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Research Article

Pharmaceutical Development and Pharmacogenetic Evaluation of Ghutika Prepared from Bombax Ceiba Flowers for Its Potential Anthelmintic Properties

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ABSTRACT

Ghutika is a traditional Ayurvedic formulation prepared as a semi-solid dosage form, rich in nutrients, herbs, and essential minerals. It plays a significant role in promoting health and managing various ailments. In recent years, the relevance of such formulations in preventive and therapeutic applications has grown considerably. Bombax ceiba, commonly known as the silk cotton tree, has long been used in Ayurveda due to its valuable pharmacological properties. This plant, belonging to the family Bombacaceae, is often referred to as kapok or mocha. Its flowers and bark have demonstrated effectiveness in managing conditions such as cholera, tuberculosis, urinary tract infections, and cough. Decoctions made from the bark are traditionally used for treating fever, while the heartwood is advised for diabetic individuals. The formulation was tested for quality (like ash value, moisture content) and phytochemicals such as boric acid and gallic acid were found. These compounds may improve alertness, concentration, and even help fight parasitic infections, showing its potential use for students and general wellness.

INTRODUCTION

Plants function as natural biosynthetic factories, producing a wide variety of biochemical

constituents beyond carbohydrates, proteins, and lipids used as nutrition. They also synthesize secondary metabolites like glycosides, alkaloids,

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and tannins, which exert significant physiological and therapeutic effects. These bioactive compounds play a key role in the plant's medicinal properties. Notably, extracts of *Bombax ceiba* have shown promising antidiabetic activity, especially through in-vitro inhibition of enzymes such as alpha-amylase and alpha-glucosidase. Among the different solvent extracts, aqueous and ethanolic extracts (derived from both thalamus and flowers) demonstrated the highest inhibitory action^[1]. Historically, plants have played a vital role in the development of medicines and health supplements. *Bombax ceiba* (family: Bombacaceae) is a large deciduous tree that is native to tropical Asia, especially in regions like India, Sri Lanka, and Malaysia. It can grow up to 1500 meters above sea level and is known for its multiple therapeutic uses. Almost all parts of the tree including the root, bark, gum, flowers, leaves, fruits, and seeds are used in traditional healing practices, particularly among tribal and forest communities. Pharmacological investigations reveal that *Bombax ceiba* exhibits multiple therapeutic properties such as astringent, cooling, diuretic, aphrodisiac, and demulcent effects. It also acts as an anti-inflammatory, hepatoprotective, anti-HIV, anti-ulcer (anti-*Helicobacter pylori*), analgesic, antioxidant, antidiabetic, and antimicrobial agent. Additionally, phytochemical screenings indicate the presence of compounds such as naphthol, naphthoquinones, anthocyanins, polysaccharides, shaming, and lupeol^[5]. One of the major health concerns globally is helminthic infections, caused by parasitic worms, which affect various organs in the human body. Conventional anthelmintic medications often result in adverse effects including abdominal discomfort, nausea, vomiting, and diarrhea. Hence, there is growing interest in exploring herbal alternatives that are both safe and effective^[2]. We selected *Bombax ceiba* for formulation because it is readily available, easy to prepare in

traditional herbal forms, and possesses a wide spectrum of phytoconstituents with proven antibacterial and anthelmintic properties. The preparation method involves decoction and drying of the plant material to develop a ghutika dosage form^[3]. Natural products have significantly influenced modern pharmaceutical research. Although there are over 250,000–400,000 plant species, only a small fraction has been studied for their therapeutic potential. Less than 6% have undergone biological evaluation and only 15% have been chemically screened. This highlights the urgent need to investigate underutilized plants like *Bombax ceiba* for their medicinal value and therapeutic applications. This study focuses on the formulation and evaluation of *Bombax ceiba* flower Ghutika for its ethnobotanical uses and pharmacological potential, particularly targeting helminthic infections.

Formulation of Ghutika: Ghutika is a solid oral dosage form traditionally prepared in pill form. It typically involves the use of herbal, mineral, or animal-derived ingredients, either individually or in combination.

Advantage of Using Bombax Ceiba in Ghutika:

Key Therapeutic Benefits:

- **Cooling and Bitter Taste:** The flower exhibits bitter and cooling properties, making it beneficial in reducing body heat.
- **Management of Leucorrhea:** It is traditionally used in treating abnormal vaginal discharge.
- **Pain Relief:** Various parts of the plant, especially the root and stem bark, demonstrate significant analgesic (pain-relieving) effects.

Additional Health Benefits of *Bombax ceiba*:



- **Cardiovascular Support:** *Bombax ceiba* is known to have heart-protective effects and acts as an anti-inflammatory.
- **Antioxidant Activity:** The plant is rich in natural antioxidants that help neutralize free radicals.
- **Wound and Skin Healing:** Traditionally used in managing boils, ulcers, burns, and other inflammatory skin conditions, as well as urinary issues like dysuria and urolithiasis.



Fig. 01: *Bombax Ceiba* Flowers

Furthermore, *Bombax ceiba* has demonstrated cooling, demulcent, and antimicrobial activities according to Ayurvedic texts, supporting its inclusion in traditional medicine systems. Its high safety profile and therapeutic potential justify continued investigation into its use as an herbal alternative to conventional anthelmintic therapies.

Plant Profile

Plant Name: *Bombax ceiba*

Scientific Name: *Ceiba pentandra* Linn

Common Name: Red Silk Cotton Tree

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Malvales

Family: Malvaceae

Genus: *Bombax*

Species: *B. ceiba*

Botanical Name: *Bombax ceiba* Linn.,

Synonym: *Salmalia Malabarica* ^[4]

Description of Plant

Bombax ceiba is a tall deciduous tree that typically grows up to 20 meters in height, although older trees can reach as much as 60 meters. It thrives in tropical climates. In its younger stages, the trunk and branches bear sharp conical spines which gradually wear off with age. The leaves are compound and palmate, generally made up of six leaflets that radiate from the tip of the petiole. These leaflets range in size from 7–10 cm in width and 13–15 cm in length, with smaller ones ranging from 5 to 6 cm. Its petiole (leaf stalk) can extend up to 20 cm (8 inches), while the tree's flowers, either solitary or in small clusters, appear at the tips or sides of the branches. When in bloom, the tree sheds its leaves, showcasing bright red flowers. The petals, which can reach up to 12 cm in length, are cup-shaped with three to five lobes. Each lobe measures approximately 3–5 cm in diameter. The stamens are grouped into five clusters, each containing more than 60 stamens. The style measures about 9 cm long, and the stigma is deep red. The ovary is pink in color, measuring about 1.5–2 cm in length and covered with fine white hairs. Fruits are elongated, oval-shaped capsules containing numerous seeds enveloped in a silky white fiber. Each fruit grows to about 13 cm in length. The unripe fruit is greenish, turning brown as it matures. This species is commonly found in countries across South and

Southeast Asia, including India, Myanmar, Thailand, Malaysia, Vietnam, and Indonesia. It is frequently planted along roadsides and in public gardens due to its vibrant red flowers, which bloom from March to April^[4].

Phytoconstituents

Bombax ceiba is rich in a variety of phytochemicals that contribute to its medicinal properties. These include: Polyphenols, Flavonoids, Carotenoids, Coumarins, Saponins, Tannins, Phenolic acids, Isoflavones, Lignans, Anthraquinones, Procyanidins, Stilbenoids, Ginsenosides, and others. These compounds exhibit several pharmacological actions such as antioxidant, anti-inflammatory, antimicrobial, and hepatoprotective effects, making the plant highly beneficial for herbal drug formulations.

Phytochemicals in the Leaves: Preliminary screening of *Bombax ceiba* leaves confirms the presence of glycosides, phenolic compounds, flavonoids, saponins, carbohydrates, and proteins. Specifically, the leaves have been found to contain flavonol C-glycoside and shamimin, a known bioactive constituent^[6].

Phytochemicals in the Flowers: The flowers of *Bombax ceiba* contain complex polysaccharides. These include chains of $\beta(1\rightarrow4)$ -linked D-galactopyranose and $\beta(1\rightarrow3)$ -linked L-arabinopyranose units, which are further connected to terminal sugars like α -linked D-galactose, α -linked L-rhamnose, and L-arabinose. These sugar chains are considered valuable for their biological functions^[7,8].

Phytochemicals in the Seeds: Seeds of *Bombax ceiba* yield significant bioactive compounds such as N-hexacosanol and palmitic acid. In addition, the seed oil has been found to contain phytosterols,

stearic acid, linoleic acid, oleic acid, and enzymes like lipase^[9].

Ethnobotanical Uses

1. Traditionally used to reduce symptoms of nausea, hyperacidity, dyspepsia, flatulence, and vomiting.
2. Possesses anthelmintic (anti-parasitic) activity, particularly effective against intestinal worms.
3. Applied in the treatment of skin-related conditions and infections.
4. The bark is boiled and consumed as a decoction to manage fever.
5. Widely used in managing diseases such as cholera, tuberculosis, urinary infections, nocturnal emissions, and impotency.
6. Decoction of the bark is also used as a natural remedy for constipation^[10]

METHODOLOGY

➤ pH Determination

The pH of the Ghutika was measured using a benchtop digital pH meter.

➤ Raw Material Testing

Ash Value: Refers to the inorganic residue left after ignition of the sample is called as ash. For Ghutika preparations, this should not exceed 2% as per Ayurvedic pharmacopoeia standards.

Loss on Drying: This test determines the moisture content by heating the sample until a constant weight is achieved. It reflects the percentage of water and volatile matter present in the sample^[14].

Extractive Values



- a) **Alcoholic Extract Procedure:** The powdered plant material is soaked in ethanol. After 24 hours, the mixture is filtered using standard filtration methods (filter paper and funnel). The clear filtrate is then separated and used for analysis^[14]

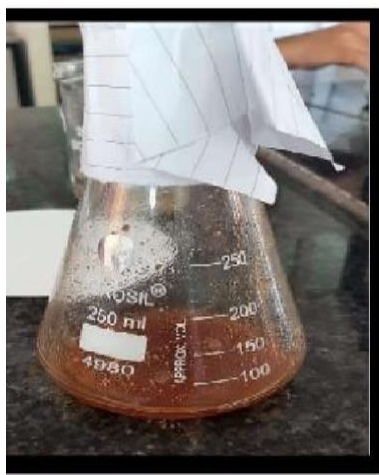


Fig 02: *Bombax ceiba* in alcoholic extract

- b) **Aqueous Extract Procedure:** 100 ml of distilled water is mixed with 2 g of *Bombax ceiba* powder. The mixture is heated for 30 minutes in a water bath. After cooling, it is filtered and used for further tests^[14]

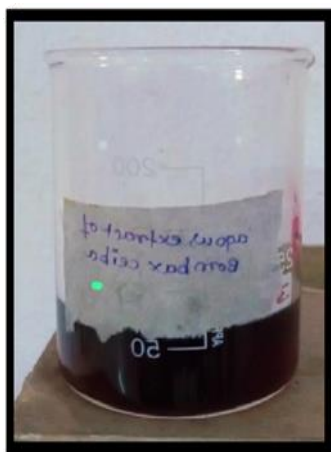


Fig 03: *Bombax ceiba* in Water extract

TLC Value: After determination of extractive value of a different value of different sample of Ghutika this extract were further dissolved in 0.5

ml of their respective solvents and 10microliter of each sample was applied on thin layer chromatography plates manually. with the help of TLC chamber, the TLC pattern were observed in the solvent system(a) toluene: ethylene: acetate: methanol 80:20:10 and solvent system (b) methanol, 12 the chromatograms were visualized under 254 nm and 365nm^[12].

Each spot has a retention factor which is expressed as (Rf)

- **Rf value=Distance travel by solute/Distance travel by solvent**



Fig 04: TLC of *Bombax ceiba*

Methods Of Preparation:

Ghutika preparation involves preparing a decoction of herbs, firstly we have to collect a flower and wash them. after collection dry that flower for few days.

1.Drying and Pulverization: The dried *Bombax ceiba* flowers are powdered using a grinder or pulverized. The powder is sieved through mesh #80 to obtain a fine, uniform consistency.

2. Weighing of Ingredients: Accurately weigh the required quantities of *Bombax ceiba* powder, jaggery, asafoetida and cardamom according to the formulation batch size.

3. Preparation of Binding Syrup (Jaggery Solution): Jaggery is gently heated with minimal water to prepare a semi-thick syrup that acts as a binding agent.

4. Mixing: The herbal powders (*Bombax ceiba*, asafoetida, and cardamom) are mixed thoroughly in a mortar to ensure uniform blending. Gradually add the warm jaggery syrup to the powder mix and triturate to form a cohesive, semi-solid mass suitable for molding into pills.

5. Rolling and Shaping: The cohesive mass is divided into equal portions and hand-rolled into

spherical pills (ghutika) of uniform size, typically weighing between 250 mg to 500 mg each.

6. Drying: The prepared ghutika are dried under shade or indirect sunlight for 1–2 days to ensure complete removal of moisture. After drying, the pills are stored in air-tight glass containers or blister packs.

7. Storage: Store in a cool, dry place away from sunlight and moisture to preserve stability and effectiveness^[13].

Table 1: Ingredient Data Contain

Sr.no.	Ingredients	Quantity taken 50 gm F1	Quantity taken 20 gm F2	Uses
1)	<i>Bombax ceiba</i> flower drug	27 gm	10 gm	API, Anthelmintics property
2)	Jaggery	20 gm	7 gm	Sweetening agent
3)	Asafoetida	1 gm	0.5 gm	Anthelmintics activity
4)	Cardamom	2gm	1.5 gm	Flavoring agent

Pharmaceutical Evaluation:

- **PH:** It has a neutral PH
- **Moisture content:** 20% We have considered water as lower the better ghutika. measurement most have a low moisture (e.g. circus peanuts with 8% moisture)

$$MC = W - d/w \times 100$$

Where, MC = moisture content %

W = Weight of sample

d = Weight after drying.

Pharmaceutical Parameters

1) Hardness:

Hardness the measure of the mechanical integrity of the ghutika it is the force required to break the ghutika in a specific plan .the ghutika must have a

specific strength and hardness to able the with stand mechanical shaking during manufacturing packaging and transport . Pfizer's tablet hardness tester was use to independently test the randomly chosen tablet.

2) Friability test:

The friability is measured by the amount of weigh loss following tumbling .friability test is conducted in the Roche friability apparatus by taking 20 ghutika. tjis consist of plastic drum that revolves at 25rpm dropping the ghutika through 6 inches in a friabilator to undergo shock , which is then operated for a 100 revolutions the ghutika are reweighed . The ghutika lose less than 1.0 percent than the ghutika weight are consider as acceptable.

• Weight Variation Test



- The weight variation test performs with ghutika the desired amount of ghutika in number are taken weight variation test is perform were there is any variation in ghutika if its variation more than desired limit which is 5% should not cross. Weight 20 tablet and then its average weight is calculated.

3)Disintegration time

The state in which no residue of the ghutika remains on the remains on the screen of apparatus .This test will determine whether the ghutika disintergrates within a specified time when it is

placed in liquid medium under the control prescribed experimental condition .

Disintegration weight of ghutika=15min

4)Dissolution time:

The time required for the dissolve ghutika in a sample solution is Dissolution time of ghutika is 14min^[14].

RESULT:

Pharmaceutical properties:

Table 2: organoleptic properties of formulations.

Sr.no.	Properties	Inhouse formulation
1.	Colour	Brown
2.	Odour	Characteristics
3.	Appearance	Solid

Table 3: physiochemical parameter of *Bombax ceiba*.

Sr. no.	Parameters	Result
1.	Percentage Ash value	9 %
2.	Loss of drying (moisture content)	14.2 %
3.	Extractive value (ethanolic extract)	63.5 %
4.	Extractive value (water extract)	130 %

Table 4: Pharmaceutical parameter of inhouse F1and F2 parameter.

Sr.no.	Parameters	Inhouse formulation F1	Inhouse formulation F2
1.	pH	Neutral	Basic
2.	Viscosity	Less viscous	Stable
3.	Homogeneity	Good	Good
4.	Appearance	change in colour	No change
5.	Thermal stability	Stable at 45°C ±48 hrs	Stable

Table 5: Inhouse F1 parameter And Inhouse F2 parameter

Quantity taken for 20 gm	Quantity taken for 50 gm
10 gm (powder drug)	27 gm (powder drug)
7 gm (jaggery)	20 gm (jaggery)
0.5 gm (Asafetida)	1 gm (Asafetida)
1.5 gm (cardamom)	2 gm (cardamom)

Table 6: Pharmaceutical test

Parameters	Result F1	Result F2
Hardness	8.0kg/cm ²	9.0 kg/cm ²
Friability test	0.39%	0.49%

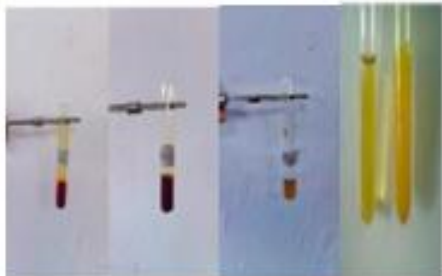
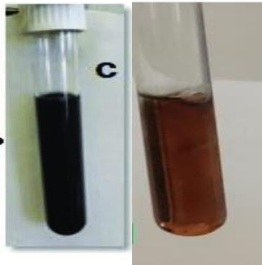


Weight variation test	1.875 gm	1.016 gm
Disintegration time	15 min	45 min
Dissolution time	14min	40 min

Table 7: TLC Table

Stationary phase	Silica gel
Mobile phase	toluene: ethylene acetate: methonal (80:20:10)
Rf value of spot A	0.73
Rf value of spot B	0.78

Table 8: physiochemical Screening of *bombax ceiba* drug.

Sr. no.	Plant constituents	Test reagent	Aqueous extract	Ethanollic Extract	Diagram
1.	Alkaloids	1)Dragendorff's reagent 2)Wagner's reagent 3)Mayer's reagent 4)Hager's reagent	+	+	 1 2 3 4
2.	Carbohydrate	1)Molish's test 2) Fehling's test	+	+	 1 2
3.	Tannins	1)Ferric chloride test 2)Led acecate test	+	+	 1 2

4)	Flavonoids	1) Shinoda test	+	+	
5)	Proteins	1) Biuret reagent	+	+	
6)	Ammonia	1) Ninhydrin	+	+	

(+) Indicate presence (-) Indicate absence

DISCUSSION AND SUMMARY:

In present research work attempts were made for developing a quality control profiling of ghutika. formulation along with evaluation and under the study of helminthics activity. Estimation of various qualitative and quantitative parameters which will help using setting standard for a particular product where an these standard might prove beneficial for identification and characterization of that particular drug formulation. With the help of these standard one can maintain quality and purity of that particular drug and its formulation prevent it from being adulterated by drug of same genus or other species having low potency. Its present study deals with phytochemical investigation of *bombax ceiba* flower including determination of loss on drying, ash value, and extractive value. The different

medicinal plant, such as arid zone plants, herbal plants and some shrubs have potential role in the prevention and treatment of various health ailments. This tree is rich in phytochemicals. Extract have confirmed the presence the presence of alkaloids, flavonoids, glycosides, coumarins, protein and amino acids. It has numerous documented effects, some of which are anti helminthics and hypotensive. . Ghutika is an ayurvedic health supplement which is made up of a super- concentrated blend of nutrient- rich herbs and minerals. It is formulated by processing around 50 medicinal herbs and their extracts, including the prime ingredients. Ghutika possesses multiple health benefits and has been widely used since ancient times as a health supplement as a medicine for enhancing immunity. Ghutika has been a part of every Indian life from the day it was introduced, irrespective of socio culture, political

and scientific factors. It was one of the most appreciate foods for its anti helminthics effects long before vitamins minerals and antioxidant. It is also beneficial to in asthma, diarrhea, wound healing and tuberculosis. This research is an attempt to discuss the various ethnobotanical and traditional uses along with reported phytochemical and pharmacological activities of *bombax ceiba*.

CONCLUSION:

The above literature survey revealed that *bombax ceiba* L. contain so much medicinal properties. It is used in many herbal formulation and traditional medicine system. It contains many phytoconstituents which show great medical properties. *Bombax ceiba* shows antioxidant, diuretic, anti-leprosy. It is used in treatment in blood purifier, inflammation and shows the antimicrobial, analgesic property. The whole plant of *bombax ceiba* is very useful, barks, roots, flowers, and seeds have lots of chemical constituents. Practical aspects show that the *bombax ceiba* is the king of herb. Pharmaceutical evolution by the various chemical it is found that formula f2 is better than f1 in formulation Thus, from phytochemical evaluation it can be conclude that, the formulation in the present investigation shows good. Pharmaceutical properties and from the various investigation study from *bombax ceiba*. it shows a good anti helminthic activity. hence it will act as a referential data can be useful performing human trials for anti-helminthic activity of the formulation.

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