

DEVELOPMENT OF CURATIVE FABRIC USING ACALYPHA INDICA MEDICINAL HERBS FOR SELECTED SKIN DISEASES

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ABSTRACT

The present investigation was carried out to restore the vintage artwork of dyeing with herbal dye from leaves of Acalypha indica. It is belonging to own circle of relatives Euphorbiaceae, generally acknowledged kuppaimeni. The dye has suitable scope withinside the business dyeing of fabric in the textile industry. In the existing study, degummed fabric had been dyed with chemical and herbal mordants. Dyeing turned into accomplished by pre-mordanting, post mordanting and simultaneous mordanting.

Our project focuses over eco-friendly natural antimicrobial finishing knitted fabric. The fabric is treated with the dye prepared from Acalypha Indica (Kuppaimeni) through pad-dry-cure method. Then the treated knitted fabric was put under various tests like Functional (Anti-bacterial) A.Indica shows effect on bacteria like E.coli and S.aureus. Anti-bacterial property is high enough to show effect. Characteristics test like XRD, EDX, SEM, FTIR are taken. XRD shows the high-level presence of dye particles on the surface of the fabric. SEM & EDX shows the particle, they're having the proper size to hold on and give perfect outlook. FTIR result comes out good showing negative to harmful materials present through peak.

Physical property tests like Burn test, Water observation, Elasticity test are trialed on A.Indica treated fabric and plain Knitted fabric. The results are comparatively similar no great difference in drop of fabric after A.Indica treatment. At last, the fabric will be tested on the fungal infected skin to find the percentage of effect of the acalypha indica dye treated fabric. It will be done in sertine interval of time to find the strength and speed of its effect on human body (or) effected skin.

INTRODUCTION

1.1 Introduction to Acalypha Indica Medicinal Herbs

The plant Acalypha Indica is mostly grown in Indian rode sides in large amount. Its name either describes it's native "Indica" in Acalypha Indica refers to India. This type of plant is not mostly grown in agriculture fields or in large forming. This plants Acalypha Indica is grown on their own through different types of seed transport in nature it does not require continues watering or large amount of waterit can survive with occasionally watering. The main distribution of this type genus is in the tropical and sub-tropical places.

1.2 Medicinal quality

Acalypha Indica generally utilized in customary restorative arrangement of India and numerous different nations. Clinical use instance of this plant is exceptionally high in both outside and inside body issues. This plant has been accounted for to have hostile to disease, against diabetic, hostile to oxidant, against bacterial, antifungal hepatoprotective, calming, and furthermore used to check enemies of ulcers and wounds mending (Rodw 2021).

1.3 Traditional uses

Acalypha Indica has numerous traditional restorative employments. In Madagascar, the overpowered plant is utilized for pores and skin parasites. In Mauritius, the sap of beaten leaves joined with salt is utilized for scabies and various pores and skin issues. In the Seychelles and Réunion, a root mixture or decoction is taken for bronchial sensitivities, and furthermore to smooth the liver and kidneys. The root decoction is similarly taken for digestive worms and stomach pain. The 1 leaf sap is taken as an emetic. An implantation all things considered with the foundations of *Tylophora indica* is accepted in Reunion as an emetic withinside the instance of harming. A leaf implantation is in like manner taken as a laxative and vermifuge in Réunion and Madagascar. In East Africa sap of the leaves is utilized for eye diseases. Leaf powder is utilized for parasite swarmed wounds. *Acalypha indica* is recorded withinside the Pharmacopeia of India as an expectorant to manage bronchial sensitivities and pneumonia (Rodw 2021). This plant is held in unnecessary regard in customary Tamil Siddha medicine as it's far accepted to revive the body.

The plant has moreover been eaten as a gvegetable in Africa and India, but care wants while ingesting this is on the grounds that it conveys various alkaloids notwithstanding hydrocyanic corrosive. (Rodw 2021).

1.4 Concluding remark

Acalypha Indica is a herbal plant which has most of the profitable quality on medical health in natural way. This medical use case is on both outer and inner human body. Traditional use explains the past understanding and habits on this plant.

LITERATURE REVIEW

2.1 ACALYPHA INDICA

Acalypha Indica, commonly known as "kuppaimeni," is a medicinal plant native to tropical regions, including India, Sri Lanka, Pakistan, and parts of Africa. This plant has been traditionally valued in Tamil Siddha medicine for its therapeutic properties, particularly in restoring overall health. Its medicinal applications are wide-ranging, as it is known to possess antibacterial, antifungal, anti-inflammatory, neuroprotective, wound healing, and anti-osteoporotic properties. *Acalypha Indica* has been extensively studied for its various health benefits, with over 6000 plant species being utilized in traditional Indian medicine systems like Ayurveda, Siddha, and Unani.

The plant thrives in tropical climates and is typically found in the wild or in backyards in India. Its leaves, roots, and stems are used in medicinal extracts to treat a variety of ailments, including eye infections, respiratory issues, skin diseases, and reducing blood sugar levels. In addition, *Acalypha Indica* is used to treat rheumatism, hemorrhoids, and various gastrointestinal problems. The plant's bioactive compounds, such as antioxidants and antimicrobial agents, contribute to its beneficial effects in treating conditions related to the skin, digestive system, and general health.

Acalypha Indica has been recognized for its ability to treat conditions such as constipation in children, where its leaf extract is used as a remedy. Furthermore, it has been used topically to treat hemorrhoids, providing relief and accelerating healing. The leaves of the plant possess antibacterial and antifungal properties, which help protect the skin from infections and external irritants, reinforcing its status as a versatile and valuable medicinal plant.

2.2 ACALYPHA INDICA EXTRACT (MEDICINAL PROPERTY)

Acalypha Indica extract is well-documented for its diverse medicinal properties, which include anticancer, wound healing, anti-inflammatory, and anti-psoriatic activities. Studies have shown that *Acalypha Indica* leaf extracts possess significant anticancer potential. Research by Amarnath et al. (2014) revealed that ethanolic extracts from the leaves of *Acalypha Indica* exhibited inhibitory effects against various cancer cell lines, including MCF7 (breast cancer), KB (oral cancer), and PC3 (prostate cancer). The ethanolic extract showed an IC₅₀ value of 35 µg/ml for MCF7 cells, suggesting its potential as an anticancer agent, although higher concentrations were required for other cell lines.

In addition to its anticancer properties, *Acalypha Indica* has been shown to support wound healing. Reddy et al. (2002) conducted research on the plant's methanolic extract, which was tested in albino Wistar rats for wound healing in both incision and excision wound models. The study demonstrated that the plant's extract accelerated wound healing, with a healing rate of up to 34.37% for excision wounds. *Acalypha Indica* also displayed the ability to enhance collagen synthesis, reducing the formation of scar tissue, which is crucial in the wound healing process.

The plant's anti-inflammatory properties extend to skin conditions such as psoriasis. Rajkiran et al. (2017) conducted an in vitro study to assess the anti-psoriatic effects of *Acalypha Indica* leaf extract. The study demonstrated that the extract induced significant cell death and apoptosis in both A431 and B16-F10 skin cell lines, indicating its potential as an effective treatment for psoriasis. This finding further emphasizes the plant's potential in treating chronic inflammatory skin diseases.

Acalypha Indica is also recognized for its dyeing properties. Saravanan et al. (2013) studied the use of *Acalypha Indica* leaves as a natural dye in the textile industry. The dye, applied to degummed silk fabric, exhibited excellent color fastness and antibacterial properties. The study concluded that *Acalypha Indica* is a safe and eco-friendly alternative to synthetic dyes, with no harmful heavy metals detected in the dye extract. Its antimicrobial properties further enhance its value in industrial applications, particularly in textiles.

Moreover, the plant's antibacterial and antifungal properties have been investigated for their potential to treat infections. Bharathi et al. (2014) demonstrated the efficacy of *Acalypha Indica* extracts against pathogens like *Staphylococcus aureus* and *Pseudomonas aeruginosa*. The water extract of the plant exhibited significant inhibition zones, highlighting its potential as a natural remedy for skin infections and dental problems.

Acalypha Indica also provides digestive benefits, particularly in treating constipation. The plant's leaf extract is used to relieve gastrointestinal issues, especially in children, where it serves as a natural laxative. The extract contains compounds that help regulate bowel movements, making it a useful treatment for constipation and other digestive disorders.

In conclusion, *Acalypha Indica* is a medicinal plant with a wide array of health benefits, supported by extensive research into its pharmacological properties. Its antibacterial, antifungal, anticancer, and wound healing capabilities make it a versatile plant for treating various conditions. As research continues to uncover its therapeutic potential, *Acalypha Indica* remains a valuable resource in both traditional and modern healthcare practices.

2.3 NATURAL DYEING

Natural dyeing is a practice that has been deeply rooted in human history, with India recognized as a pioneer in this craft. The use of natural dyes can be traced back to ancient times when early dyeing techniques were empirical, without scientific reasoning. These techniques evolved as a people's art, and today, natural dyeing is based on sound scientific principles, particularly in understanding how dyes bond with fabrics. Various fibers such as cotton, wool, silk, jute, and sisal are used in the dyeing process, with wool being particularly adept at absorbing color, followed by cotton and silk, and coarse fibers like sisal and jute requiring multiple applications of dye (P.S. Vankar, 2000).

The history of natural dyeing in India is particularly noteworthy, as it continues to be a major area of research. India is home to over 450 plant species that yield dyes, some of which have medicinal properties as well. Despite the abundance of plant-based dye sources, the commercial use of natural dyes has not been as successful as synthetic dyes due to a lack of technical knowledge on extraction and dyeing processes. However, the natural dye industry remains a vital area for innovation, as it is considered more eco-friendly than synthetic alternatives. Various parts of plants, such as roots, bark, leaves, flowers, and fruits, produce dyes in a range of colors, including red, yellow, blue, brown, and more. This makes natural dyes a sustainable option for fabric and food colorants. Despite their potential, less than 150 plant-based dyes have been commercially utilized, even though over 2,000 colors can be derived from plants (Jeannette Lucejko, 2007).

One significant challenge in the use of natural dyes is the issue of microbial contamination in textiles. Since fabrics are prone to microbial growth due to their moisture retention, they can suffer from issues like odor, skin infections, and product degradation. Although conventional dyes do not typically have antimicrobial properties, there is potential for natural dyes to serve as antimicrobial agents. This is especially important as the global textile industry moves towards more sustainable and non-toxic alternatives. In fact, some plant-based dyes, like

turmeric, have been known for their medicinal benefits, such as being a natural disinfectant and skin rejuvenator (R Singh, A Jain, S Panwar, D Gupta, SK Khare, 2005).

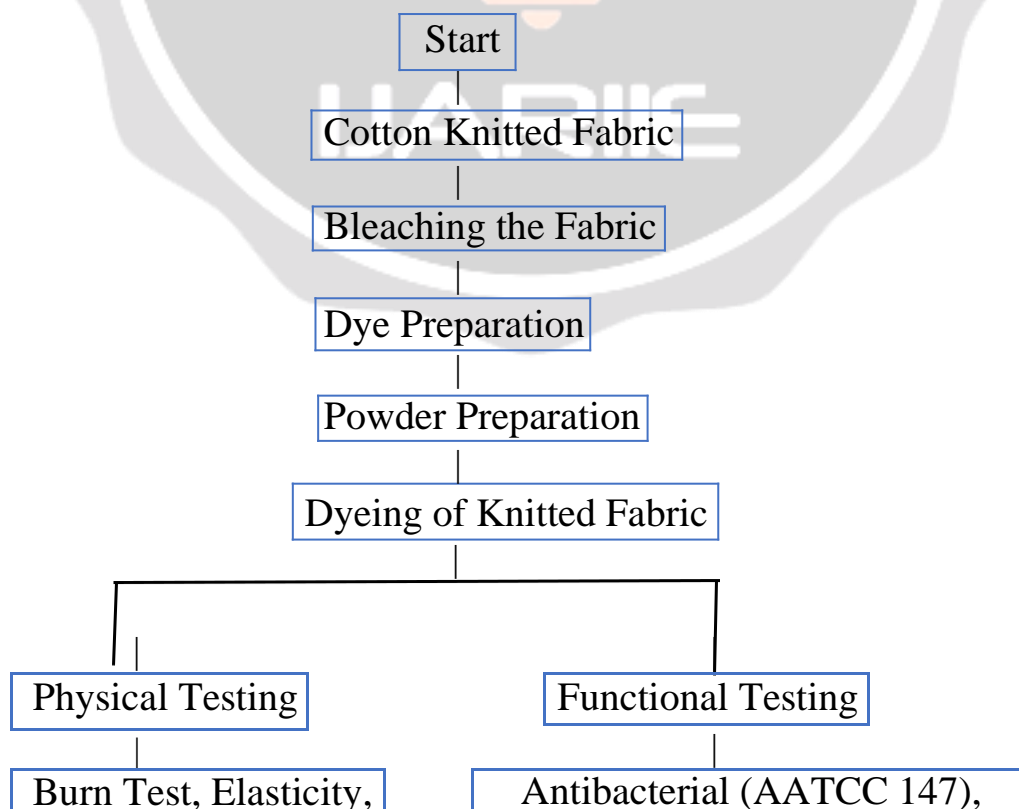
The study of natural dyes also plays an essential role in conservation efforts, particularly when working with ancient textiles. Natural dyes were the primary method of coloring fabrics until the late 19th century. As natural dye molecules are susceptible to degradation over time, understanding their structure and the changes they undergo is critical for preserving textiles. The degradation of natural dyes can help conservators decide how to handle and protect historical fabrics by regulating environmental factors such as light exposure and temperature (Jeannette Lucejko, 2007).

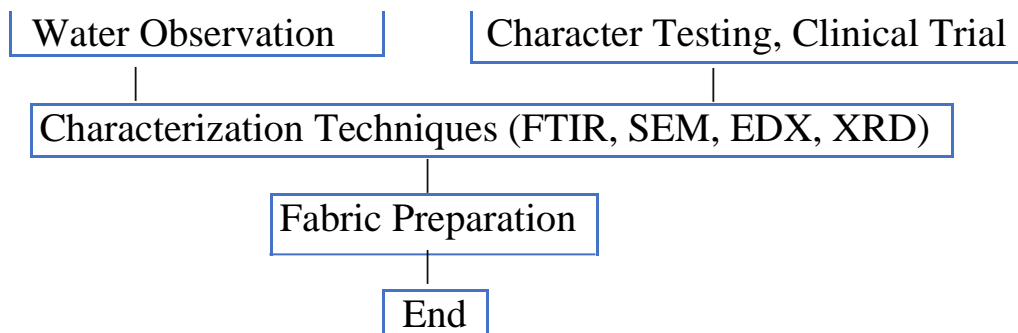
India's rich biodiversity offers an incredible potential for natural dye production. It is one of the world's twelve biodiversity hotspots, and its plant species number over 490,000, including approximately 17,500 angiosperms. With such a vast array of plants, India has enormous untapped potential for the cultivation and use of plants that can provide natural dyes. For example, turmeric is a bright yellow dye with strong antimicrobial and skin-soothing properties, while indigo, known for its cooling properties, remains one of the most iconic natural dyes used worldwide (R Siva, 2007).

Despite the promise of natural dyes, the full potential of this industry has not yet been realized due to various challenges. One issue is the difficulty in extracting and processing these dyes at scale. In addition, the lack of detailed knowledge on specific plant species and their optimal dyeing techniques has hindered broader adoption. However, recent efforts are being made to preserve the knowledge of traditional dyeing methods, integrate scientific research, and explore new ways to extract and apply these natural dyes in the textile and food industries.

In conclusion, natural dyeing is not only an art but also a science, with the potential to offer sustainable, non-toxic alternatives to synthetic dyes. India, with its vast plant resources, has the opportunity to revive and promote the use of natural dyes for various industries. However, overcoming challenges such as extraction techniques and commercialization will be essential for realizing the full benefits of this ancient craft.

METHODOLOGY





MATERIALS & METHODS

4.1 Materials

- The main source for preparing dye



Fig 4.1 Acalypha Indica fresh & dried Leafe

The fig 4.1 represents the plant Acalypha indica from village from Coimbatore south. The other image in it shows the dried stage of the plant leaf.

- Agent used for extraction of dye from the plant.

Ethanol (99.9%) Lab reagent LR grade. It was sold by Ng Enterprises, Osmanabad, Maharashtra.

- Fabric used for dying and testing



Fig 4.2 Knitted Fabric

The fig 4.2 is the fabric taken for dyeing. This a white cotton knitted fabric without any chemical treatment. It is in the length of 1m to 1m only the needed part of the fabric will be taken for dyeing.

- The secondary material used in preparing dye and dye storing.



Fig 4.3 Materials used for storing and other processes

The fig 4.3 has two 20ml containers and 100ml beaker used in preparation of dye. The 20ml containers are used for storing dye. polytechnic sheet is used as to provide an air tight to the beaker to avoid the evaporation of ethanol in it.

4.2 METHODS

4.2.1 DYING FABRIC

Dyeing might be done in a soluble shower, acidic shower or in a free shower. There are severa reports accessible on explicit strategies of mordanting on interesting filaments like cellulosic, protenic and engineered for dyeing with unique home-grown colors. Different kinds of shades like dark to brown, green to yellow to orange, etc might be procured by use of different mordants. Dyeing of cotton and silk with henna, indigo, marigold, etc is accounted for. There is a developing interest in the restoration of natural colors in material colourationo. Conversely, natural colors are harmless to the ecosystem, display higher biodegradability and for the most part have a higher similarity with the climate than manufactured color.

4.2.2 Procedure of making dye



Fig 4.4 Acalypha Indica plant



Fig 4.5 Washing fresh leaves

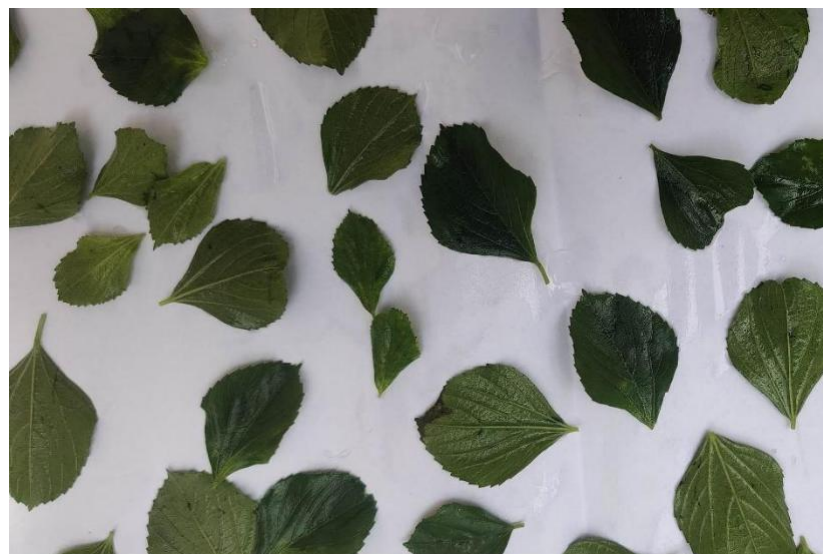


Fig 4.6 Drying the washed leaf on plain paper



Fig 4.7 Crushing the dried leaves



Fig 4.8 Measuring the powder

- The fresh *Acalypha Indica* plant leaves (fig 4.4) were plucked and cleaned in clear water for 3 times to remove the unwanted substance present on the surface of the leaf (fig 4.5). Then it is dried under sun shade outside to rapid dry the leaf (fig 4.6) which is suitable for making powder.
- The 100% dried leaves (fig 4.7) obtained from the sun shade dry were put into a crusher to have a very tiny powder partial. Which is then taken measured (fig 4.8) for testing and dye preparation.
- Powder is mixed (fig 4.9) with 70% ethanol in the ratio of 1gm:50ml and the readings were noted in the both the bases like timing and increasing temperature which is monitored with stop clock and thermometer.



Fig 4.9 Filtering the solution

- Then the mixture is placed on the heater to extract the required dye. As the ethanol is highly flammable this heater method is used. The beaker is placed in a half water filled copper container for heating.
- Then the heated solution is filtered to store (fig 4.9). We used 2 filter paper for better filtration. The filtered liquid is stored in an air lock container.
- The container is set still for 2 days for sediment test. If there is any sediment in the bottom of the stored container after 2 days then the dye can't be used for dyeing as that will provide us the proper dye on fabric. The clear dye is taken for dyeing.

4.2.3 Procedure of dyeing



Fig 4.10 Immersing fabric in dye for dyeing



Fig 4.11 Padding fabric

- The fig 4.10 Represent the initial process of preparing the fabric for padding. Dipping the knitted fabric in prepared dye (*Acalypha indica* leaf extract)
- The fig 4.11 Shows the method of dyeing the knitted fabric in padding machine. This process is repeated multiple times (6 times) to improve and have a efficient dyeing.



Fig 4.12 Weight of plain fabric



Fig 4.13 Weight of

dyed fabric

- The fig 4.12 shows the weight of the knitted fabric before dyeing. Which is **1.501 grams**.
- The fig 4.13 shows the weight of the netted fabric after dyeing in padding angle. Which is **1.632 grams**.

REFERENCES

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- 2 **R. Singh, A. Jain, S. Panwar, D. Gupta, S.K. Khare (2005)** - *Antimicrobial Activity of Some Natural Dyes*. This study focuses on the antimicrobial properties of various natural dyes, examining their effectiveness against a range of microorganisms, which makes them suitable for textile applications.
- 3 **Jeannette Lucejko (2007)** - *Colour Fading in Textiles: A Model Study on the Decomposition of Natural Dyes*. This paper investigates how natural dyes degrade over time, especially in textile products, and models the fading process using various environmental conditions.
- 4 **R. Siva (2007)** - *Status of Natural Dye and Dye-Yielding Plants in India*. This paper discusses the status and availability of natural dye plants in India, the traditional practices related to their use, and the importance of promoting their cultivation and use in modern textile industries.

- 5 **R. Mondal, A. Negi, M. Mishra (2021)** - *Acalypha Indica - A Boon to Mankind*. This article explores the medicinal properties and health benefits of *Acalypha Indica*, particularly focusing on its use in traditional medicine and its potential for treating various diseases and conditions.
- 6 **Sudhakar et al. (2020)** - This paper delves into the historical and contemporary applications of *Acalypha Indica* in traditional Siddha medicine. It discusses its role in treating various health conditions and the active components contributing to its medicinal properties.
- 7 **Bharathi et al. (2014)** - *Antibacterial Activity of Acalypha Indica Extract*. This research examines the antibacterial properties of *Acalypha Indica* extracts, specifically focusing on its efficacy against harmful bacteria like *Staphylococcus aureus* and *Pseudomonas aeruginosa*.
- 8 **Amarnath et al. (2014)** - *Anticancer Potential of Acalypha Indica Extract*. This study investigates the anticancer properties of *Acalypha Indica* leaf extracts, highlighting their potential in inhibiting the growth of various cancer cell lines.
- 9 **Reddy et al. (2002)** - *Wound Healing Properties of Acalypha Indica*. This research evaluates the wound healing abilities of *Acalypha Indica* extracts in animal models, demonstrating its effectiveness in accelerating tissue repair and recovery.
- 10 **Rajkiran et al. (2017)** - *Anti-Psoriatic Activity of Acalypha Indica*. This study examines the effects of *Acalypha Indica* leaf extracts on psoriasis, showing its potential as an anti-inflammatory and skin healing agent.
- 11 **Saravanan et al. (2013)** - *Dyeing Properties of Acalypha Indica*. This paper explores the use of *Acalypha Indica* as a natural dye for textile materials, focusing on its potential in the commercial dyeing industry for eco-friendly applications.
- 12 **Naga Lakshmi et al. (2015)** - This article discusses the role of traditional medicinal systems in India, such as Ayurveda, Siddha, and Unani, and their importance in providing holistic healthcare solutions in conjunction with modern medicine.

