International Standard Serial Number (ISSN): 2249-6807

International Journal of Institutional Pharmacy and Life Sciences 16(3): May-June 2026

INTERNATIONAL JOURNAL OF INSTITUTIONAL PHARMACY AND LIFE SCIENCES

Pharmaceutical Science

Research Article……!!!

Received: 18-02-2026; Revised: 29-04-2026; Accepted: 25-05-2026

FORMULATION AND EVALUATION OF HERBAL HAIR OIL FROM *CUSCUTA REFLEXA* (AMARVEL)

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Keywords:

Cuscuta reflexa, Phyllanthus Emblica, Cocos Nucifera, Tocopherol, Zizyphusjujuba, Ethanolic Extraction, Phytoconstituents

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ABSTRACT

Cuscuta reflexa (C. reflexa) is a parasitic climber of medicinal importance. The present study was aimed to evaluate the nutraceutical potential of C. reflexa stems collected from different hosts and to evaluate the role of the herbal formulation in dandruff, hair fall control as well as hair growth promoter. Hair formulations of C. reflexa collected from different host plants were prepared in the form of herbal oils (10% w/v). C. reflexa stems were extracted using mustard oil as base oil by using direct boiling technique. Prepared oil was studied as hair tonic. The experimental protocols used were anti-dandruff hair growth activity, as well as hair fall reduction. Herbal hair oils versus mustard oil were evaluated by applying oils on human volunteers with hair fall and dandruff problem whereas promotion of hair growth activity was conducted on rats. The formulated oils were also characterised for proximate analysis, physiochemical composition, as well as antimicrobial activity. The test oils of C. reflexa collected from Azadiracta indica and Zizyphus jujuba were effective in the promotion of hair growth, dandruff control, as well as reduction in hair fall activity. All the formulated oils showed potent antimicrobial activity against all selected strains of bacteria and fungi.

INTRODUCTION

Herbal products are becoming increasingly popular nowadays because they are considered safe, effective and have minimal side effects compared to synthetic or chemical-based products. Since ancient times, medicinal plants have been used for the treatment of various health conditions, including hair and scalp problems. In recent years, there has been a growing interest in preparing herbal formulations for personal care, especially for maintaining healthy hair. Herbal hair oils are one of the most commonly used traditional preparations as they provide nourishment, improve hair strength and promote hair growth.

In this project, an herbal hair oil has been prepared using Amarvel (*Cuscuta reflexa*) and Amla (Phyllanthus emblica) as the main ingredients, with coconut oil as the base. Amarvel is a well-known medicinal plant that is traditionally used for strengthening hair roots, reducing hair fall and improving overall scalp condition. Amla is rich in vitamin C and antioxidants, which help in promoting hair growth, preventing dandruff, and enhancing the natural shine of hair. Coconut oil is widely used as a base oil because of its excellent moisturizing property and its ability to penetrate deeply into the scalp, thereby improving the effectiveness of herbal ingredients.

The preparation of the herbal oil involves extraction of active constituents from Amarvel using ethanol as a solvent. This hydroalcoholic extraction helps in obtaining maximum phytoconstituents from the plant material. The extract obtained is then concentrated by evaporation and further incorporated into Amlainfused coconut oil. The mixing process is carried out using a controlled heating method such as a water bath to ensure uniform distribution of the extract in the oil without degrading the active components.

During the preparation process, proper care was taken to maintain suitable temperature conditions and avoid overheating, which could lead to degradation of active constituents. The use of a water bath provided controlled heating and helped in achieving uniform mixing of extract with the oil base. After preparation, the oil was allowed to settle and then filtered to remove any unwanted solid particles, resulting in a clear and stable formulation.

The prepared herbal oil was further evaluated using various parameters such as organoleptic properties (colour, odour, and appearance), viscosity and specific gravity. These evaluation tests are important to determine the quality, consistency and stability of the formulation. Proper evaluation ensures that the product is suitable for application and meets the required standards for use.

Thus, the main aim of this project is to prepare a simple, effective and economical herbal hair oil using natural ingredients and basic pharmaceutical techniques. This formulation combines traditional knowledge with scientific methods of extraction and evaluation. The prepared herbal oil can be used as a natural alternative for maintaining healthy hair and scalp, making it suitable for regular use and beneficial for overall hair care.

In addition to this, herbal formulations are also preferred because they are eco-friendly and easily biodegradable, which makes them safer for both users and the environment. Unlike synthetic products that may contain harmful chemicals, herbal oils are prepared from natural sources and are less likely to cause irritation or long-term damage. This makes them suitable for regular and long-term use in daily life.

Another important aspect of herbal oil preparation is the use of proper extraction techniques to obtain maximum active constituents from plant materials. The efficiency of extraction directly affects the quality and effectiveness of the final product. In this project, the use of ethanol as a solvent and controlled heating methods helped in achieving better

extraction and incorporation of active components into the oil base. This ensures that the final product contains the desired therapeutic properties.

Moreover, the incorporation of natural antioxidants such as vitamin E in the formulation helps in improving the stability and shelf life of the oil. It prevents oxidation and rancidity, thereby maintaining the quality of the product over a longer period. The addition of natural fragrance oils further enhances the acceptability of the formulation by improving its odour and user experience.

Overall, this project not only focuses on the preparation of herbal hair oil but also highlights the importance of proper formulation techniques, evaluation methods and quality control. It provides practical knowledge about extraction, formulation and testing of herbal products, which can be useful in pharmaceutical as well as cosmetic applications. Thus, the study contributes to understanding the role of herbal ingredients in developing safe and effective hair care products.

Fig 1 Herbal Hair Oil

Advantages of Herbal Amarvel Hair Oil

1. Natural and Safe:

The herbal hair oil is prepared using natural ingredients like Amarvel and Amla, which makes it safer compared to synthetic products and reduces the chances of side effects.

2. Promotes Hair Growth:

Amarvel and Amla are known for their beneficial effects on hair, helping in improving hair growth and strengthening hair roots.

3. Reduces Hair Fall:

Regular application of the oil helps in reducing hair fall by nourishing the scalp and improving blood circulation.

4. Improves Scalp Health:

The formulation helps in maintaining a healthy scalp by reducing dryness, dandruff and irritation.

5. Provides Nourishment:

Coconut oil acts as a good base and provides deep nourishment, making hair soft, smooth and shiny.

6. Cost Effective:

Herbal oils can be prepared easily with locally available materials, making them economical.

7. Eco-friendly:

Being plant-based, the formulation is biodegradable and does not harm the environment.

AIM AND OBJECTIVES

Aim:

To prepare and evaluate herbal hair oil *Cuscuta reflexa* (Amarvel).

Objectives:

1. To collect and identify the raw materials such as Amarvel and Amla used in the formulation.
2. To prepare the extract of Amarvel using ethanol as a solvent.
3. To prepare Amla infused coconut oil as a base for the formulation.
4. To incorporate the Amarvel extract into the oil base using controlled heating method.
5. To obtain a stable and uniform herbal hair oil formulation.
6. To evaluate the prepared oil by different tests such as organoleptic properties, viscosity and specific gravity.
7. To study the physical characteristics and quality of the prepared herbal oil.
8. To develop a simple and cost-effective herbal formulation for hair care.

REVIEW OF LITERATURE

Anjum et al. (2013) conducted a study titled "Exploration of nutraceutical potential of herbal oil formulated from parasitic plant". In this

study, the authors worked on Amarvel (*Cuscuta reflexa*) and prepared herbal oil formulations using plant material. The oil was evaluated for various parameters such as hair growth activity, dandruff control and reduction in hair fall. The results indicated that the herbal oil showed significant improvement in hair growth when compared to untreated samples. The study also reported antimicrobial activity against common scalp microorganisms, which helps in maintaining scalp hygiene. Furthermore, the presence of phytoconstituents like flavonoids and alkaloids in Amarvel was found to be responsible for its therapeutic action on hair and scalp.

Suman et al. (2022) presented a detailed review on herbal hair oil and its applications in hair care. According to their study, herbal oils play an important role in nourishing the scalp, improving blood circulation and strengthening hair follicles. They reported that herbal formulations containing natural antioxidants help in reducing oxidative stress, which is one of the major causes of hair damage and premature greying. The study also emphasized that regular application of herbal oils improves hair texture, reduces dryness and enhances overall hair health. Additionally, they concluded that herbal products are more acceptable among users due to their safety and minimal side effects.

Jain et al. (2016) evaluated the hair growth activity of herbal hair oil prepared using various plant extracts including Amla. The study demonstrated that the formulation significantly increased the length and density of hair in experimental models. Amla was identified as a key ingredient due to its high vitamin C content and antioxidant properties, which help in strengthening hair roots and preventing hair loss. The researchers also observed that the use of coconut oil as a base enhanced the absorption of active constituents into the scalp, thereby improving the overall effectiveness of the formulation.

Neeraj Kumar et al. (2023) developed andevaluated an herbal hair oil formulation containing Amla and other herbal ingredients. The study focused on formulation development and quality evaluation using parameters such as viscosity, specific gravity, pH and organoleptic properties. The results showed that the prepared oil had suitable viscosity, good stability and acceptable physical characteristics. The authors concluded that the formulation provided essential nutrients required for hair growth and helped in maintaining healthy scalp conditions. They also suggested that such formulations can be used as an effective alternative to synthetic hair care products.

Another study on formulation and evaluation of herbal hair oil reported that herbal oils provide deep nourishment to the scalp and improve hair strength. The study highlighted that these formulations help in restoring damaged hair, reducing split ends and preventing hair fall. It was also observed that herbal oils support the normal functioning of sebaceous glands, thereby maintaining proper moisture balance in the scalp. Evaluation parameters such as viscosity, specific gravity and organoleptic characteristics were found to be essential for determining the quality and acceptability of the product.

In addition to these studies, various researchers have emphasized the importance of proper extraction techniques for obtaining maximum active constituents from plant materials. Ethanol extraction is widely used because it efficiently extracts both polar and non-polar compounds. Controlled heating methods such as water bath are preferred during formulation as they prevent degradation of sensitive phytoconstituents and ensure uniform mixing. The use of antioxidants like vitamin E further enhances the stability of the formulation by preventing oxidation and rancidity.

Overall, the literature suggests that herbal ingredients like Amarvel and Amla possess significant properties beneficial for hair care.

Their combination with coconut oil and proper formulation techniques results in an effective herbal hair oil. These studies support the approach used in the present project and confirm that the prepared formulation is based on scientifically accepted principles.

DRUG PROFILES

DRUGS USED IN THE HERBAL HAIR OIL

1. *Cuscuta reflexa* (Amarvel)
2. Phyllanthus emblica (Amla)
3. Cocos nucifera (Coconut oil)
4. Tocopherol (Vitamin E)
5. Citrus sinensis oil (Orange oil)
6. Ethanol (Alcohol)

1) *Cuscuta reflexa* (Amarvel)

Biological Source:

Cuscuta reflexa consists of the dried stems of the plant belonging to the family Convolvulaceae. It is a parasitic plant that grows on host plants.

Taxonomical Classification:

- Kingdom: Plantae
- Division: Angiosperms
- Class: Dicotyledonae
- Order: Solanales
- Family: Convolvulaceae
- Genus: Cuscuta
- Species: reflexa

Morphological Study:

- Colour: Yellowish to greenish
- Odour: Slight, characteristic
- Taste: Bitter
- Stem: Thin, thread-like, twining and leafless
- Leaves: Absent or reduced to small scale-like structures
- Flowers: Small, white or pale yellow in clusters
- Nature: Parasitic plant that derives nutrients from host plants

Microscopical Characters (Optional):

- Presence of vascular tissues
- Parenchymatous cells
- Xylem and phloem elements

Chemical Constituents:

- Flavonoids
- Alkaloids
- Glycosides
- Tannins
- Resin

Fig 2 *Cuscuta reflexa* Phyllanthus Emblica (Amla)

Biological Source:

Phyllanthus emblica consists of the dried fruits of the plant belonging to the family Phyllanthaceae.

Taxonomical Classification:

- Kingdom: Plantae
- Division: Angiosperms
- Class: Dicotyledonae
- Order: Malpighiales
- Family: Phyllanthaceae
- Genus: Phyllanthus
- Species: emblica
- **Morphological Study:**
- Colour: Greenish-yellow
- Odour: Slight, characteristic
- Taste: Sour and astringent
- Shape: Round with 6 vertical furrows
- Surface: Smooth and hard
- Size: Medium-sized fruit
- Seeds: Present inside fruit

Microscopical Characters (Optional):

- Presence of parenchymatous cells
- Stone cells (sclereids)
- Fibrovascular bundles
- Calcium oxalate crystals **Chemical Constituents:**
- Vitamin C (Ascorbic acid)
- Tannins
- Gallic acid
- Ellagic acid
- Flavonoids
- Polyphenols

Fig 3-Phyllanthus Emblica (Amla)

3) Cocos Nucifera (Coconut Oil)

Biological Source:

Cocos nucifera oil is obtained from the dried kernel (copra) of the coconut, belonging to the family Arecaceae.

Taxonomical Classification:

- Kingdom: Plantae
- Division: Angiosperms
- Class: Monocotyledonae
- Order: Arecales
- Family: Arecaceae
- Genus: Cocos
- Species: nucifera

Morphological Study:

Colour: Colourless to pale yellow

- Odour: Pleasant, characteristic coconut odour
- Taste: Bland
- Nature: Oily liquid (solidifies at low temperature)
- Appearance: Clear and transparent

Chemical Constituents:

- Lauric acid
- Myristic acid
- Palmitic acid
- Oleic acid
- Caprylic acid
- Capric acid
- Saturated and unsaturated fatty acids

Fig 4- Cocos Nucifera (Coconut Oil)

4) Tocopherol (Vitamin E)

Biological Source:

Tocopherol is a naturally occurring fat-soluble vitamin obtained from plant oils such as wheat germ oil, sunflower oil and other vegetable oils.

Taxonomical Classification:

- Kingdom: Not applicable (Vitamin) - Category: Organic compound (Vitamin)

Morphological Study:

- Colour: Pale yellow
- Odour: Odourless or slight characteristic
- Taste: Bland
- Nature: Oily liquid
- Appearance: Clear, viscous liquid

Chemical Constituents:

- Tocopherols (α, β, γ, δ forms)
- Antioxidant compounds

Fig 5 Vitamin E Capsules

5) Citrus sinensis Oil (Orange Oil)

Biological Source:

Citrus sinensis oil is obtained from the peel of the fruit of Citrus sinensis, belonging to the family Rutaceae.

Taxonomical Classification:

- Kingdom: Plantae
- Division: Angiosperms
- Class: Dicotyledonae
- Order: Sapindales
- Family: Rutaceae
- Genus: Citrus
- Species: sinensis

Morphological Study:

- Colour: Pale yellow to orange
- Odour: Sweet, pleasant citrus smell
- Taste: Slightly bitter
- Nature: Volatile oil - Appearance: Clear liquid

Chemical Constituents:

- Limonene (major component)
- Myrcene
- Linalool
- Citral

Fig 6 – Citrus sinensis Oil (Orange Oil

6) Ethanol (Alcohol) Biological Source:

Ethanol is obtained by the fermentation of sugars using yeast or by synthetic methods. It is widely used as a solvent in pharmaceutical preparations.

Taxonomical Classification:

- Kingdom: Not applicable
- Category: Organic compound (Alcohol)

Morphological Study:

- Colour: Colourless
- Odour: Characteristic alcoholic odour
- Taste: Burning taste
- Nature: Volatile liquid
- Appearance: Clear and transparent

Chemical Constituents:

- Ethyl alcohol (C_2H_5OH)

Fig 7 - Ethanol (Alcohol)

MATERIAL AND METHODS:

Sr. No	Name of Ingredients	Quantity
1	*Cuscuta reflexa* (Amarvel)	400 gm.
2	Ethanol	2 litre
3	Phyllanthus Emblica (Amla powder)	40 gm.
4	Cocos Nucifera (Coconut oil)	400 ml
5	Perfume	q.s
6	Tocopherol (Vitamin E)	400mg

METHOD OF PREPARATION:

Method of Preparation of Herbal Hair Oil

1. Collection and Preparation of Raw Materials:

Amarvel (*Cuscuta reflexa*) was collected and cleaned to remove dust and impurities. It was then dried and coarsely powdered. Amla powder was also taken as one of the ingredients. Coconut oil was used as the base oil for the formulation.

2. Weighing of Materials:

About 430 g of Amarvel was accurately weighed. Approximately 2 litres of 95% ethanol was taken as a solvent for extraction.

FIG NO 8-Weighing Of Sample

3. Extraction of Amarvel:

The powdered Amarvel was soaked in ethanol and kept for extraction. The mixture was subjected to extraction and then filtered to obtain the ethanolic extract containing active constituents of Amarvel.

4. Concentration of Extract:

The obtained extract was concentrated by evaporation using a distillation process and later water bath method to remove excess ethanol. Controlled heating was applied to avoid degradation of active constituents. A viscous extract was obtained after evaporation.

5. Preparation of Oil Base:

Coconut oil was taken (around 280–350 ml) in a clean container and gently heated using a water bath to maintain controlled temperature.

Fig 9-Heating Oil Base

6. Incorporation of Extract:

The concentrated Amarvel extract (approximately 40–50 g/ml) was added to the heated coconut oil. The mixture was continuously stirred to ensure uniform mixing.

7. Addition of Amla:

Amla powder was added to the oil and heated for some time to allow proper infusion of its constituents into the oil. The mixture was then filtered to remove solid residues.

8. Heating and Mixing:

The oil mixture was heated for about 1 hour using a water bath with continuous stirring to ensure proper extraction and incorporation of all herbal components into the oil base.

9. Filtration:

After completion of heating, the oil was allowed to cool slightly and then filtered using a clean cloth or filter paper to remove any remaining solid particles. A clear herbal oil was obtained.

10. Cooling:

The filtered oil was allowed to cool to room temperature.

11. Addition of Additives:

After cooling, Vitamin E capsules were added as an antioxidant to improve stability. Fragrance

oils such as orange oil or peppermint oil were added in small quantity to enhance odour.

12. Final Mixing:

The oil was mixed thoroughly to ensure uniform distribution of all components.

13. Storage:

The prepared herbal hair oil was transferred into clean, dry and airtight containers and stored in a cool and dry place.

Final Product:

A clear, stable and moderately viscous herbal hair oil containing Amarvel and Amla was obtained.

EVALUATION PARAMETER:

1. Organoleptic Evaluation (Physical Appearance) :

Color – Yellowish / brownish-green

Odour – Characteristic herbal smell Texture – Smooth, non-gritty

Clarity – Clear (no turbidity or particle**)**

Fig No 10-Nature of Final Prepared oil

2. pH Determination:

The ph is usually around 5.5-7.

The hair oil shows safe pH, suitable for scalp use.

3.Irritation test :

Apply small amount on skin. Check for redness or irritaton. No irritation-oil is safe to use.

Fig no 11-Skin Irritation Test

4.Viscosity Determination (Observation):

Time taken by water (t1) = 45 sec Time taken by oil (t2) = 68 sec Density of water (ρ1) = 1 g/cm³ Density of oil (ρ2) = 0.92 g/cm³ Viscosity of water (η1) = 1 cP Calculation:

$\eta 2 = (\rho 2 \times t2 \times \eta 1) / (\rho 1 \times t1)$

$\eta 2 = (0.92 \times 68 \times 1) / (1 \times 45)$

$\eta 2 = 62.56 / 45$

$\eta 2 = 1.39$ cP

Result:

Viscosity of oil = 1.39 cP

The oil is slightly thick and flows easily, so it is suitable for application.

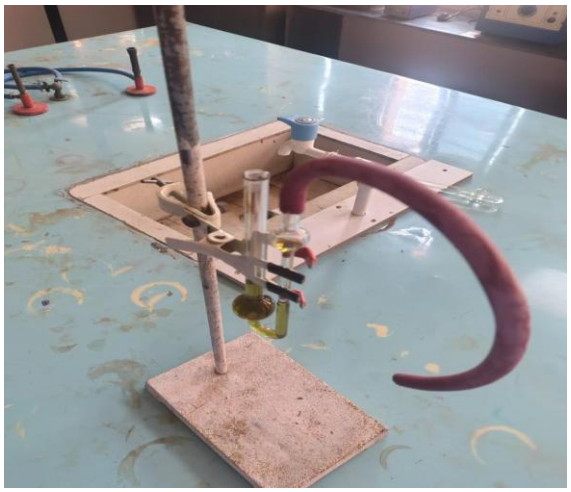

Fig no 12 -Viscosity Determination by Ostwald Viscometer

6. Acid value (Observation): Weight of oil taken (W) = 2 g Volume of KOH used (V) = 1.2 ml Normality of KOH (N) = 0.1 N Formula:

Acid Value = (56.1 × N × V) / W Calculation:
Acid Value = (56.1 × 0.1 × 1.2) / 2
Acid Value = 6.732 / 2
Acid Value = 3.36 mg KOH/g Result:
Acid value of herbal hair oil = 3.36 mg/KOH
The acid value is within acceptable limit, indicating good quality oil with low free fatty acid content.

1. Spreadability test (Observation):
The oil spreads easily on skin surface. Result:
Good spreadability observed. Inference:
Easy to apply on hair and scalp.

2. Density test:
-Take equal volume of water and oil (10ml)
-Weigh both
-Use formula
Specific Gravity = Weight of Oil / Weight of Water
Result: The value is less than 1 hence Oil is Good and Light

DISCUSSION AND RESULT:
Formulation of Herbal hair Oil was successfully done and evaluated for various parameter to ensure the quality, safety, and standard of formulated product.

1	**Colour**	**Yellowish/Brownish Green**
2	**Odour**	**Herbal Smell**
3	**pH**	**5.5-7**
4	**Viscosity**	**1.39cP**
5	**Acid value**	**3.36 mg/KOH**
6	**Spreadability**	**Good**
7	**Density**	**<1**

The prepared herbal hair oil containing *Cuscuta reflexa* showed satisfactory results in terms of physical appearance, stability, and hair growth promoting activity. The oil was found to be light yellow to brownish green in color with a pleasant herbal odor. The formulation showed good homogeneity and was free from any particulate matter.

CONCLUSION
The Amarvel herbal hair oil was prepared using *Cuscuta reflexa*, Amla, coconut oil, ethanol, orange oil, and vitamin E, following standard extraction and formulation methods to retain active compounds. The oil showed good physical properties such as uniformity, color, and odor, while chemical tests including saponification, acid, and peroxide values confirmed its quality and stability. The herbal ingredients provided nourishment to the scalp, promoted hair growth, and offered antioxidant benefits, and vitamin E helped maintain the stability of the formulation.
Overall, the prepared Amarvel herbal hair oil is safe, effective, cosmetically acceptable, and can be considered a natural alternative to synthetic hair oils for maintaining healthy hair and scalp.

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HOW TO CITE THIS ARTICLE

Vineet P. Dwivedi , Rushikesh D. Mahajan , Harshal S. Patil ,Samiksha P. Warke: Formulation and evaluation of herbal hair oil from *Cuscuta reflexa* (amarvel). International Journal of Institutional Pharmacy and Life Sciences, Vol 16[3] May-June 2026 : 50-60.