

Formulation & Evaluation Of Herbal Cream Containing *Tectona Grandis* & *Cynodon Dactylon*

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ABSTRACT

Herbal-based formulations have gained increasing importance in pharmaceutical and cosmetic applications due to their safety, efficacy, and natural origin. The present study focuses on the development and evaluation of a herbal cream incorporating extracts of *Tectona grandis* and *Cynodon dactylon*. The plant materials were collected, authenticated, processed, and subjected to aqueous extraction. The obtained extracts were incorporated into suitable cream bases to prepare different formulations. The prepared formulations were evaluated for physicochemical parameters such as pH, viscosity, spreadability, homogeneity, and stability. In addition, antioxidant activity was assessed using the DPPH free radical scavenging method. The results indicated that the developed formulation exhibited satisfactory physicochemical characteristics and significant antioxidant potential. The study suggests that the formulated herbal cream can serve as a safe and effective alternative for topical application.

Keywords: *Tectona grandis*, *Cynodon dactylon*, Antioxidant activity.

INTRODUCTION

Natural products derived from plants have played a crucial role in healthcare systems for centuries [6, 23]. In recent years, there has been a growing interest in herbal formulations due to their therapeutic benefits, reduced side effects, and better patient acceptability [7, 8]. Plant-derived compounds are known to possess a wide range of biological activities, including antioxidant, anti-inflammatory, and antimicrobial properties. Topical dosage forms such as creams are widely used for delivering active ingredients directly to the skin. Herbal creams, in particular, combine plant extracts with suitable bases to provide both medicinal and cosmetic benefits. These formulations are commonly used for moisturizing, protecting, and improving skin conditions [1, 5]. Based on formulation design, these creams can be prepared as oil-in-water (O/W) or water-in-oil (W/O) emulsions, depending on their intended dermatological application [9, 10]. Because of the presence of naturally derived bioactive compounds, these formulations are generally considered safer and are associated with fewer side effects compared to

synthetic counterparts [2, 34]. *Tectona grandis* is known for its rich content of phenolic compounds and flavonoids, which contribute to its antioxidant and anti-inflammatory activities [21, 23]. *Tectona grandis* possesses significant antioxidant, anti-inflammatory, and antimicrobial properties, largely attributed to its high content of flavonoids and phenolic compounds [6, 23]. *Cynodon dactylon* has been traditionally used for wound healing, cooling effects, and management of inflammation. The combination of these two plants may enhance the overall therapeutic effect due to the presence of multiple bioactive constituents. [22, 23]. The combination of these two plant extracts in a single formulation may enhance therapeutic efficacy through synergistic action. Oxidative stress is one of the major factors responsible for skin damage and premature aging. The use of natural antioxidants in topical formulations can help in neutralizing free radicals and protecting the skin. [35, 40]. Therefore, the development of a herbal cream containing *Tectona grandis* and *Cynodon dactylon* is considered a promising approach for safe and effective skincare. [1, 4].

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Types of Herbal cream

1. Emulsion based type
2. Hydrating/Moisturizing cream
3. Anti-aging cream
4. Restorative /soothing cream
5. Cleansing cream

Advantages

- Gentle on the skin with a low risk of allergic reactions.
- Highly biocompatible and skin friendly
- Potent even in small applications
- Rich in natural ingredients
- Accelerates natural skin recovery

Disadvantages

- Slower therapeutic onset compared to synthetic drugs
- Difficulties in active ingredients standardization
- Manufacturing complexity
- Not suitable for severe conditions
- Risk of contamination

MATERIALS AND METHODS

Tectona grandis



Figure 1: *Tectona grandis* leaves

Taxonomy

- Kingdom: Plantae
- Phylum: Magnoliophyta
- Class: Eudicots
- Order: Lamiales
- Family: Lamiaceae
- Genus: *Tectona*
- Species: *Tectona grandis*

Plant part used: leaves

Chemical Constituents

- Flavonoids
- Terpenoids
- Tannins
- Phenolics acids
- Alkaloids
- Steroids

Uses

- Anti-inflammatory
- Anti-oxidant
- Antiseptic
- Wound healing

Cynodon dactylon



Figure 2: *Cynodon dactylon* leaves

Taxonomy

- Kingdom: Plantae
- Phylum: Tracheophyta
- Class: Liliopsida
- Order: Poales
- Family: Poaceae
- Genus: *Cynodon*
- Species: *Cynodon dactylon*

Plant part used: Leaves**Chemical Constituents**

- Flavonoids
- Tannins
- Flavonoids
- Alkaloids
- Steroids
- Terpenoids

Uses

- Antioxidant
- Anti-inflammatory
- Cooling
- Arthritis
- Antiseptic
- Wound healing

Preparation of plant extract

The aqueous extraction of the collected plant material was carried out through maceration method according to the following procedure:

- Fresh, tender leaves of *Tectona grandis* and *Cynodon dactylon* were collected and thoroughly rinsed with clean water to eliminate dirt and other contaminants. The leaves were then shade-dried to preserve their active constituents and subsequently ground into a fine powder to increase the surface area for efficient extraction.
- The powdered plant material was immersed in distilled water and allowed to stand at room temperature for a period ranging from 24 to 72 hours to facilitate extraction of water-soluble components.
- During the maceration period, the mixture was intermittently stirred and shaken to improve solvent penetration and enhance the release of phytoconstituents into the aqueous medium.
- After completion of the extraction process, the mixture was filtered using suitable filter paper to separate the solid plant residue from the liquid extract.
- The obtained filtrate was then concentrated by gently evaporating the solvent on a water bath under controlled temperature conditions. This resulted in a thick, semi-solid crude extract, which was carefully stored for further analysis and formulation development.

Table 1: Formula for herbal cream

SI no.	Ingredients	Quantity		
		Formula 1	Formula 2	Formula 3
1	<i>Tectona grandis</i>	0.6 ml	2 ml	3ml



2	<i>Cynodon dactylon</i>	0.6 ml	2 ml	2.5 ml
3	Bees wax	2.1 g	5 g	5 g
4	Liquid paraffin	3 ml	10 ml	10 ml
5	Stearic acid	1.5 g	5 g	5 g
6	Glycerin	3 ml	8 ml	10 ml
7	Triethanolamine	0.3 ml	1 ml	1 ml
8	Methyl paraben	0.06 g	0.2 g	0.2 g
9	Rose oil	0.15 ml	0.5 ml	0.5 ml
10	Water	q.s	q.s	q.s

Preparation of herbal cream

Three different formulations of herbal cream were prepared and labeled as F-1, F-2, and F-3. All ingredients, including active constituents and excipients, were accurately weighed as per the formulation requirements. The preparation was carried out using the following method:

1. The oil phase, consisting of beeswax and liquid paraffin, was heated to approximately 75°C until completely melted.
2. In a separate vessel, the aqueous phase containing purified water, glycerin, and triethanolamine was heated to the same temperature (75°C).
3. The heated aqueous phase was then gradually added to the oil phase with continuous stirring to form a stable emulsion.
4. The resulting emulsion was allowed to cool with constant stirring until the temperature dropped to about 40°C.
5. At this stage, *Tectona grandis* extract, *Cynodon dactylon* extract, preservative, and fragrance were incorporated into the mixture. Stirring was continued to ensure uniform distribution and formation of a smooth, homogeneous cream.
6. The final prepared cream was transferred into suitable containers, properly sealed, and stored for further evaluation.

EVALUATION OF FORMULATED HERBAL CREAM

The prepared herbal cream formulations were evaluated using the following parameters:

1.Colour and odor

The physical characteristics such as colour and odour were assessed by visual inspection and sensory evaluation.

2. pH Determination

The pH meter was first calibrated using standard buffer solutions. Approximately 0.5 g of the cream was dispersed in 50 ml of distilled water, and the pH was measured to ensure compatibility with skin.

3.Homogeneity

Homogeneity of the formulations was examined by visual observation and by touch to confirm the absence of lumps or phase separation.

4.Viscosity

The viscosity of the prepared cream was measured using a Brookfield viscometer at 100 rpm with spindle number 6, ensuring consistency in texture.



5. Spreadability

Spreadability was evaluated by observing the ease of application, smoothness, and the amount of residue left on the skin after application.

6. Thermal Stability

Stability studies were performed according to ICH guidelines. The cream samples were stored in a humidity chamber maintained at $35 \pm 2^\circ\text{C}$ and $65 \pm 5\%$ relative humidity for a period of two months.

After the study period, samples were examined for any changes in physical properties.

7. Irritancy test

A specific area (1 cm^2) on the dorsal surface of the hand was marked, and the cream was applied. The site was observed for 24 hours at regular intervals for signs of irritation such as redness (erythema), swelling (edema), or discomfort.

RESULTS AND DISCUSSION

Table 2: Phytochemical screening

SI NO	Plant	Alkaloids	Flavonoids	Phenolic compounds	Tannins	Terpenoids
1	<i>Tectona grandis</i>	+	+++	+++	+++	++
2	<i>Cynodon dactylon</i>	++	+++	+++	++	++

Table 3: Evaluation of formulated herbal cream

Parameter	Formula 1	Formula 2	Formula 3
Color	Light pink	Light pink	Light pink
Odor	Pleasant and herbal	Pleasant and herbal	Pleasant and herbal
pH	6.9	7.2	7.2
Viscosity	27021	27023	27024
Irritancy	Non irritant	Non irritant	Non irritant

Antioxidant activity of the extract *Tectona grandis* & *Cynodon dactylon*

The antioxidant potential of the plant extracts was evaluated using the DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical scavenging assay. This method is widely employed to assess the ability of compounds to donate hydrogen atoms or electrons and neutralize free radicals. A DPPH solution was prepared using 90% methanol. Stock solutions of the extracts of *Tectona grandis* and *Cynodon dactylon* were prepared by dissolving the extracts in 95% ethanol to obtain a concentration of 5 mg/ml. For the assay, a fixed volume of freshly prepared DPPH solution was taken in test tubes, and different concentrations of the plant extracts were added. The final volume of each reaction mixture was adjusted to

3 ml using methanol. The mixtures were then incubated for 10 minutes at room temperature to allow the reaction to occur. After incubation, the absorbance of each sample was measured at 517 nm using a spectrophotometer. Ascorbic acid was used as the reference standard, and its stock solution was prepared at the same concentration (5 mg/ml) using methanol. A control solution containing DPPH and methanol without any extract or standard was also prepared. Methanol (95%) was used as the blank during spectrophotometric analysis. The free radical scavenging activity (RSA) of the extracts was calculated using the following formula:

$$\% \text{ RSA} = \frac{\text{Abs control} - \text{Abs sample}}{\text{Abs control}} \times 100$$

Where,



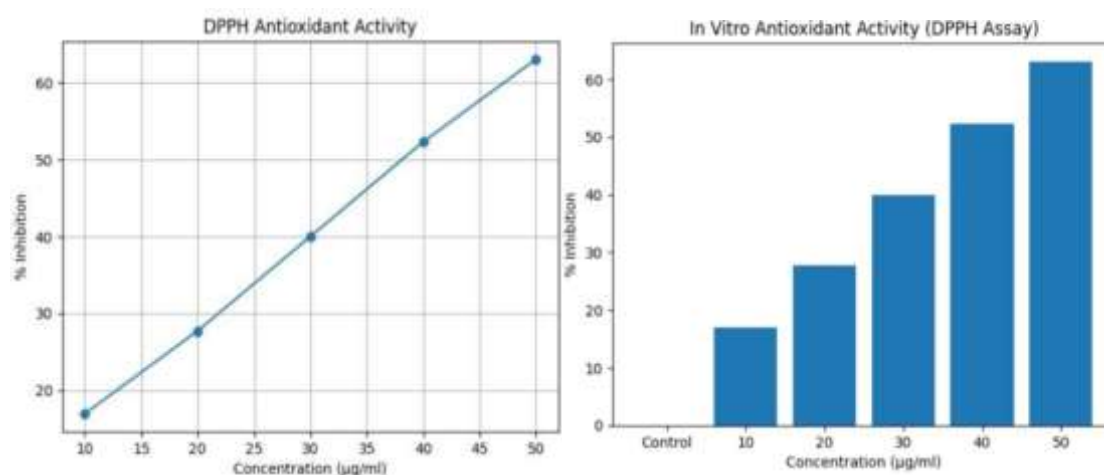
RSA-Radical Scavenging Activity

Abs sample = absorbance of DPPH radical + extract.

Abs control= absorbance of DPPH radical + methanol

Table 4: Antioxidant activity of *Tectona grandis* & *Cynodon dactylon* by DPPH Assay

SI NO	Concentration(microgram/ml)	Absorbance(517nm)	%inhibition
1	Control	0.650	-
2	10	0.540	16.92
3	20	0.470	27.69
4	30	0.390	40.00
5	40	0.310	52.31
6	50	0.240	63.08

**Figure 3: Graphical plot of Antioxidant activity****Table 5: Stability testing of herbal cream (formulation 3)**

Parameter	0 day	7 days	14 days	30 days
Color	Light pink	No change	No change	No change
Odor	Pleasant and herbal	No change	No change	No change
pH	7.2	No change	No change	No change
Irritancy	Non irritant	No change	No change	No change
Type of smear	Non greasiness	No change	No change	No change

DISCUSSION

The herbal cream was successfully developed using extracts of *Tectona grandis* and *Cynodon dactylon*,

which were carefully processed through cleaning, shade drying, and pulverization prior to extraction [13, 21]. The prepared herbal cream formulations



exhibited uniform consistency, smooth texture, and a pleasant odor, indicating successful incorporation of the plant extracts into the base. The pH values of all formulations were found to be within the acceptable range for topical application, suggesting that the creams are unlikely to cause irritation or discomfort when applied to the skin. Appropriate viscosity and good spreadability were also observed, which are essential characteristics for ensuring ease of application and user acceptability [33]. The antioxidant activity of the combined extracts was evaluated using the DPPH assay, and the results demonstrated a clear concentration-dependent increase in free radical scavenging activity. As the concentration of the extract increased, a corresponding decrease in absorbance was noted, indicating enhanced neutralization of DPPH radicals [4,23]. This behavior can be attributed to the presence of bioactive compounds such as phenolics and flavonoids, which are known for their ability to donate electrons or hydrogen atoms and stabilize free radicals. The stability studies revealed that the formulations remained physically stable under the specified storage conditions, with no noticeable changes in color, odor, or texture over time. Additionally, the absence of irritation during testing suggests that the formulation is well tolerated and suitable for topical use. Overall, the results indicate that the developed herbal cream possesses desirable physicochemical properties along with significant antioxidant potential. The combination of *Tectona grandis* and *Cynodon dactylon* extracts appears to contribute effectively to the formulation, making it a promising natural alternative for skincare applications [1, 4].

CONCLUSION

The present work focused on the successful development of a herbal cream using extracts of *Tectona grandis* and *Cynodon dactylon* following standard processing methods [13]. The plant materials were properly collected, authenticated, dried, and converted into powder before extraction. Various preliminary evaluations confirmed the presence of important bioactive constituents such as flavonoids, phenolic compounds, alkaloids, and tannins, which are responsible for therapeutic activity [23]. The formulated cream demonstrated acceptable

physicochemical properties, including suitable pH, good consistency, and stability under the tested conditions [6]. The antioxidant study confirmed that the formulation possesses effective free radical scavenging ability, which increased with concentration of the extract. This activity can be related to the presence of naturally occurring antioxidant compounds in the plant extracts [9]. Overall, the developed formulation can be considered a safe and effective herbal cream for topical application. It provides protective and beneficial effects on the skin while reducing dependence on synthetic ingredients. Hence, the formulation may be useful for routine skincare and can be further explored for its long-term benefits and clinical effectiveness [1,4].

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