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## Research Article

# Formulation And Evaluation Of Herbal Hair Serum

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## ABSTRACT

This project focuses on the preparation and formulation of herbal hair serum using extracts from Carica papaya leaves and Wrightia tinctoria leaves. The Carica papaya leaf extract was obtained through maceration with 96% ethanol & water, while the Wrightia tinctoria extract was done by using Soxhlet extraction with ethanol. Phytochemical analysis of both extracts revealed the presence of alkaloids, glycosides, tannins, and flavonoids. Solubility studies indicated that the extracts are soluble in water, ethanol, warm water, and chloroform. The herbal hair serum formulation involved by using the extracts of Carica papaya and Wrightia tinctoria with coconut oil and almond oil, and enhancing the fragrance with lavender oil. The resulting serum was evaluated for its physical and chemical properties. It exhibited a pinkish color and a pleasant aroma. The pH of the serum was measured with a digital pH meter and found to be appropriate for hair application. The serum demonstrated good spreadability and suitable viscosity, as measured by a Brookfield Viscometer and Smoothness of the hair serum was also evaluated. Stability testing confirmed that the formulation remains consistent under various conditions, making it a promising herbal hair care product.

## INTRODUCTION

Herbal cosmetics are skin care and beauty products made with plant-derived ingredients. The focus is on using herbs, essential oils, and natural extracts that are believed to provide therapeutic benefits. The natural herbs and their products when used for their aromatic value in cosmetic preparation are termed as herbal cosmetics [1].

### Advantages of Herbal Cosmetics over Synthetic

Herbal cosmetics, which are made from plant-based ingredients, are often compared to synthetic

cosmetics, which rely on man-made chemicals. Here are some key advantages of herbal cosmetics over synthetic alternatives

### 1. Natural Ingredients

#### Fewer Chemicals:

Herbal cosmetics generally contain fewer synthetic chemicals, which can be beneficial for individuals with sensitive skin or allergies.

#### Nutrient-Rich:

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They often include plant-based nutrients like vitamins, minerals, and antioxidants that can nourish and support skin health.

## **2. Reduced Risk of Irritation**

### **Gentler Formulations:**

Herbal ingredients are often milder and less likely to cause irritation or allergic reactions compared to synthetic chemicals, which can sometimes be harsh on the skin.

## **3. Eco-Friendly**

### **Sustainability:**

Many herbal cosmetics are produced with environmentally friendly practices, focusing on sustainable sourcing and reducing chemical waste.

### **Biodegradable:**

Plant-based ingredients are generally more biodegradable than synthetic chemicals, which can be better for the environment.

## **4. Fewer Side Effects**

### **Minimal Synthetic Additives:**

Herbal cosmetics usually avoid synthetic fragrances, dyes, and preservatives, which are common irritants in synthetic products.

### **Natural Healing:**

Some herbs have inherent healing properties, such as anti-inflammatory or antibacterial effects, which can help improve skin conditions naturally.

## **5. Ethical Considerations**

### **Cruelty-Free Options:**

Many herbal cosmetic brands emphasize cruelty-free practices, avoiding animal testing and promoting ethical treatment of animals.

### **Fair Trade:**

Some herbal cosmetics use fair-trade ingredients, supporting sustainable practices and fair labor conditions.

## **6. Holistic Benefits**

### **Synergistic Effects:**

The combination of various herbal ingredients can work synergistically to enhance the overall health of the skin, offering benefits beyond just the cosmetic appearance.

## **Traditional Wisdom:**

Herbal cosmetics often draw on traditional knowledge and time-tested remedies that have been used for centuries.

## **7. Customized Solutions**

### **Tailored Formulations:**

Herbal cosmetics can be customized with specific herbs for individual skin concerns, such as acne, aging, or dryness, allowing for targeted treatments.

## **8. Lower Toxicity**

### **Reduced Chemical Exposure:**

By avoiding harsh synthetic chemicals, herbal cosmetics reduce the risk of long-term exposure to potentially toxic substances.

## **9. Therapeutic Qualities**

### **Essential Oils and Extracts:**

Many herbal cosmetics include essential oils or plant extracts with aromatherapeutic properties, which can have additional benefits such as stress relief and relaxation.

## **10. Innovation and Trends**

### **Natural Trends:**

As consumer demand for natural and organic products grows, herbal cosmetics are often at the forefront of innovative and sustainable beauty trends [2].

## **HAIR SERUM**

Hair serums are specialized treatments designed to address various hair concerns and enhance the health and appearance of your hair. Unlike traditional hair conditioners, which are meant to be rinsed out, serums are typically leave-in treatments. They help to smooth, protect, and nourish the hair, addressing specific issues such as frizz, split ends, or dullness.

### **Benefits of Hair Serums:**

#### **1. Frizz Control:**

Hair serums can help to tame frizz and flyaways, giving hair a smoother and shinier appearance.

#### **2. Enhanced Shine:**

They often add a glossy finish to the hair, making it look healthier and more vibrant.



### 3. **Damage Repair:**

Some serums contain ingredients that help to repair and strengthen damaged hair, reducing split ends and breakage.

### 4. **Heat Protection:**

Many serums provide a protective barrier against heat styling tools like blow dryers, curling irons, and straighteners.

### 5. **Moisture Retention:**

They can help lock in moisture, preventing hair from becoming dry and brittle.

### 6. **Detangling:**

Hair serums can make hair easier to comb through, reducing breakage caused by tangling.

### 7. **Scalp Health:**

Some serums are formulated to improve scalp health, addressing issues such as dryness or dandruff. *Wrightia tinctoria*, commonly known as the "Dyeing *Wrightia*" or "Pala Indigo", is a plant species native to parts of Asia, including India, Thailand, and Malaysia. It is notable for its use in traditional dyeing processes and its various medicinal and practical applications.

#### **Botanical Characteristics:**

- Family: Apocynaceae
- Genus: *Wrightia*
- Species: *Wrightia tinctoria*
- Appearance: *Wrightia tinctoria* is a small to medium-sized tree or shrub. It features glossy, dark green leaves and produces clusters of small, fragrant, white to pale yellow flowers. The plant also bears seed pods that are used in traditional dyeing.

#### **Traditional Uses:**

##### **1. Dyeing:**

##### **Natural Dye:**

The plant is renowned for its role in traditional dyeing, particularly for producing indigo dyes. The dye is obtained from the leaves and bark, which contain compounds used to create blue and green hues.

##### **2. Textiles:**

In traditional textile industries, especially in parts of India and Southeast Asia, *Wrightia tinctoria* has been used to dye fabrics, giving them a rich and lasting color.

### **3. Medicinal Uses:**

#### **Traditional Medicine:**

Various parts of *Wrightia tinctoria*, including the leaves, bark, and seeds, are used in traditional medicine. They are believed to possess anti-inflammatory, analgesic, and antimicrobial, antifungal properties.

#### **Preparations:**

The plant is used in different preparations such as poultices and decoctions for treating skin conditions, hair growth, antidandruff, wounds, and certain ailments.

### **4. Cultural Significance:**

#### **Ritual and Cultural Uses:**

In some cultures, the plant has been used in rituals and ceremonies, including in traditional healing practices and as part of cultural heritage. *Carica papaya*, commonly known as the papaya, is a tropical fruit renowned for its sweet taste and numerous health benefits. Here's an overview of what makes the papaya notable:

#### **Botanical Overview:**

- Family: Caricaceae
- Genus: *Carica*
- Species: *C. papaya*
- Botanical Characteristics:
- Type: Tropical fruit tree
- Height: Typically grows between 5 to 10 feet (1.5 to 3 meters), though some varieties can grow taller.
- Leaves: Large, deeply lobed leaves that can be up to 3 feet (1 meter) in diameter.

#### **Health Benefits:**

##### **1. Nutritional Content:**

Papaya leaves are rich in vitamins A, C, E, and several B vitamins. They also contain minerals like calcium, potassium, and magnesium.

##### **2. Digestive Health:**



They contain enzymes like papain and chymopapain, which are beneficial for digestion. Papain helps break down proteins, making it easier to digest food.

### 3. Immune Support:

The high vitamin C content can help boost the immune system and protect against illnesses.

### 4. Anti-inflammatory Properties:

The leaves have anti-inflammatory compounds that may help reduce inflammation and support overall health.

### 5. Blood Health:

Some research suggests that papaya leaves can help increase platelet counts in individuals with dengue fever, though more research is needed in this area.

## MATERIALS AND METHODS

### PLANT COLLECTION AND IDENTIFICATION

The plants *Carica papaya* and *Wrightia tinctoria* leaves were collected in the month of March from Palakkad District. The plant was authenticated by Dr. Suresh V, Associate Professor, Department of Botany, Govt. Victoria College, Palakkad.

*Carica papaya*



Fig No 1 *Carica papaya* plant & leaf

### VERNICULAR NAMES

English : pawpaw tree, melon tree, papaya

Arabic : Fayfay, babaya

Bengali : Pappaiya, papaya

German : Papaya, melonenbaum

Hindi : Papaya, papeeta

Malayalam : papaya

Tamil :Pappali

### Taxonomical Classification of *Carica Papaya*

Table No 1 Taxonomical Classification *Carica papaya*

Kingdom	Plantae
Sub kingdom	Tracheobionta
Phylum	Streptophyta
Class	Magnoliopsida
Subclass	Dilleniidea
Order	Brassicales
Family	Caricaceae
Genus	<i>Carica</i>
Species	<i>Carica papaya</i>

### DESCRIPTION

*Carica papaya* belongs to the family Caricaceae and is commonly known as papaya, pawpaw, and kates. It is a perennial horticultural shrub

originated from Mesoamerican Centre, Central America, and southern Mexico and is mainly cultivated in the tropical and subtropical regions of Brazil, Australia, Malaysia, China, India. Papaya



is not only cultivated for the ripe sweet fruit, even other parts of the plant such as seeds, leaves, roots, flowers, barks, and latex have been traditionally used worldwide for the preparation of various medicinal formulations.[3][4] Scientific studies revealed the existence of considerable levels of glycosides, flavonoids, alkaloids, saponins, phenolic compounds, amino acids, lipids, Carbohydrates, Enzymes, Vitamins E, C, A, and minerals in papaya leaves.[5]

### USE

Few of the studies reported that fresh papaya leaves possess antiseptic properties, while the dried leaves can be used as a tonic to purify the blood and to improve digestion. Leaf juice of

papaya is now being known for its potent anti-cancer, ant oxidative, anti-inflammatory, antimicrobial, and anti-sickling properties along with nephron protective, hepatoprotective, hypoglycemic and hypolipidemic effects against toxins in the human system. In fact, polar isolates of papaya have exhibited antihuman immunodeficiency virus (HIV), analgesic, and wound healing properties. Papaya leaf helps to promote hair growth, prevent balding and thinning of hair. Helps to regulate sebum that nourishes and strengthen your hair. It helps to repair damaged hair [6][7]

### Wrightia tinctoria



Fig No 2 : Wrightia tinctoria plant & leaf

### VERNICULAR NAMES

English : Ivory Wood, Steet Indrajio  
Hindi : Dudhi  
Malayalam : Vettupala, Venpala, Ayyapala,  
Gandhapala

Telugu : Ankuduchettu

Tamil : Veppalai

Taxonomical Classification of Wrightia tinctoria

Table No 2 Taxonomical Classification Wrightia tinctoria

Kingdom	Plantae
Phylum	Streptophyta
Class	Equisetopsida
Subclass	Magnoliidae
Order	Gentianales
Family	Apocynaceae
Genus	Wrightia
Species	Wrightia tinctoria

## DESCRIPTION

*Wrightia tinctoria* R. Br. belongs to family Apocynaceae commonly called as Sweet Indrajao, Pala Indigo Plant, Dyer's Oleander. "Jaundice curative tree" in south India. Sweet Indrajao is a small, deciduous tree with a light gray, scaly smooth bark. Native to India and Burma, *Wrightia* is named after a Scottish physician and botanist William Wright (1740-1827). The plant is reported to contain presence of flavonoid, glycoflavones-iso-orientin, and phenolic acids. The various chemical constituents isolated from various parts of the plant are reported as 3,4-Secolup-20 (29)-en-3-oic acid, lupeol, stigmasterol and campesterol, Indigotin, indirubin, tryptanthrin, isatin, anthranillate and rutin Triacantanol, Wrightial, cycloartenone, cycloeucalenol,  $\beta$ -amyrin, Alpha-Amyrin, and  $\beta$ -sitosterol, 14 $\alpha$ -methylzymosterol. Four uncommon sterols, desmosterol, clerosterol, 24-methylene-25-methylcholesterol, and 24-dehydropollinastanol, were isolated and identified in addition to several more common phytosterols. [8][9]

## USE

The bark of this plant is used as a galactagogue to treat abdominal pain, skin diseases and wounds, as an anti-pyretic, anti-dysenteric, anti-diarrheal- and anti-hemorrhagic agent, and as an antidote for snake poison. Seeds of this plant are also used as an aphrodisiac. In view of the reported severe health hazards of estrogen, such as increased risk of endometrial hyperplasia and carcinoma, breast cancer, and thromboembolic diseases. A large number of natural products showing promising anti-fertility activity in preliminary studies could not be pursued due to their associated estrogen-agonistic activity.[10] The leaves are applied as a poultice for mumps and herpes. Sometimes, they are also munched to relieve toothache. The bark and seeds are effective against psoriasis and non-specific dermatitis. It has anti-inflammatory and anti-dandruff properties and hence is used in hair

oil preparations. It is astringent and antibacterial properties are beneficial in treating scalp disorders like dandruff. [11]

## METHODOLOGY

### Preparation Of Extract of *Carica papaya*

This is an extraction procedure in which coarsely powdered *Carica papaya* leaves is placed inside a container; the menstruum (chloroform & water) 20ml and 80 ml is poured respectively on top until completely covered the drug material. The container is then closed and kept for three days. The content is stirred periodically to ensure complete extraction. At the end of extraction, the extract is filtered and stored in an air tight container. [12]



**Fig: 3 Extraction of *C. papaya***

### PREPARATION OF EXTRACT OF *Wrightia tinctoria*

The *Wrightia tinctoria* leaf powder to be extracted is taken and loaded in a thimble made from filter paper. Then the thimble is placed inside the extractor and the ethanol solvent about 700ml is taken in the conical flask which is placed in the heating element. When the apparatus is turned on, the vapour from the solvent travels through the distillation arm and then through the thimble. The thimble is surrounded by the warm solvent which makes the powder to get dissolved in it. The cycle is repeated until the solvent becomes colourless.

Here the solvent is evaporated and the dry crude extract is transferred to the air tight container for the next activity. [13]



**Fig: 4 Extraction of W. tinctoria**

## **PREFORMULATION STUDIES**

### **Preliminary Phytochemical Screening**

#### **1. Test for glycosides**

##### **Borntrager's Test:**

Boil the test material with 1 ml of sulphuric acid in a test tube for five minutes. Filter while hot. Cool the filtrate and shake with equal volume of dichloromethane or chloroform. Separate the lower layer of dichloromethane or chloroform and shake it with half of its volume of dilute ammonia. A rose pink to red colour is produced in the ammoniacal layer.

#### **2. Test for carbohydrates**

##### **Molisch's test:**

To the test solution add few drops of Molisch's reagent, then add few drops of concentrated sulphuric acid through sides of test tube, purple to violet colour ring appears at the junction.

##### **Fehling's test:**

Take 1 ml of a given sample in a clean, dry test tube. Add 2 drops of A and B reagent to the sample. Observed as reddish-brown colour.

#### **3. Test for alkaloids**

##### **Mayer's test:**

Alkaloids give cream colour precipitate with Mayer's reagent (Potassium mercuric iodide solution)

##### **Dragendorff's test:**

Alkaloids give reddish brown precipitate with Dragendorff's reagent (Potassium bismuth iodide solution).

#### **4. Test for flavonoids**

##### **Alkaline test:**

To the test solution add few drops of sodium hydroxide solution, intense yellow colour is formed which turns to colorless on addition of few drops of dilute acid indicate presence of flavonoids.

#### **5. Test for tannins**

##### **Ferric chloride test:**

Treat the extract with ferric chloride solution, blue colour appears if hydrolysable tannins are present and green colour if condensed tannins are present.

##### **Lead Acetate Test:**

10 mg of bark extract was taken and 0.5 ml of 1% lead acetate solution was added and the formation of precipitate indicates the presence of tannins and phenolic compounds. [14-16]

##### **Solubility Study**

Solubility is defined as number of grams of substance which will dissolve in 100gm of solvent at a stated temperature. Solubility of the sample was observed in different solvents such as water, ethanol, warm water, chloroform.

## **FORMULATION OF HERBAL HAIR SERUM [17-18]**

The herbal hair serum was prepared by using Carica papaya and Wrightia tinctoria leaf extracts. The following steps are involved in the preparation of hair serum

1. The extract of the Wrightia tinctoria was taken in a clean beaker and it is dissolved in sufficient quantity of coconut oil.
2. Add required amount of almond oil to the above mixture

3. To this mixture add Carica papaya leaf extract.
4. Add lavender oil as a perfuming agent.
5. Mix thoroughly the mixture using a homogenizer to get a uniform mixture of hair serum

**Table No 3 Formulation chart of Herbal hair serum**

SL NO.	CONTENT	QUANTITY
1	Carica papaya leaf extract	6 ml
2	Wrightia tinctoria leaf extract	6 ml
3	Coconut oil	4 ml
4	Almond oil	3 ml
5	Lavender oil	drops

**EVALUATION STUDIES [19-29]****Organoleptic Properties**

Organoleptic properties were evaluated by observation on the texture, color and smell of the formulated cosmetic serum.

**Determination of pH**

The pH test will be determined by using Digital pH meter.

**Determination of Viscosity**

Viscosity of the formulation is determined by Brookfield Viscometer at 100 rpm, using spindle no.62.

**Spreadability Test**

Spreadability was measured by a parallel plate process typically used to assess and measure the spreadability of semisolid preparations. One gram hair serum was pressed between two horizontal plates of dimension 20× 20 cm, the upper of which weighed 125 g. The spread diameter was measured after 1 min.

Spreadability was calculated using the following formula:

$$S = M \times L / T$$

Where,

S= Spreadability,

M= Weight in the pan (tied to the upper slide),

L= Length moved by the glass slide,

T = Time (in sec) taken to separate the slides completely

**Homogeneity Test**

A clean and dry object glass was smeared with the hair serum, and a cover glass was sealed. The appearance under the light of some coarse particle/homogeneity was investigated. Herbal hair serum was tested by visual examination for homogeneity and tested for some lumps, flocculates, or aggregates.

**Stability Test**

The herbal hair serum was kept for three months at two separate temperatures of  $4 \pm 2^\circ\text{C}$  and  $30 \pm 2^\circ\text{C}$ , with 65% RH. Compared with the original pH and viscosity, the pH and viscosity of the herbal hair serum were determined after three months.

**RESULTS AND DISCUSSION****PREFORMULATION STUDIES****Preliminary Phytochemical Screening**

The preliminary phytochemical studies of extract of Carica papaya and wrightia tinctoria was carried out. The observations are

**Table No 4 Preliminary Phytochemical screening**

TEST	OBSERVATION	
	WTLE	CPLE
<b>Glycoside</b>		
Bontrager's test	+	+
<b>Carbohydrates</b>		





Molisch's test	+	+
Fehling's test	+	+
<b>Alkaloids</b>		
Mayers test	+	+
Dragendroff's test	+	+
<b>Flavonoids</b>		
Alkaline reagent test	+	+
<b>Tannins</b>		
Ferric chloride test	+	+
Lead acetate test	+	+

(+ Positive, - Negative)

### Solubility Study

Solubility of Carica papaya and Wrightia tinctoria leaf extracts in various solvents are shown in the table

**Table: No 5 Solubility studies**

SL NO	SAMPLE	SOLUBILITY			
		COLD WATER	WARM WATER	CHLOROFORM	ETHANOL/METHANOL
1	Carica papaya leaf extracts	Soluble	Soluble	Soluble	Soluble
2	Wrightia tinctoria leaf extracts	Soluble	Soluble	Soluble	Soluble

### FORMULATION OF HERBAL HAIR SERUM

Formulation of herbal hair serum were prepared by using Carica papaya and Wrightia tinctoria leaf extract with coconut and almond oil.



**Fig No 5 Herbal hair serum**

### EVALUATION STUDIES

#### 1. Organoleptic Evaluation

**Table No 6 Organoleptic evaluation**

Sl. No.	Parameters	Observation
1.	Colour	Pink
2.	Odour	Pleasant

3.	Texture	Smooth
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## 2. Determination of pH

pH of the hair serum was determined using digital pH meter and was found to be 5.4

## 3. Determination of Viscosity

The viscosity of the formulated herbal hair serum was done by using Brookfield viscometer and it was found to be 39 cp at 100 rpm using spindle no 62.

## 4. Spreadability

The spreadability of herbal hair serum was done and it was found to be that the herbal hair serum has good spreadability.

## 5. Homogeneity Test

By visual examination of serum, appearance and presence of any lumps, flocculates or aggregates was checked for homogeneity. The homogeneity of prepared serum was observed to be good.

## 6. Stability test

Herbal hair serum was stable during the research time, as these serums showed no physical instability, and there was no noticeable difference in the pH before and after the study. The formulation was stable at room temperature.

## CONCLUSION

The serum showed significant benefits for hair health, including promoting hair growth, strengthening hair, reducing frizz, smoothing hair, and preventing dandruff. The serum was found to be stable, consistent, and user-friendly with a pleasant texture and scent, based on various tests. Herbal hair serums are becoming increasingly important in the cosmetic industry. Consumers are looking for natural and organic products that are safer and more environmentally friendly. Herbal ingredients, when properly formulated, can solve common hair problems without the side effects often found in synthetic products. Ingredients like *Carica papaya*, *Wrightia tinctoria*, coconut oil, and almond oil are rich in vitamins and antioxidants, which nourish the scalp and hair, promoting

overall hair health. The value of combining traditional herbal knowledge with modern scientific methods to create effective and safe cosmetic solutions. The findings contribute to the growing body of research in herbal cosmetics and provide a foundation for further studies and potential commercial applications. The outcomes of this study suggest that the formulated herbal hair serum has favorable characteristics for potential use in hair care, offering natural benefits from the active phytochemicals in *Carica papaya* and *Wrightia tinctoria*.

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