50% during the active phase of the composting process [1]. Different microorganisms, such as bacteria and fungi, break down complex organic matter into simpler elements in the presence of air during the composting process. Composting was viewed as a solution to the problem of cotton trash being disposed of directly in landfills, which is still a major waste disposal issue today. Cotton waste and vermin compost may make an excellent long-term source of nutrients [10]. Earthworms are used in the biotechnological vermin composting process, which produces compost with improved soil fertility that is far superior than ordinary compost.

2.5 Fiber Regeneration

Since "export for reuse" of used clothing is no longer a viable option in many developing countries, virgin cotton fibre manufacturing necessitates the use of significant resources. Fiber regeneration through recycling is a closed loop up cycling technique for cotton waste clothing [7]. The regeneration of fibres involves turning used cotton garments into pulp, dissolving that pulp in a solvent, and spinning that pulp into fibres. The solvent N-methylmorpholine N-oxide (NMMO) can completely dissolve cellulose while remaining environmentally safe. Wood pulp can be combined with pulp recovered from cotton-based waste clothing to create fibres similar to lyocell. [11].

3. Current Scenario Regarding Packaging

The packaging industry is concerned with items or products that are transported, stored, protected, or confined. Textile packaging materials range from heavyweight woven bags and sacks used to wrap food and industrial products to lightweight nonwovens used to wrap food and industrial products, as well as polymer-based bags for industrial packing to jute sacks used to package grain and tea. Bags and sacks were traditionally made of cotton, flax, and jute, but polypropylene is now more commonly used. Lighter weight nonwovens and knitted structures are now used for a variety of wrapping and protective purposes in the modern packaging market, particularly in the food industry, while tea and coffee bags are frequently made of wet laid nonwovens. Loose fruits and vegetables are frequently sold in knitted net packaging, whereas vegetables, meat, and fruit are frequently packed with a nonwoven insert to absorb liquids. According to packaging textile manufacturers, the production of disposable and/or biodegradable materials that can be recycled or reused is currently under increased environmental pressure. Such demands are also expected to result in the use of highly designed nonwovens rather than less durable materials for consumer product packaging, such as paper. Because the lightweight properties of materials such as wet laid and spunbond nonwovens are being used more frequently in the food industry, as well as for packaging medications and electronic equipment, nonwovens are expected to profit. .[8]

4. Market Trends

Increased online trade and e-commerce, as well as urbanization and population growth, all contribute to an increase in packaging use and trade. Furthermore, consumers are consuming goods on the go, which has increased demand for food service packaging and various packaging sizes. Smithers Pira forecasts that the global packaging market will grow at a rate of about 3.5 percent per year, reaching US$980 billion in 2022. Paperboard packaging accounts for approximately US$300 billion per year, with an average annual growth rate of 3%, of which 50% is made from virgin fibre. Plastic packaging alone accounts for roughly one-third of the market. Non-fiber packaging, such as plastic, glass, and metal packaging, is worth US$460 billion, or slightly more than half of the total packaging market. According to many experts, the use of packaging materials and manufacturing techniques is changing as major companies in this industry. The National Composites Network in the United Kingdom has identified a number of market trends for the textile packaging industry, including jute sacking free of hydrocarbons to reduce contamination caused by oils used during jute processing. As the industry shifts toward bulk handling, "big bags" are replacing small and medium-sized sacks, including antistatic bags to reduce the risk of explosion when transporting combustible materials, bags with leak-proof seams, and bags lined with Aluminium. Nonwovens are also gaining popularity as long-lasting synthetic papers for shipping envelopes, medical packaging, industrial bags, and military, electronic, and inflatable packaging. Food packaging is another application for nonwovens. Nonwovens for food packaging, such as teabags, coffee filters, and absorbent pads, to prevent blood and other juices from leaking and spreading from meat packaging. The use of narrow-woven polypropylene strapping in place of metal straps, which can be dangerous to cut under tension; the rise of net packing because of food transportation in general and pre-packaging of previously offered loose foods such as fruit and vegetables; and clever packaging, which includes security detectors and functional packaging with temperature, freshness, and traceability markings.

Main Products

The following are the primary technical textile items used in packaging:

Flexible intermediate bulk containers (FIBCs), wrapping materials, leno bags, non-paper teabags and coffee filters, soft luggage items, and polyolefin woven sacks make up an estimated 50% of all textile packaging by volume. Jute hessian and sacks, including food-grade jute bags, make up an additional 30% of all textile packaging [10].

1.Woven sacks

Polyolefin woven sacks are versatile packaging materials that are commonly used in the packaging of cement, fertilisers, chemicals, thermoplastic raw materials, grains, sugar, salt, animal feed, and other products. High-density polyethylene or polypropylene (HDPE/HDPP) is commonly used. HDPE/HDPP has advantages over alternative packaging materials such as high strength, light weight, little seepage, moisture proof, durability, and low cost due to its reusability.

2.Jute hessian and sacks

Jute textiles and bags have excellent mechanical strength, low cost, a soft surface with high friction resistance to support high stacking of full bags in storage and transit, and a porous structure that facilitates ventilation of, for example, grain and vegetables. Jute hessian, also known as burlap, is a higher-grade jute fabric that has been used to package a variety of commodities for decades. Hessian is used for wrapping, wall coverings, upholstery, and home furnishings in addition to bags. Jute sacking is a broad term for the heavier, coarser fabric that is typically used to make packaging supplies bags. Jute sacking bags are especially useful for storing agricultural products as well as in the cement industry [11].

3.FIBCs

FIBCs, also known as jumbo bags, are larger versions of HDPE/PP bags. They can be made of flat or tubular woven PP fibres, and the fabrics can be coated or uncoated. They are a low-cost packaging option for shipping and storing dry bulk goods. FIBC bags are classified into three types: panel type, circular weaving type, and baffle type (square bags). The bags can hold 500-4,000 kg and are made of fabrics weighing 180-275 g/m2. FIBCs can weigh anywhere from 900 g to 3 kg, depending on the bag and the weight being transported. FIBCs have several advantages over small bags, including low cost and ease of material handling, low weight for transport, no need for pallets, and high strength.

4.Leno bags

In Leno bags, many different fruits and vegetables can be preserved and packed. They're made of virgin PP woven net fabric and a colour masterbatch. Leno bags have good mechanical properties, are chemically inert, are lightweight and easy to store, are reusable, and recyclable. They are suitable for dry-skinned vegetables (such as potatoes, onions, and garlic) as well as cold storage, and they can be a cost-effective alternative. The Dry-Fresh Resolve compostable absorbent fruit pad serves as an absorbent presentation surface for fruit while allowing it to breathe. A micro porous surface allows air to circulate while absorbing excess juices into a cellulosic absorbent membrane. This layer also offers cushioning, which helps to reduce sweating and bruising.

5.Wrapping fabric

Wrapping fabric with a basic weight of 50-200 g/m2 can be made to be tear-resistant, thin, light, and have a high tensile strength. Cotton canvas or HDPE/HDPP are commonly used to make it. Unlaminated HDPE/PP woven fabric is commonly used to wrap yarn cones, steel coils, tyres, paper rolls, and paper bundles. Beaulieu Technical Textiles, a well-known manufacturer, offers industrial packaging solutions in the form of rolls of coated or uncoated woven PP under the Dura pack brand. These can be used to wrap yarns or bulk fibres, as well as to package technical textile rolls, wall-to-wall carpets, and tufted carpets. Adaptable luggage- Soft luggage is lightweight and flexible, made of woven materials such as polyester and polyamide. In addition to upright suitcases [12].

6. LDPE Impact:

Plastic is currently one of the most dangerous pollutants on the planet. The most common type of polymer film used for packaging is Low-Density Polyethylene (LDPE), and most plastics are produced for this purpose [3]. LDPE production ranks second among the 64 million tonnes of plastic produced worldwide. Unfortunately, LDPE plastics are typically not biodegradable, resulting in waste accumulation in landfills and the environment. [2]. Beside from end-of-life procedures, the other stages of an LDPE plastic packaging's life cycle may also have an impact. Throughout the life cycle of an LDPE plastic packaging, from raw material extraction to end-of-life treatments, harmful emissions will have an adverse effect on the environment and human life. For example, the manufacturing phase contributed to global warming, and incineration contributed to toxic gas emissions. [5]. Artificial plastics are increasingly being used, which has had serious consequences for the environment and human existence, including climate change, glacier melting, ozone layer depletion, biodiversity loss, and water contamination. The optimal waste management strategy with the fewest negative environmental effects is determined by comparing how LDPE plastic packaging is handled at the end of its useful life [12]. Impact assessment enables waste management facilities, users, and manufacturing companies to raise awareness and develop practical proposals for environmental preservation and protection. As a result, major consequences such as air pollution, acidification, and global warming can be mitigated. Waste management is an important and impactful process that promotes productivity while reducing environmental impacts [7].

7. Biodegradable packaging material

Because of their ability to be composted in an environmentally friendly manner, biodegradable polymers have sparked intense research and industrial interest. For the benefit of the market economy and ongoing environmental risks, biodegradable materials should be used more heavily in packaging materials, which currently account for 60% of all plastic products. [3] Because of their ability to degrade in environmental conditions or in municipal and industrial biological waste treatment facilities, biodegradable plastics allowed for the consideration of new waste management techniques. [4] Although their impact on the plastics sector is still minimal, bio-based biodegradable polymers are becoming increasingly important in the packaging, health, and agriculture industries. Bio-based biodegradable polymers are made from renewable resources. Bio-based biodegradable polymers are environmentally preferable in a variety of industrial applications due to their ability to completely disintegrate biologically. Starch is the most commonly used bio-based polymer in the production of biodegradable plastics. Because of its availability, affordability, abundance, and proclivity to degrade in environmental conditions, starch is frequently used to create bio-based, biodegradable plastics. Microorganisms consume bio-based biodegradable plastics such as cellulose, starch, and starch-based polymers directly because enzymes reduce their extracellular molecular weight. [5]. Because starch is composed of amylo-pectin and amylase polymers, it can be used as a substitute. The most popular products use starch extracts from cereals such as wheat, corn, and rice, as well as tubers such as potatoes. To be used as packaging materials, starch products must be converted into thermoplastic starch materials. [6]. There are two types of starch-based polymers, as well as a wide range of other bio-based, biodegradable compounds used in packaging. A starch-filled polymer and a starch-based polymer. These polymers can be completely degraded by microorganisms (bacteria, fungi, and algae) and various environmental factors. Various soil microorganisms have been found to degrade bio-based polymers under both anaerobic and aerobic conditions. The use of biodegradable plastics in specific applications such as packaging, agriculture, and the health industry is the most innovative and environmentally safe solution to problems associated with the disposal of plastic waste generated from various sources. Bio- and fossil-based biodegradable polymers, when used, degrade efficiently in the environment, within cells, or in well-maintained industrial settings. In terms of applications, the new generation of bio-based biodegradable plastics will pledge to make society more sustainable. To be reusable again, these polymers must be biodegraded and recycled in a balanced manner. Eco-friendly packaging is difficult to define because it is context-dependent. Eco-friendly packaging is defined as any packaging that, when compared to an alternative, causes less harm to people and the environment. In other words, no accepted standards or metrics exist. Furthermore, there are no comparable measures to which these can be compared. The definition of "eco-friendly" varies depending on who is defining the term. However, as a rule, eco-friendly packaging is made of materials that are intended to be recycled. Fast-moving consumer goods (FMCG) companies and retailers are taking proactive steps to improve the sustainability of their packaging and fundamentally rethink their packaging systems. Regulators are acting on the issue. Many in the sector may face extinction as a result of the significant impact on packaging converters and their value chain. The new environment, on the other hand, could present significant growth and new collaboration opportunities for packaging converters with the right focus and innovation capabilities to assist clients in updating their packaging portfolios. As consumer demands and regulatory obligations rise in the future, converters will need to actively address sustainability issues.[8] Packaging must be integrated into a circular economy to protect items and provide information on how to use them safely and ethically. Our modern lifestyle is heavily reliant on packaging. Without it, most products would spoil or expire before reaching a store. However, because it degrades after use, it is frequently cited as a key antagonist in the fight for environmental sustainability on our planet. As a result, businesses from a variety of industries are looking for ways to close the loop and reduce packaging's negative environmental effects while still reaping its benefits. This search requires people with a wide range of skills, but the most important .[9]

Testing and Evaluation

The material which is in sheet form must be subjected to typical air conditions before being examined forits physical characteristics. When there is no difference in weight between measurements made one hour apart of more than 0.25 per cent, the state of the material is proper. The most popular type of material needs 4 hours to condition. A certain type of hard-sized material needs 24 hours to condition. The sheet must undergo standard testing for a variety of strength characteristics after conditioning. This is required to ensure that the finished product meets customer satisfaction standards for quality. Ample focus must be placed on the quality features of the handmade sheet to maintain sustainability and compete with the growing competition from other developing innovations.

1. GSM
2. Bursting Strength
3. Tearing Resistance

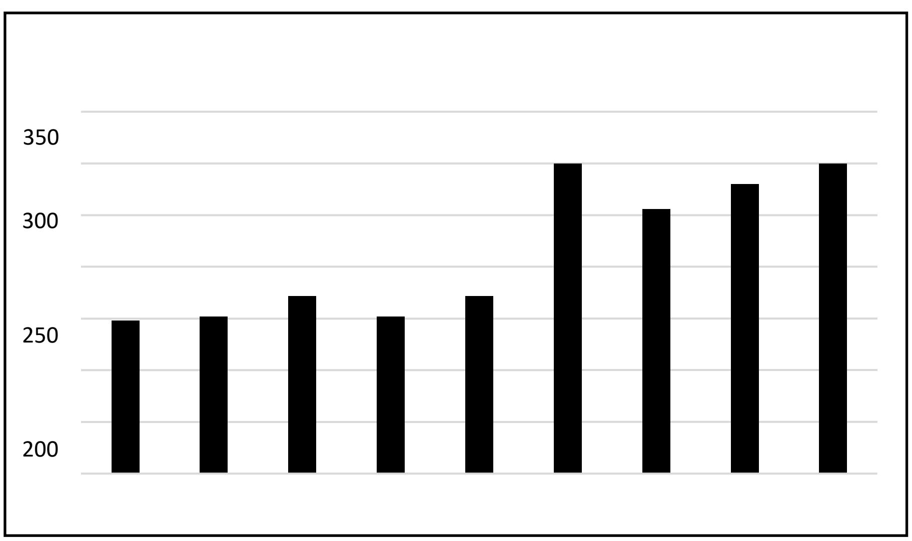
3.RESULTS AND DISCUSSION

3.1. Results of the packaging material

The manufacturing of the paper is carried out as per the methodology discussed above. The fabric samples are tested for GSM, Tear Strength, and Bursting strength. The results of thesetests are discussed in Tables 3.1, 3.2 and 3.3 respectively.

Table 3.1 Effect of process parameters on GSM of paper

Cotton (gm)	Starch (gpl)	Babul Gum (gpl)	PVA (gpl)	GSM
10	2	2	0.2	148
10	4	4	0.4	152
10	6	6	0.6	172



20	2	2	0.2	152
20	4	4	0.4	172
20	6	6	0.6	300
30	2	2	0.2	256
30	4	4	0.4	280
30	6	6	0.6	300

Fig. 3.1: Effect of process parameters on GSM of paper

From table no. 3.1 and fig. 3.1, it is observed that, as the concentrations of the chemicals used for manufacturing paper increase, there is an increase in the GSM of the paper. This may be because as the chemical concentration increases, the add-on of chemicals in fibres increases resulting in an increase in the GSM of the manufactured paper. Also, is observed that there is a gradual increase in the GSM of paper.

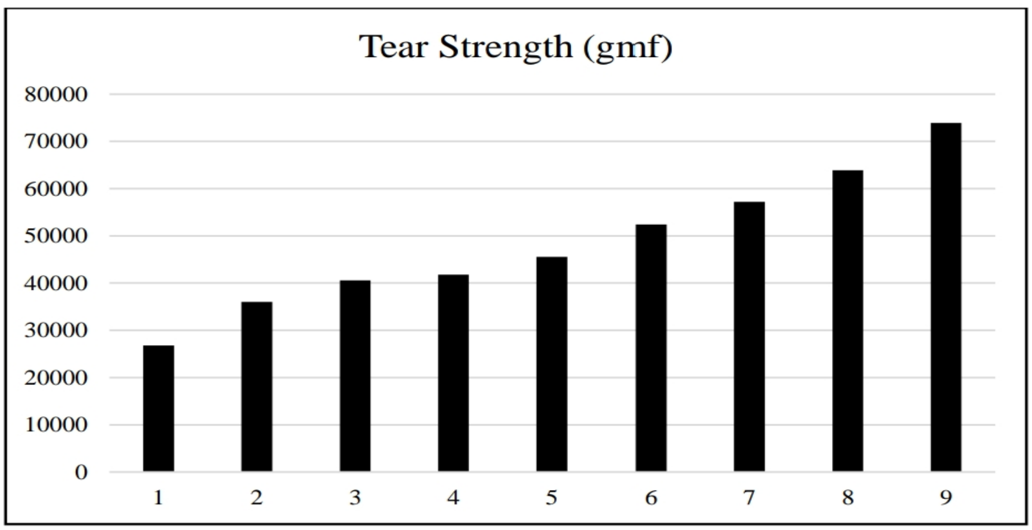


Fig. 3.2 Effect of process parameters on Tearing Strength of paper

Table 3.2 Effect of process parameters on Tearing Strength of paper

Cotton (gm)	**Starch (gpl)**	**Babul Gum (gpl)**	**PVA (gpl)**	**Tear Strength (gmf)**
10	2	2	0.2	26816

10	4	4	0.4	36032
10	6	6	0.6	40576
20	2	2	0.2	41792
20	4	4	0.4	45568
20	6	6	0.6	52416
30	2	2	0.2	57216
30	4	4	0.4	63879
30	6	6	0.6	73920

From table no. 3.2 and fig. 3.2, it is observed that, as the concentrations of the chemicals used for manufacturing paper increase, there is an increase in the Tear strength of the manufactured paper. This may be because as the chemicals concentration increases, the add-on of chemicals in fibres increases resulting in an increase in the GSM of the manufactured paper, so more force is required to break the fibres in the perpendicular direction of fibres. Also, is observed that there is a gradual increase in the Tear strength of the paper.

Table 3.3 Effect of process parameters on Bursting Strength of paper

Cotton (gm)	**Starch (gpl)**	**Babul Gum (gpl)**	**PVA (gpl)**	**Bursting Strength (kg)**
10	2	2	0.2	0.67
10	4	4	0.4	0.70
10	6	6	0.6	0.86
20	2	2	0.2	0.90
20	4	4	0.4	1.35
20	6	6	0.6	1.60
30	2	2	0.2	1.70
30	4	4	0.4	2.00
30	6	6	0.6	2.50

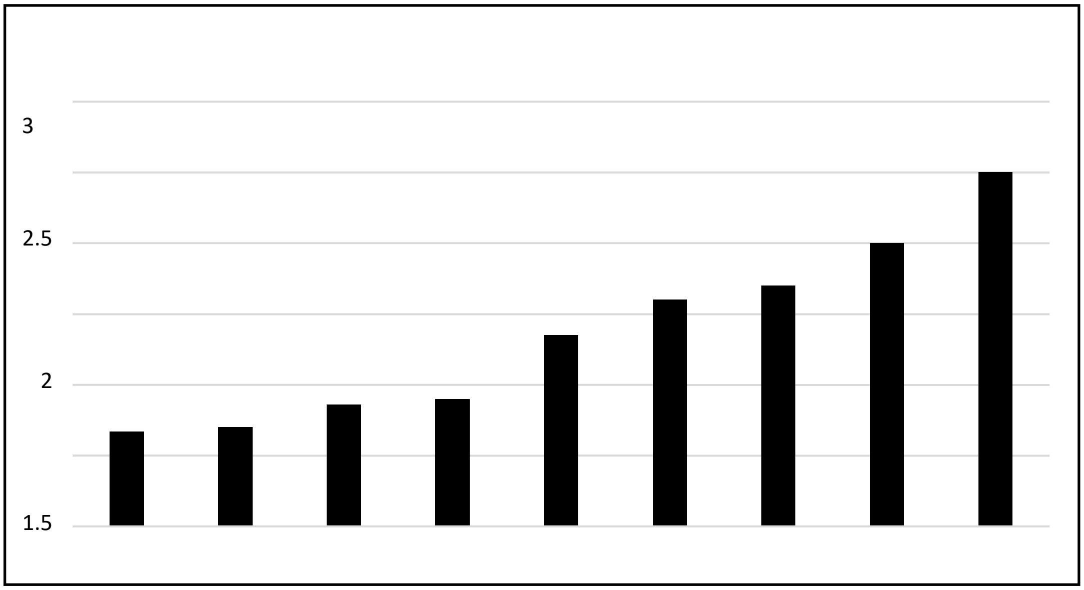


Fig. 3.3 Effect of process parameters on Bursting Strength of paper

From table no. 3.3 and fig. 3.3, shows the effect of concentrations of the chemicals used for manufacturing of paper. It is observed that there is an increase in the concentration of chemicals used for manufacturing paper resulting in an increase in the bursting strength of the manufactured paper. This may be because as the chemicals concentration increases, the add-on of chemicals in fibres increases resulting in an increase in the bursting strength of the manufactured paper, so more energy is required to break the fibres in all directions of fibres. Also, is observed that there is a gradual increase in the bursting strength of paper.

4.CONCLUSION

In this project work, spinning mill waste linters are used for the manufacturing of the packaging material. Taguchi technique is used to design the experiment. Also, in the process of manufacturing various types of adhesives were added during the manufacturing process. All the samples are tested for physical properties as per standards. After analysing the results, statistically, the following conclusions are drawn.

1. As the concentrations of the chemicals used for manufacturing packaging material increase, there is an increase in the GSM of the paper.
2. As the concentrations of the chemicals used for manufacturing packaging material increase,

there is an increase in the Tear strength of the manufactured paper.

3. As there is an increase in the concentration of chemicals used for manufacturing packaging material resulting in an increase in the bursting strength of the manufactured paper.
4. This indicates that spinning waste can be used for manufacturing packaging material by using combinations of various adhesives at various concentrations.

5.REFERENCES

1. Kaur, D., Bhardwaj, N.K., Lohchab, R.K., 2018, A study on pulping of rice straw and impact of the incorporation of chlorine dioxide during bleaching on pulp properties and effluents characteristics. J. Clean. Prod. 170, 174-182.
2. Emine Dilara Kocak,Munir Tasdemir & Cigdem Gul, Sustainable Green -Based Composites from Renewable Resources in Textile: Industrial Cotton Wastes, Sustainability in the Textile and Apparel Industries, 45–61.
3. Paneti Rajesh & V. Subhashini, Sustainable Packaging from Waste Material: A Review on Innovative Solutions for Cleaner Environment, Bioremediation and Green Technologies, 259-270.
4. Sukhvir Singh and Alok Kumar, Soft Waste Management in Spinning Industry, 213– 217
5. Ashvani Goyal, 2021, 3 - Management of spinning and weaving wastes, Waste Management in the Fashion and Textile Industries, The Textile Institute Book Series, 61-82
6. .F.F.Aspiras and J.R.I.Manalo , 15 January 1995, Utilization of textile waste cuttings as building material, Journal of Materials Processing Technology, Volume 48, 379-384.
7. Siracusa V, Rosa M D, Romani S, Rocculi P and Tylewicz U, 2011, Procedia Food Sc. 1, 9, 235
8. Koushal V, Sharma R, Sharma M, Sharma R and Sharma V, 2014, Int. J. Waste Resources, 9, 4134.
9. Ruban A, 2012, Life Cycle Assessment of Plastic Bag Production (Sweden: Uppsala University), 7–36.
10. Aryan Y, Yadav P and Samadder S R, 2018, Journal of Cleaner Production, 211, 1268-1283.
11. Agarski B, Vukelic D, Micunovic M I and Budak I, 2019, Journal of Environmental Management 245, 55–65.
12. Sambhu Nath Chattopadhyay, Preparation of handmade paper from jute, Advances in product diversification and waste utilization of natural fibres.

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