# Development Of Eco-Calm Banana –Base Curtain with Lavender Extract

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Abstract—This study presents the development of a novel, eco-friendly curtain made from banana Fibers infused with lavender extract, dubbed "Eco-Calm." The curtain aims to promote indoor air quality and wellbeing by leveraging the natural air-purifying properties of banana fabric and the calming effects of lavender. With the increasing concern about indoor air pollution and its impact on human health, this innovative curtain offers a sustainable solution for creating a healthier indoor environment. The banana fabric was extracted and processed using a combination of mechanical and chemical treatments, then blended with lavender extract and woven into a durable, aesthetically pleasing curtain fabric. The unique blend of natural fabric and lavender extract creates a synergistic effect, enhancing the curtain's air-purifying properties while promoting relaxation and reducing stress. Results showed significant improvements in indoor air quality, with reductions in volatile organic compounds (VOCs) and particulate matter (PM). Furthermore. the lavender-infused curtain demonstrated a calming effect on occupants, with reduced stress levels and improved mood. This study demonstrates the potential of eco-friendly, plant-based materials in promoting indoor environmental quality and occupant wellbeing. The Eco-Calm curtain offers a promising solution for various applications, including homes, offices, and healthcare facilities. Its sustainable, eco-friendly design aligns with the growing demand for environmentally responsible products.

*Index Terms*—Eco-friendly, Sustainable, Indoor air quality, Air purification, Wellbeing, Relaxation, Stress reduction.

#### I. INTRODUCTION

The significance of indoor air quality and its effects on human health has become an increasingly pressing issue in recent times. As individuals spend more time

indoors, they are exposed to various pollutants that can negatively impact their health. Conventional curtains and upholstery can trap allergens, bacteria, and volatile organic compounds (VOCs), worsening respiratory problems and other health concerns. Additionally, the stress and anxiety associated with contemporary living can be amplified by the artificial environments we construct around ourselves. In light of these issues, there has been a notable rise in interest towards sustainable, eco-friendly materials and products that enhance indoor air quality and overall wellbeing. Natural fabrics like cotton, hemp, and bamboo have become more popular due to their breathability, durability, and biodegradability. Nevertheless, the potential of banana fabric as a sustainable option remains largely untapped. Banana fabric, made from the stems and leaves of banana plants, presents an exciting alternative to conventional materials. Abundant in cellulose, hemicellulose, and lignin, banana fabric boasts impressive mechanical properties, making it suitable for various applications, including textiles and composites. Utilizing banana fabric also offers a chance to minimize waste and encourage sustainable agricultural practices, as banana plants are commonly cultivated and often discarded post-harvest. Combining lavender extract with banana fabric creates a distinct opportunity to develop a product that not only enhances indoor air quality but also promotes wellbeing and tranquility. Lavender, celebrated for its soothing qualities, has been utilized for centuries in aromatherapy and herbal medicine. By infusing banana fabric with lavender extract, it becomes feasible to produce curtains that purify the air while also fostering relaxation and alleviating stress. This research aims to create an innovative,

eco-friendly curtain made from banana fabric infused with lavender extract, referred to as "Eco-Calm." By harnessing the natural air-purifying qualities of banana fabric alongside the calming benefits of lavender, Eco-Calm presents an exciting solution for improving indoor air quality, wellbeing, and relaxation. The introduction of Eco-Calm could significantly influence the textile industry by offering a sustainable and healthier alternative to traditional curtains and upholstery.

#### **II. OBJECTIVES**

- Design and develop an eco-friendly curtain
- Improve indoor air quality
- Enhance wellbeing and relaxation
- Create a sustainable and biodegradable product
- Promote a healthy indoor environment
- Investigate mechanical and physical properties of banana Fibers

#### III. METHODOLOGY AND METHODS

SELECTION OF PROCESS

SELECTION OF FABRIC (BANANA FABRIC)  $\downarrow$ SELECTION OF HERB (LAVENDER EXTRACT)  $\downarrow$ PREPARATION PROCESS  $\downarrow$ PREPARATION OF OIL AND EXTRACT INFUSION  $\downarrow$ PREPARATION OF FABRIC  $\downarrow$ CUTTING  $\downarrow$ SEWING  $\downarrow$ TESTING  $\downarrow$ RESULT

#### BANANA FABRIC:



Banana fabric, sourced from the fibers of banana stalks or pseudostems, is becoming increasingly popular as a sustainable and environmentally friendly substitute for conventional textiles. A primary benefit of this material for curtains is its positive environmental effect since the fibers are obtained from the waste of banana plants, it promotes zerowaste agriculture and lessens reliance on synthetic or chemical-laden fabrics. The fabric itself is inherently strong and durable, allowing banana fabric curtains to endure everyday use and sun exposure without fraying or fading easily. Despite its robustness, the fabric boasts a soft and smooth feel, providing curtains with a sumptuous and graceful drape that enhances the aesthetic of any space. Furthermore, banana fabric possesses natural insulating qualities, assisting in regulating indoor temperatures by preventing excessive heat or cold from entering. It is also breathable and moisture-wicking, which helps to deter mold and mildew growth particularly beneficial in humid environments. Additionally, banana fabric is both biodegradable and free from chemicals, making it a safer option for households, especially those with children or individuals sensitive to allergens. With its blend of beauty, practicality, and eco-friendliness, banana fabric presents an appealing choice for environmentally conscious interior design.



Lavender blooms provide a diverse array of advantages for both physical and mental health. One of the most recognized benefits of lavender is its capacity to alleviate stress and anxiety.

The calming scent of lavender creates a serene atmosphere for the mind, aiding in relaxation and enhancing mood. It is frequently utilized in aromatherapy to relieve tension and encourage improved sleep. In fact, positioning dried lavender near your sleeping area or applying lavender essential oil before bedtime can result in deeper, more restorative slumber. Furthermore, lavender boasts strong anti-inflammatory and antiseptic qualities, making it effective for addressing minor burns, insect stings, and skin irritations. The essential oil extracted from lavender flowers can be applied directly to the skin to assist in wound healing and diminish scarring. Additionally, lavender has demonstrated efficacy in alleviating pain, such as headaches and muscle soreness, when incorporated into massage oils or added to bath water. In addition to its therapeutic applications, lavender is also utilized in beauty products, skincare formulations, and even culinary recipes because of its delightful scent and flavor. Consuming lavender tea may aid in soothing digestive concerns like bloating and indigestion. Its antioxidant characteristics might also support overall wellness by safeguarding cells against damage from free radicals. In summary, lavender is a multifaceted and natural solution that has been valued for ages. Whether in oil, tea, or dried form, it provides gentle yet powerful support for both the body and the mind.

## LAVENDER OIL



Lavender oil is a popular essential oil known for its wide range of therapeutic and cosmetic benefits. It is most well-known for its calming and relaxing properties, which can help reduce stress, anxiety, and promote better sleep. Many people use lavender oil in aromatherapy to soothe the mind and create a peaceful environment. It also has natural antiseptic and anti-inflammatory properties, making it useful for treating minor burns, cuts, and insect bites. Lavender oil can be applied topically (when diluted) to help heal skin irritations and acne due to its antibacterial effects. Additionally, it may relieve pain from sore muscles and headaches when massaged into the skin or used in a warm bath. Some studies even suggest that lavender oil can improve scalp health and promote hair growth. With its pleasant fragrance and multiple health benefits, lavender oil is a versatile remedy for both the body and mind.

#### IV. STEAM TECHNIQUE

#### **PRE-TREATMENT:**

The pretreatment prepare for banana texture includes a few steps to plan the strands for turning and weaving. Mechanical pretreatment incorporates cleaning, pulverizing, and retting to break down the cellular structure and mellow the strands. Chemical pretreatment includes antacid treatment to evacuate debasements and make strides fiber quality, taken after by dying to expel common shades and neutralization to evacuate overabundance soluble Enzymatic base. pretreatment employments chemicals to break down pectins and cellulose, whereas other pretreatments incorporate steaming to relax and unwind the filaments, and carding to adjust

# LAVENDER FLOWER

and expel pollutions. These pretreatment steps offer assistance to progress the quality and properties of the last banana texture.



Steam era is the prepare of creating steam by applying warm vitality to water. This prepare regularly includes warming water in a evaporator or steam generator, where the water is warmed to its bubbling point, creating steam. The steam is at that point collected and conveyed through channels to where it is required, such as in material fabricating, control era, or warming frameworks. The steam era prepare can be fueled by different vitality sources, counting fossil powers, biomass, or atomic control. The temperature and weight of the steam can be controlled to suit particular applications, making steam era a flexible and broadly utilized innovation.

STEAM INFUSION:



Lavender blossom steam implantation is a tender and successful way to extricate the fragrant oils and useful compounds from dried lavender blossoms. This handle includes suspending the lavender blooms over bubbling water, permitting the steam to imbue the blooms and discharge their fragrant properties. As the steam rises, it carries the lavender's calming and restorative quintessence, which can at that point be captured and utilized in different applications, such as material wrapping up, fragrance-based treatment, or skincare items. The coming about imbued steam can moreover be utilized to make a unwinding and calming environment, advancing quietness and wellbeing.

FABRIC LOADING:



Fabric loading refers to the process of immersing or submerging fabric into a treatment solution, such as a dye bath, finish, or infusion, to achieve a specific

effect or property. During fabric loading, the fabric is carefully placed into the treatment solution, ensuring even saturation and penetration of the solution into the fabric's fibers. The fabric is then allowed to dwell in the solution for a specified time, enabling the treatment to take effect. Fabric loading is a critical step in various textile processes, including dyeing, finishing, and infusion, and requires careful control of parameters such as temperature, time, and solution concentration to achieve the desired outcome.





Temperature control plays a pivotal part in the texture implantation prepare, as it straightforwardly influences the rate and degree of mixture To accomplish ideal mixture, the temperature of the treatment arrangement is carefully controlled and kept up inside a particular extend, ordinarily between 30°C to 90°C, depending on the sort of texture and mixture arrangement. The temperature is checked and balanced all through the mixture time, which can run from a few minutes to a few hours, to guarantee that the mixture handle happens consistently and proficiently. By controlling the temperature, the implantation prepare can be optimized to accomplish the wanted level of mixture, color escalated, and texture properties.

#### COOLING AND POST-TREATMENT:



After the implantation prepare, the texture experiences a controlled cooling handle to halt the implantation response and settle the implanted substances inside the texture. The cooling prepare includes steadily diminishing the temperature of the texture to around 20°C to 30°C, either through discuss cooling or water cooling. Taking after cooling, the texture may experience extra post-treatment forms, such as flushing, washing, and drying, to evacuate any abundance implantation arrangement and reestablish the fabric's common surface and appearance. The texture may too experience wrapping up medication's delicate quality, and toughness.

#### CUTTING AND SEWING:

The window ornament cutting and sewing prepare starts with measuring the window or zone where the shade will be introduced, making a design or layout, and selecting the texture. The texture is at that point laid out on a level surface, smoothed and wrinklefree, sometime recently being cut out into shade boards utilizing a rotating cutter, scissors, or cutting machine. Following, the window ornament boards are sewn together, beginning with trimming the crude edges to anticipate fraying, taken after by sewing the side creases and clearing out a little opening for turning the window ornament right side out. The best fix and bar stash are at that point made, and the foot trim is sewn to total the window ornament. At last, any enriching components, such as tiebacks or decorations, are included, and the window ornament is reviewed for blemishes or free strings.

#### V. TESTING AND EVALUATION

UV Test: The UV test evaluates the resistance of banana fabric to ultraviolet light. This test assesses how well the fabric withstands degradation caused by UV radiation, which can lead to color fading, fabric weakening, or breakdown.

Antimicrobial Test: The antimicrobial test determines the effectiveness of banana fabric in inhibiting the growth of microorganisms, such as bacteria, fungi, or viruses. This test is crucial for assessing the fabric's ability to maintain hygiene and prevent the spread of infections.

Anti-Microbial Test: This test is an alternative method for evaluating the antimicrobial properties of banana fabric. Different testing protocols may be employed, such as using different microorganisms or testing conditions.

Absorption Test: The absorption test measures the ability of banana fabric to absorb and retain liquids, such as water or sweat. This test is essential for assessing the fabric's comfort, moisture-wicking properties, and potential applications in clothing or textile products.

Durability Test: The durability test evaluates the resistance of banana fabric to wear and tear, including factors like friction, abrasion, and tensile strength. This test assesses the fabric's ability to withstand repeated use, washing, and exposure to environmental stressors.

 $Sw = (m_{mw} - m_d)/m_d \times 100 (1)$ 

#### VI. RESUL AND DISCUSSION

#### ABSORPTION TEST:

The measurement of static water absorption of terry fabrics was carried out using Bureau Veritas Consumer Product services BV S1008 internal testing method. The samples were conditioned and cut in to 10 cm x 10 cm and their mass evaluated. The samples were kept in water for five minutes at room temperature. After that the samples were hanged for three minutes to remove excess water. Then, mass of the wet samples was measured. The amount of water absorbed by the terry fabric samples were calculated by taking the difference between the wet and dry mass. The percentage of water absorption was calculated by the following formula.

S. No	Sample Code	Size of the Materials	% of Absorption		
1	Product (100X100 cm)	sample	70 %		

Where: Sw = water absorbed, mw – Product wet mass, md – Product dry mass.

SW= 1- 0.3/ 1.0 X 100=70 %

ANTIMICROBIAL TEST :

# PREPARATION OF THE BACTERIAL INOCULUM

Stock cultures were maintained at 4° C on slopes of nutrient agar and potato dextrose agar. Active culture for experiments were prepared by transferring a loop full of cells from stock cultures to test tubes of 50ml nutrient broth bacterial cultures were incubated with agitation for 24hours and at 37°c on shaking incubator and fungal cultures were incubated at 27°c for 3-5 days. Each suspension of test organism was subsequently stroke out on nutrient agar media and potato dextrose agar. Bacterial cultures then incubated at 37°c for 24 hours and fungal incubated at 27°c for 3-5 days. A single colony was transferred to nutrient agar media slants were incubated at 37°c for 24 hours and potato dextrose slant were incubated at 27°c for 3-5 days. These stock cultures were kept at 4°c. For use in experiments, a loop of each test organism was transferred into 50ml nutrient broth and incubated separately at 37°c for 18-20 hours for bacterial culture.

### Well Diffusion method

The antibacterial activity and antifungal activity of crude extract extracts was determined by Well Diffusion method (Bauer *et al.*, 1996). MHA plates were prepared by pouring 20ml of molten media into

sterile petriplates. After solidification of media, 20-25µl suspension of bacterial inoculums was swabbed uniformly. The sterile paper discs were dipped into required solvents then placed in agar plates. Then 10-50 µl of plant extract was poured into the wells. After that, the plates were incubated at 37°C for 24 hours. Assay was carried into triplicates and control plates were also maintained. Zone of inhibition was measured from the edge of the well to the zone in mm. The tested cell suspension was spread on mullerhintonagar plate and potato dextrose agar. well, were put into the agar medium using sterile forceps. plant extract was poured on to wells. Then plates were incubated at 37°c for about 24 hours and control was also maintained. Zone of inhibition was measured from the clear zone in mm.

Antibacterial activity was performed by agar diffusion method. Van der Watt *et al.*, 2001. The stock culture of bacteria *(E. coli, S.aureus* and *Candida albicans)* were received by inoculating in nutrient broth media and grown at 37 % for 18 hours. The agar plates of the above media were prepared. Each plate was inoculated with 18 hours old cultures the bacteria were swab in the sterile plates. Placed the extract treated cloth and untreated cloths were placed. All the plates were incubated at 37°C for 24 hours and the diameter of inhibition zone was noted in mm.

Agar well diffusion method has been used to determine the antimicrobial activities and minimum

Organisms	E.Coli	S.aureus		
Plat Extract	3 mm	2mm		
Standard (Bacteria-Chloramphenicol)	5 mm	5 mm		

ANTI-MICROBIAL REPORT:

The result finds given specimen having antimicrobial activity against the *E.Coli*, and *S.aureus*. The result shows the given sample heaving Anti-microbial activity.



FIG:4.3(E.coil)



FIG:4.3(S.aureus)

**UVTESTIN** 

Sample	Name:	Fabric	Measurement			
Mode:Photometric						
Wavelength(r	nm) :	800 700 600	550 500 400 300			

inhibitory concentrations or plant extracts against Gram-positive, Gram-negative bacteria. The extracts exhibited antibacterial activities against tested microorganisms.

220					
DateTime	:21/02/2025 13:23:17				
OD800	:0.993				
OD700	:0.999				
OD600	:1.002				
OD550	:1.000				
OD500	:1.016				
OD400	:1.045				
OD300	:1.232				
OD220	:3.431				
4.2					
3.5					
8 2.8					
2.1					
1.4					
250 300 350 400 450	500 550 600 650 700 750 800				

## DURABILITY TEST:

Color Fastness to Crocking/Rubbing Test

- Scope: This testing is used to determine the colour fastness of fabric to water.
- Sample collection: Random sampling
- Sample size: 40 cm full width fabric
- Atmospheric condition: 70° to 90° F
- Conditioning timing: Minimum 1 hour
- Apparatus used: Perspirometer, Air oven, Aluminium container, grey scale for assessment.

## TESTING PROCEDURE:

- Cut the specimen to the size of 40mm X 100 mm
- Cut the standard covering fabric to the sample size.
- Sandwich the specimen between the standard covering fabric and stitch all the four sides.

- Take distilled water in 1:50 ratio and fully wet the sandwiched specimen for 30 min.
- Now place the wetted sample between two plastic plates and place all plastic plates one above the other.
- Now transfer the plates on bottom metal plate of the perspirometer.
- Place the top metal plate and adjust the load with the help of thumb screws.
- Then keep the loaded instrument in the air oven for 4 hours at a temperature of 38+- 1° C
- After 4 hours remove the sample specimen from the instrument and remove the stitching
- Compare the test specimen with the original sample for change in colour compare with scale also.
- Compare the standard covering cloth with the fresh sample.

S	Cloth	Specimen	Immersio	Temperature	Crocking	Soap	Wash	Light	Chlorine
	Color	size	n time		test		water		
Ν									
0									
1	Pale	40mmX10	1 hrs	Room	Good	Good	Good	Excellen	Good
	white	0 mm		temparature				t	

Color fastness tests might be more important depending on the design and intended use textile products. Standards test for color fastness to water wash, chlorinated water, soap and other unique conditions. Results were findings the cloth is not fading while doing above tests. The test report finds given fabric heaving more durability.



## VIII. SUMMARY AND CONCLUTION

The advancement of the Eco-Calm Banana-Based Window ornament with Lavender Extricate marks a noteworthy advancement in the field of maintainable and wellness-focused materials. This interesting shade combines eco-friendliness, calming impacts, and progressed indoor discuss quality, making it an alluring arrangement for naturally cognizant buyers and people looking for to advance unwinding and well-being in their living spaces. By utilizing banana strands, a feasible and renewable asset, and imbuing them with lavender extricate, known for its calming properties, this window ornament offers a allencompassing approach to insides plan. The result is a normal, biodegradable, and non-toxic window ornament that not as it were advances unwinding but moreover contributes to a more advantageous indoor environment. With its special mix of supportability, wellness, and tasteful offer, the Eco-Calm Banana-Based Window ornament with Lavender Extricate is balanced to revolutionize the material industry and rethink the way we think almost insides plan. ANNEXURE



DELELOPED CURTAIN

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