Design and Development of Leg Guard for Snake Bite Using Tulsi (Ocimum Tenuiflourm)

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1.INTRODUCTION :

Textiles consist of materials primarily formed from fibers, which serve as their fundamental components. These fibers can originate from natural sources such as cotton, wool, silk, or flax, or they may be synthetic, including polyester, nylon, or acrylic. Textiles play a crucial role in our daily lives, harmoniously combining style and comfort, and infusing a sense of everyday enchantment into our existence.

The Indian textile industry stands as one of the largest and most significant sectors within the economy, contributing notably to output, foreign exchange earnings, and employment opportunities in the country. It is anticipated that the textile industry will demonstrate robust quarterly performance, driven by an increase in export demand and higher production volumes.

Technical textiles have garnered significant interest; however, the application of fibers, yarns, and fabrics beyond clothing and upholstery is not a recent development. This practice is not solely associated with the advent of contemporary synthetic fibers and textiles. For centuries, natural fibers such as cotton, flax, jute, and sisal have been utilized in various applications, including tents, tarpaulins, ropes, sailcloth, and sacks. Historical evidence indicates that woven fabrics and meshes were employed in Roman times and earlier to stabilize marshy terrain for road construction, representing early instances of what we now refer to as geotextiles and geogrids**.**

protective textile products has steadily increased over the past few decades. This growth is primarily driven by a heightened focus on minimizing occupational hazards and ensuring the health, safety, and protection of workers. Ongoing updates and advancements in legislation, government policies, standards, and organizational codes have motivated both companies and individuals to implement responsible measures and equipment aimed at preventing hazardous incidents and accidents in the workplace. As a result, various personal protective equipment (PPE) and clothing are increasingly becoming standard practice within the industry. This rising demand has led to significant consumption of protective materials and a surge in innovations related to protective textile products**.**

Cotton is a highly sought-after raw material extensively employed in the textile industry for various applications. Its soft fibers can be transformed into a diverse range of valuable products,

making it one of the most versatile crops globally. Cotton fabric ranks among the most commonly used textiles worldwide.

As a natural fabric, cotton is favored in the textile sector and is not classified as synthetic. It is sourced from the seedpod of the cotton plant and is used to create an array of fabrics. The natural color of cotton ranges from white to a slight yellowish hue, and it possesses commendable tensile strength

Snakes Bite Leg Guard are frequently mischaracterized as slimy, unpleasant, and aggressive animals that

attack humans at every opportunity, which is a misconception. While a snake may defend itself if it feels threatened or injured, most species would rather escape quickly and quietly if possible. Some snakes may remain still, relying on their remarkable camouflage to avoid detection. The majority of snakebites occur when individuals inadvertently step on snakes during nighttime. In reality, snakebites are rare, and most snake species possess low venom toxicity.

Snake gaiters serve as protective gear for the lower legs against snakes. Resembling modern armor, these garments are specifically designed to prevent snakes from penetrating the skin and delivering venom when individuals are outdoors, whether working or hiking. They are often likened to chaps, which also provide leg protection.

Tulsi (Ocimum tenuiflorum) commonly referred to as Holy Basil, is a highly esteemed medicinal herb in India, widely employed in Ayurvedic medicine. Renowned for its potent healing properties, Tulsi is believed to assist in addressing various health issues, such as respiratory conditions, stress, and inflammation. Additionally, it possesses antibacterial and anti- venom characteristics, rendering it a valuable natural remedy for snakebites and other hazardous stings. Apart from its medicinal uses, Tulsi holds significant cultural and spiritual importance, often cultivated in homes for its purifying effects.

Marigold scientifically referred to as Tagetes, is a flower that has been utilized for both medicinal and decorative purposes for centuries. This flower is part of the sunflower family and is indigenous to the Americas, although it has now spread to various regions worldwide. In this

article, we will delve into the significance, characteristics, and applications of the marigold flower across different contexts.

When marigolds are cultivated, it is common to observe snakes in the vicinity of the garden. However, as the plants mature and begin to bloom, the presence of snakes tends to diminish. This phenomenon can be attributed to the scent emitted by the flowers. The roots of the marigold plant possess the ability to repel snakes.

Antibacterial assessment is conducted to evaluate whether a substance can inhibit or eliminate bacterial growth. This examination is often performed on surfaces designed to prevent bacterial contamination, such as coatings, textiles, and various other materials.

Antibacterial testing, as outlined in ISO 20743, is a standardized method for assessing the antibacterial efficacy of all textile products with antimicrobial properties, including nonwovens. These products may encompass fabrics, wadding, threads, clothing, bedding, and home textiles. This quantitative approach evaluates both bacteriostatic (growth-inhibiting) and bactericidal (bacteria-killing) effects on antimicrobial fabrics.

Qualitative analysis is a technique employed in chemistry to determine the presence or absence of specific chemical compounds or elements within a sample. This approach is particularly prevalent in organic chemistry for the identification of unknown substances.

The process of qualitative analysis entails examining the physical characteristics of the sample, including color, texture, and odor, alongside conducting chemical tests to detect particular ions or functional groups. It plays a crucial role in both organic and inorganic chemistry, as it yields insights into the quality of chemical compounds and investigates the composition of materials.

Antioxidants are compounds that can inhibit or slow down the damage inflicted by free radicals, which are unstable molecules capable of harming cells and tissues. The term "antioxidant test fabric" refers to textiles that

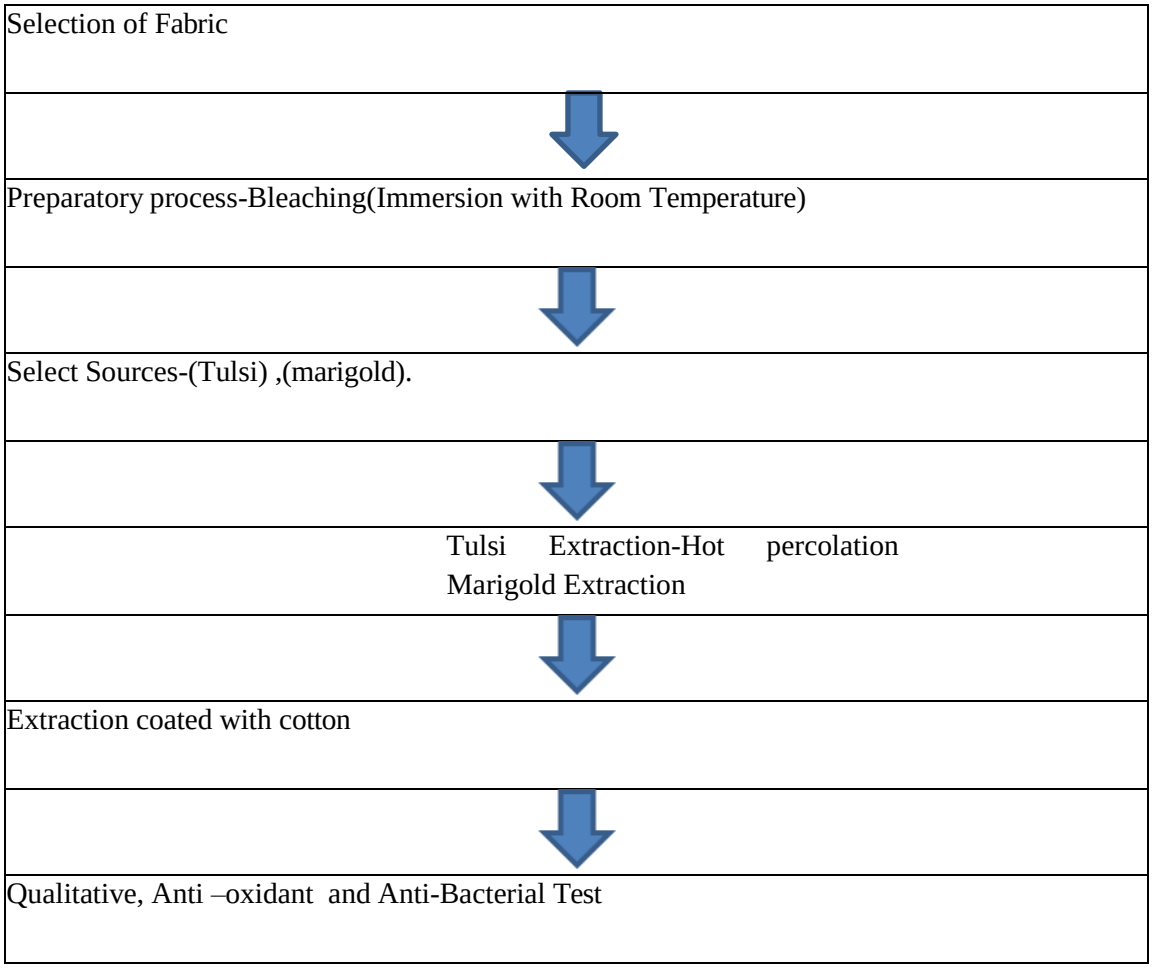
have been treated or coated with substances that exhibit antioxidant properties, enabling them to guard against oxidative damage and free radicals. Such fabrics find applications in clothing, packaging, cosmetics, and preservation. Consequently, assessing the antioxidant activity or capacity of food and biological samples is vital not only for ensuring the

quality of functional foods but also for evaluating the effectiveness of food antioxidants in preventing and addressing diseases associated with oxidative stress.

OBJECTIVE:

- To Examine the properties of Tulsi (Ocimum tenuiflorum),Marigold (Tagetes Erecta) .
- To Identify the Textile Material cotton.
- To Treat the Material with Extraction.
- To Analyze finishing the sample with Anti bacterial.
- To Develop the Final Product Leg Guard for Snake bite.

METHODOLOGY



↓
Develop Leg Guard Preparation
↓
Final Product

SELECTION OF FABRIC:

Plate-1

Cotton is a natural fiber derived from the cotton plant. It is one of the most widely used materials globally. This vegetable fiber is extracted from the seeds of the cotton plant. Various types of fabrics, including cotton, silk, wool, and others, are available in the market. Cotton is known for its soft, natural texture, lightweight properties, and exceptional comfort and durability.

In addition to its common uses, cotton can also serve protective purposes. It is processed with extracts from the tulsi plant and marigold flowers, combined with ethanol. Various tests are conducted on cotton fabric to ensure its quality.

The cotton fabric required for this project can be purchased from Sarathas Store in Trichy, with approximately four meters needed. This high-quality material is suitable for preparing leg guards..

Plate-2

STERILIZATION PROCESS

Sterilization is performed to inhibit the growth of bacteria, which, if not properly managed, can proliferate on surfaces. This process differs from various sanitization methods, which primarily aim to reduce bacterial presence rather than achieve complete eradication. Through sterilization, an item is rendered sterile or aseptic. In this instance, the cotton fabrics were immersed in water heated to 90°C for 45 minutes. Subsequently, the fabrics were taken out and allowed to dry at room temperature.

plate-3

SELECTION OF HERB :

TULSI (OCICUM TENUIFLOURM)

Plate -4

Plate -5

Tulsi, scientifically known as Ocimum tenuiflorum, is an extraordinary herb. The leaves of Tulsi are rich in antioxidants and possess antimicrobial properties that enhance the immune system. This plant is also valued for its ability to purify the air and dispel negative energy, making it a common sight in Indian households. Various parts of the Tulsi plant, including the leaves, flowers, seeds, stems, and roots, are utilized for medicinal purposes.

Tulsi's anti-inflammatory properties contribute to improved eye health by preventing infections caused by viruses, bacteria, and fungi. Additionally, it alleviates eye inflammation and helps reduce stress.

MARIGOLD (TAGETES ERECTA):

PLATE - 6 **PLATE -7**

Marigold, scientifically known as Tagetes erecta, belongs to the aster family and is indigenous to southwestern North America, tropical America, and South America. The term "marigold" can also refer to the pot marigold, which is classified under the genus Calendula.

Marigolds symbolize joy, prosperity, and tradition. Their strong fragrance is known to deter snakes. For optimal effect, it is advisable to plant them around your garden and at the entry points of your home. Additionally, marigold petals are rich in antioxidants, which can help reduce inflammation and protect cells from damage caused by free radicals

PREPARATION OF ETHANOL EXTRACTION

To prepare the plant extract, a sample of the plant was collected, and the leaves were chopped into small pieces. The entire plant sample was rinsed two to three times with running tap water, and then dried in shaded areas to avoid direct sunlight. The leaves were thoroughly dried before being finely crushed using a mortar. The resulting powdered leaves were placed in an airtight container, which should be stored in a cool, dry, and dark location. For the ethanol extract preparation, 25 grams of the powdered leaves were combined with 100 milliliters of ethanol and allowed to soak for 24 hours using the hot percolation extraction method. After the incubation period, the mixture was filtered through filter paper using a funnel. The resulting stock solution was then transferred to a brown container and stored at room temperature.

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PLATE -8

WORKING PROCEDURE: (hot percolation method)

1. Sample Preparation: Start by grinding or crushing the sample into a fine powder.

2. Loading the Percolation Apparatus: Add the sample and solvent to the percolation apparatus.

3. Heating the Mixture: Heat the mixture to the necessary temperature, generally between 50 and 100°C.

4. Percolation Process: Allow the solvent to flow through the sample, aiding in the extraction of the desired compounds.

5. Condensation: Employ a condenser to convert the solvent vapor back into liquid form, allowing the collected compounds to gather in the collection vessel.

6. Extract Collection: Collect the extracted compounds in the specified collection vessel.

7. Solvent Evaporation: Eliminate the solvent from the extract using heating or vacuum techniques.

8. Final Extract: Prepare the final ethanol extract, which is suitable for further analysis or processing.

SELECTION OF FINISHING PROCESS:

The finishing process employs the dip and dry technique. Begin by immersing the cotton fabric in a phytocompound made from tulsi and marigold for a duration of eight hours within a sealed container. This step enables the fabric to absorb the advantageous properties of both tulsi and marigold. After soaking, dry the fabric in a well-ventilated space, ensuring it is not exposed to direct sunlight, which may lead to fading or harm. Allow the fabric to dry thoroughly.

QUALITATIVE TEST :

Test for Terpenoids

To 2ml of tulsi ,marigold extract and add Few drops of chloroform added a few drops of CONJC.H2SO4.The presence of reddish brown colour shown the presence of terpenoids.

Test for flavanoids

To 2ml of tulsi, marigold extract and added few drops of CONC.H2SO4.the presence of yellow colour indicates presence of flavanoids.

Test for saponin (Foam test)

To 2ml of tulsi ,marigold extract taken in test tube added a Few drops of distilled water shake vigorously froth formation. the presence saponin.

Test for tannins (Braymer's test)

About 2ml of tulsi, marigold extract and add Few drops of distilled water

And add 1 or 2 drop of ferric chloride is added the appearance of green colour precipitate in the presence of tannins.

Test for alkaloids (Hager's test)

To 2ml of tulsi , marigold extract added a Few drops of glacial acidic acid and a Few drops of ammonia solution is added the presence of yellow colour indicate presence of alkaloids.

Test for steroids (Salkowski test)

To the 2ml of tulsi, marigold extract and added a Few drops of chloroform and Few drops of CONC H2SO4added. The appearance of reddish brown ring indicate the presence of Steroids

Test for Glycosides (Liebermann's test)

To the 2ml of tulsi, marigold extract added a Few drops of chloroform, and a few drops of glacial acidic acide .the appearance of violet, blue, green. the presence of Glycosides.

Test for phlobotannin

To the 2ml of tulsi, marigold extract added a Few drops of CONC.HCL added. the appearance of red colour solution (or) precipitation the presence of Phlobotannin.

Test for proteins (Xanthoprotein test)

T0 2ml of tulsi ,marigold extract added a Few drops of CONC.H2SO4 added . the appearance of cloudy white precitate . the presence of protein.

Test for coumarin

To the 2ml of tulsi, marigold extract added a Few drops of sodium hydroxide is added. The appearance yellow colour indicate the presence of coumarin.

Test for Emodin

To the2ml of tulsi, marigold extract added a Few drops of ammonica solution

Added a Few drops of benzene the appearance of red colour indicates the presence of emodin.

Test for anthroquinone

To the 2ml of tulsi ,marigold extract and added a Few drops of benzene and followed a Few drops of ammonia solution the appearance of pink, violet, red. the presence of anthroquinone.

Test for anthocyanin

To the 2ml of tulsi ,marigold extract and added a Few drops of CONC.HCL and a Few drops of ammonia solution the appearance of pinkish red (or) bluish violet. The presence of anthocyanin**.**

Test for Carbohydrate

To the 2ml of tulsi, marigold extract and added a Few drops of distilled water and A pinch of alpha napthol added a Few drops of CONC H2SO4 the appearance of reddish violet ring the presence of carbohydrate.

Test for leucoanthocyanin

About2ml of tulsi ,marigold extract added a Few drops of ISO amylalcohol the appearance of organic layer into red. the presence of leucoanthocyanin.

Test for cardiac glycosides

To the 2ml of tulsi, marigold extract and added Few drops glacial acidic acid and added a Few drops of ferric chloride and followed a added Few drops of CONC sulpheric acid the appearance of violet, brown ring the presence of cardiac glycosides.

Test for xanthoproteins

To the 2ml of tulsi, marigold extract added a Few drops of ferric chloride in the appearance of blue, black colour. In the indicate the presence of xanthoproteins.

Test for Phenols

To the 2ml of tulsi, marigold extract added a Few drops of ammonia solution in the appearance of reddish orange precipitate. The shown the presence of phenols .

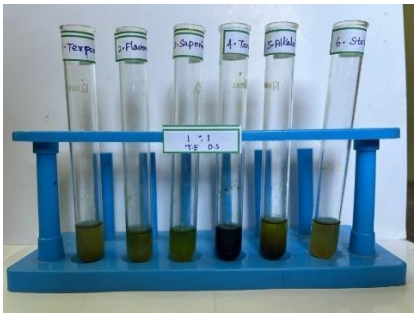

PLATE -9

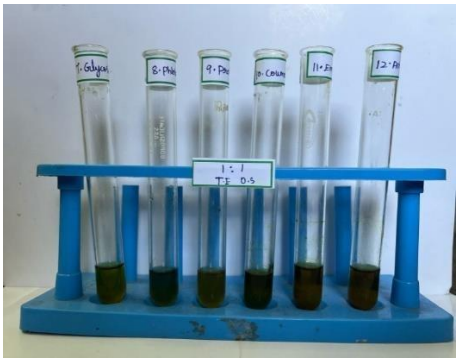

PLATE -10

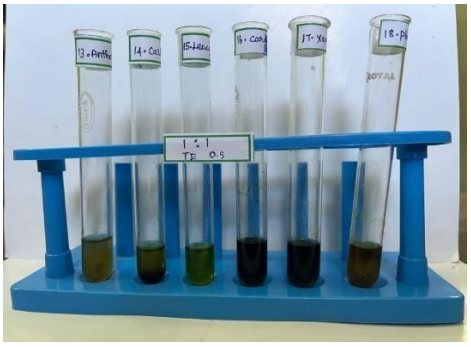

PLATE -11

ANTIOXIDANT ACTIVITY DPPH ASSAY METHOD

PLATE -12

The antioxidant properties of the sample were assessed using the stable DPPH free radical method. An ethanolic solution of DPPH (0.05 mM) was combined with 1000 µl of synthesized nanoparticles at varying concentrations (20-100 µl). The freshly prepared DPPH solution was stored in the dark at 4˚C. Subsequently, 2.7 ml of 96% ethanol was added to the mixture, which was then shaken vigorously. After allowing the mixture to stand for 5 minutes, absorbance was measured at 540 nm using a spectrophotometer, with the absorbance set to zero using ethanol. A blank sample containing equal amounts of ethanol and DPPH was also prepared. All experiments were conducted in triplicate. The radical activity of the tested samples was expressed as a percentage of inhibition, calculated using the formula:

Percent (%) inhibition of DPPH activity = [(A-B)/A] × 100,

where A and B represent the absorbance values of the blank and the sample, respectively. A graph plotting concentration against percentage inhibition was created to determine the concentration required for 50% inhibition.

The results indicate that the samples demonstrate antioxidant activity at higher concentrations when compared to standard ascorbic acid. At a concentration of 100 µg/ml, the sample exhibited 71.68% antioxidant activity, while ascorbic acid showed 81.41% at the same concentration. The proton radical scavenging effect is attributed to the antioxidants, as measured by the DPPH radical scavenging assay..

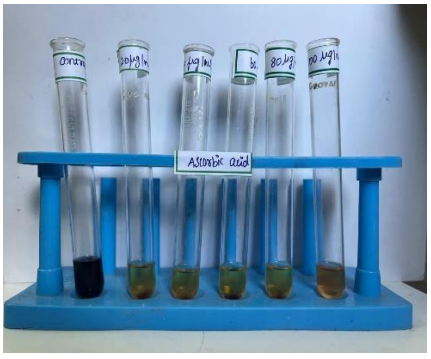

PLATE-13

PLATE -14

EVALUATION OF SAMPLE:

Specific Aim:

This study aimed to investigate the antibacterial properties of the fabric sample against selected pathogens utilizing the disc diffusion method**.**

Collection of Test Organisms:

To assess the antibacterial efficacy of the fabric sample, two bacterial strains, Klebsiella pneumoniae (MTCC 109) and Bacillus subtilis (MTCC 5981), were selected as test organisms. These strains were obtained from the Microbial Type Culture and Collection (MTCC) located in Chandigarh, India. The bacterial strains were cultured at 37ºC and preserved on nutrient agar (Difco, USA) slants at 4ºC.

Antibacterial Activity of Fabric Sample (Disc Diffusion Method):

The antibacterial activity of the fabric sample was evaluated using the disc diffusion method. Petri dishes (60 mm in diameter) were prepared with Muller Hinton Agar and inoculated with the test organisms. Sterile fabric samples, cut into rectangular pieces measuring 25 mm by 50 mm with a width of six millimeters, were impregnated with 50 and 100 µl of the sample, respectively. The prepared discs were placed on the surface of the agar plates and allowed to stand for 30 minutes at room temperature to facilitate compound diffusion. The dishes were then incubated for 24 hours at 37ºC, and the zones of inhibition were measured in millimeters. This experiment was conducted twice for accuracy.

RESULT AND DISCUSSION:

QUALITATIVE TEST RESULT:

Phytochemical constituents are found in the tulsi ,marigold extract of seated in the various assays are used to identify phytochemical compounds such as phenol, terpenoids, xanthoprotein, Flavonoids, cardiac glycosides, saponins, leucoanthocyanin, tannins, carbohydrate, alkaloids, anthocyanins, steroids, protein, glycosides, coumarins and antraquinone are strongly present in the tulsi and marigold .

Table: 1 Qualitative analysis of phytochemical compounds from the Ethanol extract of tulsi ,marigold.

Test No	Test for	Observation	Result
1.	Terpenoid	Reddish brown colour.	+++
2.	Flavonoids	Yellow colour	+++
3.	Saponins	froth formation.	+++
4.	Tannin	green colour precipitate	+++
5.	Alkaloids	yellow colour	+++
6.	Steroids	reddish brown ring	+++
7.	Glycosides	violet, blue, green.	+++
8.	Phlobatanins	red colour solution (or) precipitation	+++
9.	Protein test	cloudy white precitate	+++
10.	Coumarin	yellow colour.	+++
11.	Emodin	red colour	+++
12.	Anthroquinone	pink, violet, red.	+++
13.	Anthocyanin	pinkish red (or) bluish violet	+++
14.	Carbohydrate	reddish violet ring	+++
15.	Leucoanthocyanin	organic layer into red	Absent
16.	Cardiac glycosides	violet, brown ring	+++
17.	Xantho Protein	blue, black colour	+++
18.	Phenol	reddish orange precipitate	+++

TABLE-1

A-Absence, + -Trace, ++ - Moderate, +++ - Strong

Qualitative analysis of phytochemical compounds from the ethanol extract of *Ocicum tenuiflourm, Tagetes erecta.*

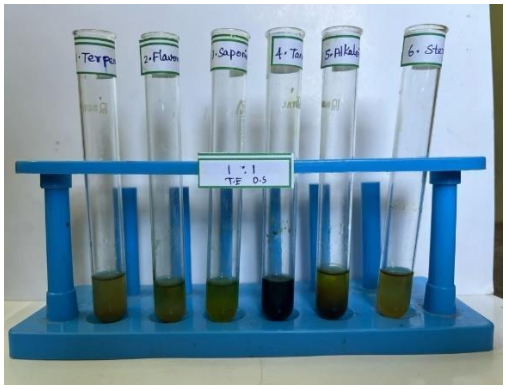

PLATE -15

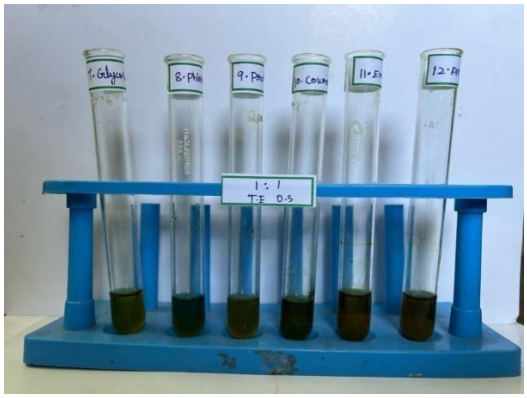

PLATE -16

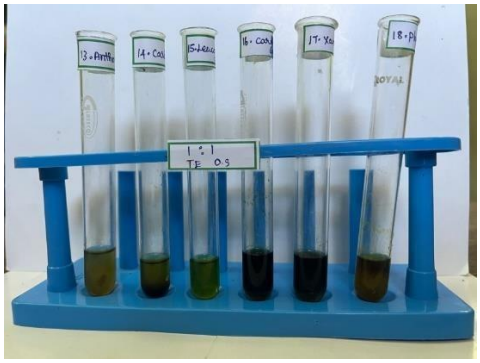

PLATE -17

ANTIOXIDANT ACITIVITY TEST:

Table 1: Antioxidant activity of medicinal plants by DPPH assay method

S.NO	CONCENTRATION (µg/ml)	ANTIOXIDANT ACTIVITY DPPH%	
		SAMPLE	ASCORBIC ACID
1.	20µg/ml	43.85	50.87
2.	40µg/ml	54.38	60.52
3.	60µg/ml	64.03	66.66
4.	80µg/ml	68.42	73.68
5.	100µg/ml	71. 92	81.57

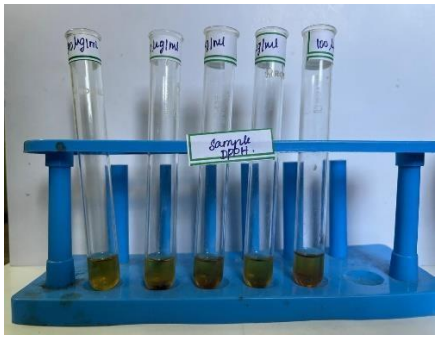

PLATE -18

Figure 1: Antioxidant activity of samples by DPPH assay method

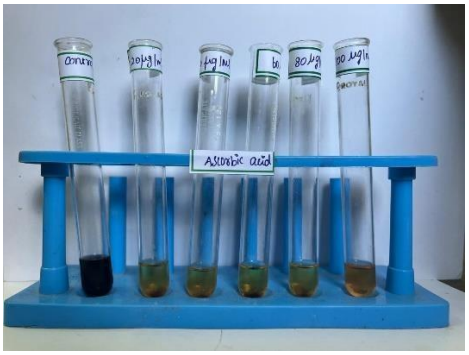

PLATE -19

Figure 2: Antioxidant activity of Ascorbic acid by DPPH assay method

ANTI- BACTERIAL TEST:

The antibacterial properties of fabric samples treated with extracts were evaluated against pathogens, as shown in Table 2. Figure 2 illustrates that the cotton fabric samples exhibited the highest level of inhibition against Bacillus subtilis, measuring 18 mm at a concentration of 100 µg/ml.

Antibacterial activity of fabric sample.

Sample	**Concentration (µg/ml)**	**Organisms/Zone of inhibition (mm)**	
		Klebsiella pneumoniae	***Bacillus subtilis***
Control		0	0
Fabric sample coated with extracts	50 µl 13 16	50 µl 13 16	50 µl 13 16
	100 µl 15 18	100 µl 15 18	100 µl 15 18

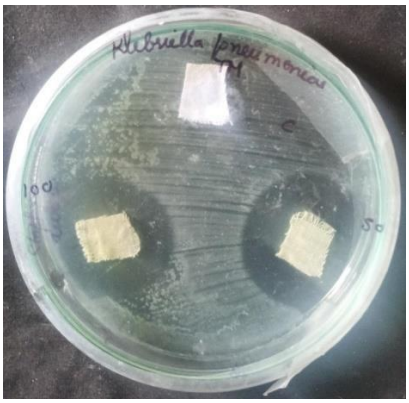

PLATE -20 Klebsiella pneumoniae

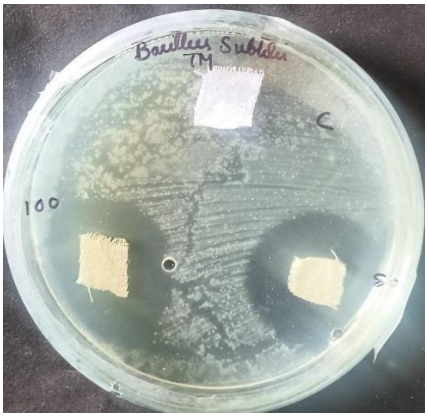

PLATE-21 *Bacillus subtilis*

SUMMARY AND CONCLUSION

The primary focus of this project was on forest communities and the selection of cotton material for leg guards. The cotton was treated with Tulsi (Ocimum tenuiflorum) and Marigold (Tagetes erecta) due to their beneficial properties, including antibacterial and antioxidant effects. Tulsi is known for its potential in treating snake and scorpion bites when applied externally, while Marigold emits a strong scent that is repellent to snakes. The leg guard was prepared using a hot percolation extraction process involving Ocimum tenuiflorum and Tagetes erecta, followed by antibacterial testing against Klebsiella pneumoniae and Bacillus subtilis. After the extraction process, the cotton fabric was immersed in the hot percolation solution and thoroughly dried. The fabric then proceeded to the next stage of construction, where the leg guard was created. Upon completion, the fabric underwent antibacterial and antioxidant testing. The use of cotton fabric ensures that there are no side effects or irritation, providing safety and protection. The antibacterial and antioxidant treatments enhance the safety of the product while ensuring comfort during use.