



Formulation and Evaluation Of Polyherbal Hair Oil

¹ Miss. Alfiya Salim Mujawar, ² Dr. S. P. Gawade

¹ Department of Cosmetic Science, Late. Narayandas Bhavandas Chhabada Institute of Pharmacy, Raigaon, Satara, Tal. Jaoli, Dist: Satara, Maharashtra. 415020.

² M. Pharm & PhD Professor, Department of Pharmacy Late. Narayandas Bhavandas Chhabada Institute of Pharmacy, Raigaon, Satara, Tal. Jaoli, Dist: Satara, Maharashtra. 415020.

ABSTRACT:

The current study presents the formulation and evaluation of a polyherbal hair oil composed of a synergistic blend of natural oils and herbal extracts renowned for their therapeutic effects on hair and scalp health. The formulation includes coconut oil, almond oil, castor oil, avocado oil, and camphor oil as base carriers, each contributing essential fatty acids, vitamins, and moisturizing properties. Herbal components such as curry leaves (*Murraya koenigii*), hibiscus (*Hibiscus rosa-sinensis*), neem (*Azadirachta indica*), onion juice (*Allium cepa*), and Acacia concinna (*shikakai*) were incorporated for their proven benefits in stimulating hair growth, preventing hair fall, reducing dandruff, and enhancing scalp circulation.[1]

The combined formulation aims to promote healthy, strong, and lustrous hair through a natural, holistic approach. Preliminary observations suggest that this polyherbal hair oil may serve as an effective alternative to synthetic hair care products, offering both nourishment and protection with minimal side effects.[2]

Keywords: Polyherbal formulation, Hair oil, Coconut oil, Castor oil, Neem, Onion juice, Acacia concinna, Hibiscus, Natural hair care, Herbal medicine, Scalp health, Hair growth stimulation

Introduction:

Hair is not only a symbol of beauty and personal identity but also serves important physiological functions such as protecting the scalp from ultraviolet radiation and helping to regulate temperature. However, common hair and scalp problems such as hair fall, dandruff, premature greying, and thinning hair affect millions of individuals globally. These issues are often exacerbated by stress, pollution, poor nutrition, and excessive use of chemical-based hair products, leading to increased interest in natural and herbal remedies.[3]

Herbal hair oils have been used in traditional medicine systems like Ayurveda for centuries due to their minimal side effects and ability to provide long-term benefits. A polyherbal formulation, which combines multiple herbs and natural oils, leverages the synergistic effects of its components to address various hair and scalp conditions more effectively than single-ingredient preparations.[4]

This study focuses on developing a polyherbal hair oil that combines coconut oil, almond oil, castor oil, camphor oil, and avocado oil as base oils, infused with medicinal herbs such as curry leaves (*Murraya koenigii*), hibiscus (*Hibiscus rosa-sinensis*), neem (*Azadirachta indica*), Acacia concinna (*shikakai*), and onion juice (*Allium cepa*). Each of these ingredients is known for specific therapeutic properties such as hair follicle stimulation, antimicrobial action, scalp nourishment, and prevention damage.[5]

OBJECTIVES:

The primary objective of this research is to formulate and scientifically evaluate a polyherbal hair oil that utilizes the synergistic properties of various natural oils and traditional herbal ingredients to address common hair and scalp issues. The formulation aims to integrate time-tested Ayurvedic principles with modern herbal science to provide an effective, natural alternative to chemical-based hair care products.

The specific objectives of the study are:

1. To formulate a stable polyherbal hair oil using coconut oil, almond oil, castor oil, camphor oil, and avocado oil as base carriers known for their nourishing and moisturizing properties.
2. To incorporate herbal extracts such as curry leaves (*Murraya koenigii*), hibiscus (*Hibiscus rosa-sinensis*), neem (*Azadirachta indica*), Acacia concinna (*shikakai*), and onion juice (*Allium cepa*) for their known benefits in enhancing hair growth, preventing dandruff, and improving scalp health.

3. To evaluate the organoleptic, physicochemical, and stability parameters of the prepared formulation, ensuring its quality, safety, and shelf-life.
4. To assess the preliminary efficacy of the formulation in terms of reducing hair fall, improving hair texture, and promoting hair regrowth through observational studies or user feedback.
5. To promote a holistic, eco-friendly, and sustainable approach to hair care using natural and biodegradable ingredients with minimal risk of side effects.[6]

DRUG PROFILE:

SHIKAKAI:-



Family : Fabaceae

Biological Name : *Acacia concinna*

Biological Source : Dried pods, leaves, and bark of *Acacia concinna* Linn.

Chemical Constituent: Saponins, Tannins, Flavonoids.

Benefits of Shikakai in Hair Oil :

- Acts as a natural cleanser
- Promotes hair growth
- Prevents dandruff and infections
- Strengthens hair roots
- Softens and detangles hair
- Maintains scalp pH balance[7]

ONION JUICE:-



Family : Amaryllidaceae

Biological Name : *Allium cepa*

Biological Source : Fresh bulb of *Allium cepa* Linn.

Chemical Constituents : Sulfur compounds (thiosulfinates), quercetin, flavonoids.

Benefits of Onion juice in Hair Oil :

- Stimulates hair growth by boosting scalp blood circulation.
- Reduces hair fall and thinning.
- Rich in sulfur, strengthens hair shafts and prevents breakage.
- Antibacterial properties help treat scalp infections.
- Adds shine and volume to hair.[8]

NEEM:-



Family : Meliaceae

Biological Name : *Azadirachta indica*

Biological Source : Leaves and seed oil of *Azadirachta indica* A. Juss

Chemical Constituents : Azadirachtin, nimbin, nimbidin, flavonoids

Benefits of Neem in Hair Oil :

- Fights dandruff and scalp infections
- Reduces itchiness and inflammation
- Promotes healthy scalp environment for hair growth
- Strengthens hair roots
- Controls excess oil and balances scalp[9]

HBISCUS:-



Family : Malvaceae

Biological Name : *Hibiscus rosa-sinensis*

Biological Source : Flowers and leaves of *Hibiscus rosa-sinensis* Linn.

Chemical Constituents : Anthocyanins, flavonoids, mucilage, vitamin C

Benefits of Hibiscus in Hair Oil :

- Stimulates hair growth and prevents hair fall

- Conditions and softens hair
- Prevents premature greying
- Adds shine and thickness
- Soothes dry and itchy scalp[10]

CURRY LEAVES:-

Family : Rutaceae

Biological Name : *Murraya koenigii*

Biological Source : Fresh leaves of *Murraya koenigii* Spreng.

Chemical constituents : Alkaloids, flavonoids, carbazole alkaloids, essential oils

Benefits of Curry Leaves in Hair Oil :

- Prevents premature greying of hair
- Strengthens hair roots and reduces hair fall
- Stimulates hair growth
- Improves scalp health
- Adds natural shine and softness[11]

Avocado Oil:-

Family : Lauraceae

Biological Name : *Persea americana*

Biological Source : Oil extracted from the pulp of *Persea americana* fruit.

Chemical Constituents : Oleic acid, palmitic acid, vitamin E, phytosterols, lecithin

Benefits of Avocado Oil in Hair Oil :

- Deeply moisturizes and nourishes dry hair
- Strengthens hair shaft and reduces breakage
- Promotes hair growth with vitamins A, D, and E
- Protects hair from damage and UV rays
- Soothes and conditions the scalp[12]

CAMPBOR OIL:-

Family : Lauraceae

Biological Name : *Cinnamomum camphora*

Biological Source : Extracted from the wood of *Cinnamomum camphora* tree.

Chemical Constituents : Camphor, safrole, cineole

Benefits of Camphor Oil in Hair Oil :

- Stimulates blood circulation in the scalp
- Reduces dandruff and scalp irritation
- Provides a cooling and soothing effect
- Helps control hair fall
- Promotes stronger, healthier hair[13]

CASTOR OIL:-

Family : Euphorbiaceae

Biological Name : *Ricinus communis*

Biological Source : Oil extracted from the seeds of *Ricinus communis* Linn

Chemical Constituents : Ricinoleic acid, oleic acid, linoleic acid, tocopherols

Benefits of Castor Oil in Hair Oil :

- Promotes hair growth and thickness
- Strengthens hair roots and prevents breakage
- Deeply moisturizes and conditions dry hair
- Reduces dandruff and scalp inflammation
- Adds shine and smoothness to hair[14]

ALMOND OIL :-

Family : Rosaceae

Biological Name : *Prunus amygdalus*

Biological Source : Oil extracted from the dried seeds (nuts) of *Prunus amygdalus* var. *dulcis*.

Chemical Constituents : Oleic acid, linoleic acid, vitamin E, phytosterols, proteins

Benefits of Almond Oil in Hair Oil :

- Nourishes and softens hair
- Reduces scalp inflammation and dryness
- Strengthens hair and prevents split ends
- Promotes healthy hair growth
- Adds shine and smooth texture to hair[15]

COCONUT OIL:-

Family : Arecaceae

Biological Name : *Cocos nucifera*

Biological Source : Oil extracted from the dried kernel (copra) of *Cocos nucifera*.

Chemical Constituents : Lauric acid, capric acid, myristic acid, vitamin E, polyphenols

Benefits of Almond Oil in Hair Oil :

- Deeply nourishes and moisturizes hair
- Prevents protein loss and hair damage
- Strengthens hair roots and reduces breakage

- Has antimicrobial properties for scalp health
- Adds shine and improves hair texture[16]

FORMULATION TABLE :

Sr.no.	Ingredients	Quantity	Role Of Ingredient
1.	Shikakai Extract	5%	Anti-dandruff and add natural shine
2.	Onion juice	4%	Reduce hair thinning
3.	Neem Extract	2%	Antimicrobial
4.	Hibiscus Extract	2%	Thickening of hair
5.	Curry Leaves Extract	2%	Moisturizes the scalp
6.	Avocado Oil	5%	Nourish damaged hair
7.	Camphor Oil	8%	Reduce dandruff and itchiness
8.	Castor Oil	7%	Promote hair growth
9.	Almond Oil	5%	Rich in Vit E and strengthen the hair
10.	Coconut Oil	60%	Stimulates hair growth unclogging pores

MATERIAL AND METHOD :**Extraction process:**

The technique used to separate active ingredients from plants , herbs , or the other natural sources is known as the extraction process. To extract the desired components , plant materials are usually broken down.

❖ **Extraction of Shikakai Extract:**

1. Plant Material Used: Dried pods of Acacia concinna (Shikakai)
2. Cleaning: Pods are cleaned with water to remove dirt and impurities.
3. Drying: Washed pods are shade-dried to retain active components.
4. Powdering: Dried pods are ground into a coarse powder.
5. Extraction Method:

Type: Decoction or oil infusion

Procedure (Oil Infusion):

- 10–15 g of shikakai powder is added to 100–150 mL of base oil (e.g., coconut or castor oil).
- The mixture is heated gently using a water bath for 1–2 hours.
- Stir continuously to avoid charring.

- Filter the oil through muslin cloth while warm.
6. Storage: Store the shikakai-infused oil in a clean, dry, airtight container away from direct light.[17]



❖ Extraction of Onion Juice Extract:

1. Selection: Choose fresh, healthy onions (*Allium cepa*).
2. Cleaning: Wash thoroughly to remove dirt and impurities.
3. Peeling & Chopping: Peel and chop the onions into small pieces.
4. Grinding: Grind or blend the pieces into a fine paste.
5. Filtration: Filter the paste using muslin cloth to extract the juice.
6. Usage: Mix the fresh onion juice directly into the base oil (e.g., coconut oil) and gently heat for infusion.[18]



Formulation of Hair Oil :

Step 1: Oil Base Preparation

Measure and mix the base oils: Coconut oil, Almond oil, Castor oil[19],[20]&[21], Avocado oil, and Camphor oil in a clean stainless steel vessel.

Step 2: Herbal Infusion

Add the powdered herbs: Neem leaves, Shikakai, Hibiscus petals, and Curry leaves into the oil mixture.

Heat the mixture gently using a water bath or low flame for 1 to 1.5 hours. Stir occasionally to avoid sticking or burning. Allow the herbal components to infuse into the oil.

Step 3: Filtration

Once heating is complete, allow the mixture to cool slightly.

Filter the oil using a clean muslin cloth or fine sieve to remove the solid herbal residues.

Step 4: Addition of Onion Juice

Add fresh onion juice (10 mL) to the filtered oil. Mix thoroughly to ensure even distribution.

Step 5: Storage

Store the final polyherbal hair oil in a clean, Clear glass bottle or airtight container. Keep in a cool, dry place away from direct sunlight.[22]

EVALUATION OF PARAMETER:

The prepared polyherbal hair oil was subjected to various physicochemical and organoleptic evaluations to ensure its quality, stability, and effectiveness.

1. Physical Appearance

Observation: Color, clarity, consistency, and odor. **Method:** Visual and organoleptic examination.

2. pH Measurement

Objective: To ensure compatibility with scalp and skin. **Method:** Step1: Mix 1 part oil + 3 parts distilled water.

Step 2: Shake well to form an emulsion. Step 3: Let sit for 2–3 minutes.

Step 4: Dip pH strip (or insert pH meter) into the liquid.

Step 5: Read pH, using pH meter (usually ranges between 6.0–7.0).

3. Refractive Index

Objective: To check purity and detect adulteration.

Method: Step 1: Place a drop of oil on a clean refractometer prism.

Step 2: Close the cover to spread the oil evenly.

Step 3: Look through the eyepiece (or read digital display).

Step 4: Calculate: $\frac{\sin i}{\sin r} =$

Angle of incidence (60°)

r = Angle of refraction (39.5°)

n = Refractive index of the polyherbal hair oil

$\frac{\sin i}{\sin r} = \frac{\sin 60^\circ}{\sin 39.5^\circ} = \frac{0.8660}{0.5664} = 1.52$

4. Specific Gravity

Objective: To evaluate the density of the oil.

Method: Step 1: Weigh an empty pycnometer (or small bottle) – record as W_1 .

Step 2: Fill with distilled water, weigh – record as W_2 .

Step 3: Empty and dry, fill with hair oil, weigh – record as W_3 . Step 4: Calculate:

Specific Gravity = $(W_3 - W_1) / (W_2 - W_1)$ W_1 (empty pycnometer) = 50 g

W_2 (with water) = 100 g

W_3 (with hair oil) = 97 g

Specific Gravity = $(W_3 - W_1) / (W_2 - W_1) = (97 - 50) / (100 - 50) = 47/50 = 0.94$

**5. Acid Value**

Objective: Indicates the amount of free fatty acids.

Method: Step 1: Weigh 5 g of hair oil into a flask.

Step 2: Add 50 mL of neutral alcohol (ethanol or isopropanol). Step 3: Add 1–2 drops of phenolphthalein indicator.

Step 4: Titrate with 0.1 N NaOH until pale pink persists.

Step 5: Calculate : Acid value: Volume of NaOH(ml) x 5.61/ Weight of oil(g) Weight of oil = 5 g

Volume of 0.1 N NaOH used in titration = 2.0 ml

Acid value: Volume of NaOH(ml) x 5.61/ Weight of oil(g) = $2.0 \times 5.61 / 5 = 11.22 / 5 = 2.24$ mg KOH/g



6. Saponification Value

Objective: To determine the average molecular weight (chain length) of fatty acids. **Method:** Step 1: Weigh 2 g of hair oil into a flask.

Step 2: Add 25 mL of 0.5 N alcoholic KOH (pre-boiled, cooled). Step 3: Reflux the mixture for 30 minutes.

Step 4: Titrate hot with 0.5 N HCl using phenolphthalein. Step 5: Run a blank (same process without oil).

Step 6: Calculate : Saponification Value= $(B-S) \times 28.05 / W$ W (weight of oil) = 2.00 g

B (blank titration) = 25.0 ML

S (sample titration) = 10.5 mL

Saponification Value= $(B-S) \times 28.05 / W = 406.725/2.00 = 203.36$ mg KOH/g



7. Peroxide Value

Objective: To assess the extent of oxidation and rancidity.

Method: Step 1: Weigh 5 g of hair oil into a dry flask.

Step 2: Add 30 mL acetic acid–chloroform (3:2 ratio).

Step 3: Add 0.5 mL saturated KI, shake, and keep in dark for 1 min. Step 4: Add 30 mL distilled water.

Step 5: Titrate with 0.01 N sodium thiosulfate using starch indicator (blue → colorless). Step 6: Calculate: Peroxide Value= $S \times N \times 1000 / W$

S=Vol. of Sodium thiosulfate(2.3ml)

N= Normality of Sodium thiosulfate(0.01N)

W=Weight of Oil sample(5gm)

Peroxide Value= $S \times N \times 1000 / W = 2.3 \times 0.01 \times 1000 / 5 = 4.6$ meq O₂/kg

8. Spreadability

Objective: Measures how easily the oil spreads on the scalp.

Method: Step 1: Take a fixed amount (e.g., 1g) of hair oil and place it at the center of a clean glass slide.

Step 2: Place another glass slide on top to sandwich the oil.

Step 3: Apply a known weight (e.g., 500g) on the top slide for 5 minutes.

Step 4: Remove the weight and measure the diameter or area of the spread oil using a ruler or scale.

Step 5: Record the result. Greater diameter = better spreadability.

9. Stability Studies

Objective: To check the oil's stability under different storage conditions.

Method: Store at various temperatures (e.g., 25°C, 40°C, 4°C) for 3 months and monitor changes in color, odor, and consistency.[20]

RESULT:

After formulation, the polyherbal hair oil was subjected to a series of evaluation parameters to assess its physical properties, stability, and quality. These tests were conducted to ensure the product meets the desired standards for cosmetic and therapeutic application. The observed results are indicative of a stable, effective, and user-friendly hair oil formulation. The findings are summarized in the table below.

Sr.No.	Parameter	Observation/Value
1	Appearance	Clear, dark green liquid with herbal odor
2	pH	6.5
3	Specific Gravity	0.94
4	Refractive Index	1.52
5	Acid Value	2.24 mg KOH/g
6	Saponification Value	203.36 mg KOH/g
7	Peroxide Value	4.6 meq O ₂ /kg
8	Spreadability	Good
9	Stability	Stable for 3 months at various conditions with no phase separation or odour change



Before 3 Months

After 3 Months

Figure. Polyherbal Hair Oil**DISCUSSION:**

The polyherbal hair oil showed good physical and chemical stability. It had a pleasant appearance, suitable pH (6.5), making it easy to apply. The specific gravity and refractive index confirmed the oil's purity. Low acid and peroxide values indicated good stability and minimal risk of rancidity. The oil remained stable under different storage conditions for 30 days. Overall, the formulation is effective, safe, and suitable for hair care use.

CONCLUSION:

The formulated polyherbal hair oil, enriched with natural ingredients like coconut oil, almond oil, neem, hibiscus, and onion juice, demonstrated excellent physicochemical properties, spreadability and stability. It is safe, effective, and suitable for promoting hair growth, reducing hair fall, and improving overall scalp health. This formulation offers a natural and beneficial alternative to chemical-based hair care products.

REFERENCE:

1. Maiti, S., & Mandal, S. (2020). J. Pharmacogn. Phytochem., 334-338; 1[1]
2. Jain, S., & Vyas, A. (2018). Int. J. Res. Pharm. Pharm. Sci., 27–30; 1[2]
3. Trease, G.E., & Evans, W.C. (2002). Pharmacognosy, 15th ed; 2[3]
4. Sharma, P., & Handa, S.S. (1999). Indian J. Nat. Prod., 3-10; 2[4]
5. Kaur, G., & Arora, S. (2015). Herbal Cosmetics: Trends in Skin and Hair Care. International Journal of Pharmaceutical Sciences Review and Research, 24–28; 2[5]
6. Khandelwal, K.R. (2010). Practical Pharmacognosy, 19th ed; 3[6]
7. Upadhyay, R. K. (2017). Hair loss, prevention and treatment by traditional Indian medicine. International Journal of Green Pharmacy, S135–S142; 4[7]
8. Ali, B., & Al-Wabel, N.A. (2015). Essential oils used in aromatherapy: A systemic review. Asian Pacific Journal of Tropical Biomedicine, 601–611; 5[8]
9. de Oliveira, A. P., et al. (2013). Avocado oil: Characteristics and applications. Acta Scientiarum. Technology, 627–632; 6[9]
10. de Oliveira, A. P., et al. (2013). Avocado oil: Characteristics and applications. Acta Scientiarum. Technology, 627–632; 7[10]
11. Sundararajan, B., et al. (2011). A study on the effect of Hibiscus rosa-sinensis on hair growth activity in rats. International Journal of PharmTech Research, 426–430; 8[11]
12. Subapriya, R., & Nagini, S. (2005). Medicinal properties of neem leaves: A review. Current Medicinal Chemistry – Anti-Cancer Agents, 149–156; 9[12]
13. Sharquie, K. E., & Al-Obaidi, H. K. (2002). Onion juice (*Allium cepa*), a new topical treatment for alopecia areata. Journal of Dermatology, 343–346; 10[13]
14. Ogunniyi, D. S. (2006). Castor oil: A vital industrial raw material. Bioresource Technology, 1086–1091; 11[14]
15. Riaz, M., et al. (2014). The therapeutic potential of *Prunus amygdalus* (almond): A review. Journal of Medicinal Plants Research, 1014–1021; 12[15]
16. DebMandal, M., & Mandal, S. (2011). Coconut (*Cocos nucifera* L.): In health promotion and disease prevention. Asian Pacific Journal of Tropical Medicine, 241–247; 13[16]
17. Kumar, R., & Sahoo, M. (2016). Extraction and Evaluation of Saponins from *Acacia concinna* (Shikakai) for Herbal Hair Formulation. International Journal of Pharmacognosy and Phytochemical Research, 682–686; 15[17]
18. Sharquie, K. E., & Al-Obaidi, H. K. (2002). Onion juice (*Allium cepa*), a new topical treatment for alopecia areata. Journal of Dermatology, 343–346; 16[18]
19. Asian Journal of Pharmaceutical Research (2018) Preparation and Evaluation of Polyherbal Hair Oil- An Effective Cosmetic 8th Vol 17[19]
20. Fong P, Tong HH, Ng KH, Lao CK, Chong CI, Chao CM. In silico prediction of prostaglandin D2 synthase inhibitors from herbal constituents for the treatment of hair loss. Journal of ethnopharmacology. 2015 Dec 4;175:470-80.17[20]
21. Gupta A, Malviya R, Singh TP, Sharma PK. Indian medicinal plants used in hair care cosmetics: a short review. Pharm Lin TK, Zhong L, Santiago JL. Anti-inflammatory and skin barrier repair effects of topical application of some plant oils. International journal of molecular sciences. 2017 Dec 27;19(1):70.acognosy Journal. 2010 Jun 1;2(10):361-4.17[21]
22. Rathi, S., & Rathi, V. (2015). Int. J. Pharm. Sci. Res., 2956-2960; 17[22]
23. Sharma, P., & Handa, S.S. (1999). Indian J. Nat. Prod. 3-10; 21[23]