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**Research Article**

# Formulation And Evaluation of Herbal Nagarmotha Hair Oil

**Mahesh Thakare *[1], Arti Date[2], Utkarsha Mane[3], Vijaykumar Kale[4], Vaibhav Narwade[5]**

*[1]HOD Department of Pharmaceutics Kasturi Shikshan Sanstha College of Pharmacy, Shikrapur, Pune-412208*
*[2]Kasturi Shikshan Sanstha College of Pharmacy, Shikrapur, Pune-412208*
*[3]Kasturi Shikshan Sanstha College of Pharmacy, Shikrapur, Pune-412208*
*[4]Principal Department of Pharmacology Kasturi Shikshan Sanstha College of Pharmacy, Shikrapur, Pune-412208*
*[5]Assistant Professor Department of Pharmaceutics Kasturi Shikshan Sanstha College of Pharmacy, Shikrapur, Pune-412208*

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## ABSTRACT

Herbal formulations generally have fewer side effects compared to synthetic drugs, which has led to a growing interest in them. The primary chemical compounds found in herbs include essential oils, flavonoids, terpenoids, and cyperacea. The key chemical components in these herbs are essential oils, flavonoids, terpenoids, sesquiterpenes, cyproten, cyperene, aselinene, rotundone, valencene, cyperol, gurjunene, transcalamenenene, cad/'Alene, cyperoutundone, mustskone, isocyperol, acyperone, and others. The study focuses on isolating oil from Cyperus rotundus and analysing the chemical composition of the essential oil derived from the roots of C. rotundus, commonly known as nagarmotha in India, which has a significant role in Ayurveda. The rhizomes of C. rotundus are considered aromatic, astringent, analgesic, diuretic, carminative, stimulant, antitussive, sedative, antibacterial, anti-helminthic, anti-inflammatory, and anti-rheumatic. The aim of the current study is to prepare and evaluate a polyherbal formulation using Emblica officinalis (Amla), Aloe vera (Aloe barbadensis Miller), Almond (Prunus dulcis), and Jasmin (Jasminum), along with C. rotundus, which is commonly called Nagarmotha, Purple Nutsedge, or Nut, belonging to the Cyperaceae family. Nagarmotha hair oil offers a natural and effective solution for various hair and scalp issues, leveraging the healing properties of traditional Ayurvedic herbs. Its regular use can lead to improved scalp health, reduced hair fall, and enhanced hair quality. Usage Recommendations -To utilize Nagarmotha oil, mix 4–5 drops with a carrier oil such as coconut or almond oil.

***Corresponding Author:** Mahesh Thakare
**Address:** *Kasturi Shikshan Sanstha College of Pharmacy, Shikrapur, Pune-412208*
**Email** ✉: datearti04@gmail.com

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Apply the mixture to the scalp and hair, leave it for 20–30 minutes, and then wash off with a mild shampoo. This regimen can be followed 2–3 times a week for optimal results

## INTRODUCTION

The combination of digital technology and
A . Cyperus rotundus Family – cypereceae

Purple nutsedge, also known as Cyperus rotundus, is a widespread perennial weed indigenous to India but now found in tropical, subtropical, and temperate regions worldwide. This plant features slender, scaly, creeping rhizomes that are bulbous at the base, originating singly from tubers approximately 1-3 cm in length. The tubers are externally dark brown to black and reddish-white inside, emitting a distinctive aroma. The stems can reach heights of up to 60 cm, with linear, dark green leaves that have a distinct midrib and are typically shorter than the flowering stems. The inflorescence consists of a terminal, open umbel surrounded by several leafy bracts, bearing tiny flowers encased in reddish-brown husks. The fruit is a three-angled, oblong-ovate achene that is yellow when unripe and turns black upon maturing.

Cyperus rotundus is renowned for its extensive medicinal applications across various traditional medicine systems. It has been utilized to treat ailments such as stomach disorders, wounds, boils, and blisters. Pharmacological studies have identified numerous bioactive compounds in the plant, attributing to it properties like anti-inflammatory, anti- diabetic, anti-diarrheal, cytoprotective, anti-mutagenic, anti-microbial, anti-bacterial, antioxidant, cytotoxic, apoptotic, anti-pyretic, and analgesic activities.

However, beyond its beneficial uses, Cyperus rotundus is also considered one of the world's most invasive weeds. Its complex underground network of tubers, basal bulbs, rhizomes, and fibrous roots enables it to survive adverse conditions and reproduce prolifically, making it a significant threat to crops and natural ecosystems in many regions.

**Hair -**

hair is a natural part of our appearance as well as reflection of our personalities . hair can also provide some protection such as preventing the sun ray from reaching our scalp .

**Structure of hair –**

Human hair comprises two: the primary components hair shaft and the hair follicle.

**Hair Shaft**

The hair shaft is the visible part of the hair that extends above the skin's surface. It consists of three main layers:

1. Cuticle: The outermost layer, composed of overlapping, flat, scale-like cells. These cells protect the inner layers and contribute to the hair's shine and smoothness.
2. Cortex: The thick middle layer, containing elongated keratinized cells. It provides strength, elasticity, and color to the hair, as it houses melanin granules.

3. Medulla: The innermost layer, which may be absent in some hair types. When present, it consists of loosely packed cells and air spaces. Its function is not entirely understood, but it may contribute to the hair's flexibility.

**Hair Follicle**

The hair follicle is a tubular structure located beneath the skin's surface, responsible for hair growth. Key components include:

- Papilla: Located at the base of the follicle, it contains blood vessels that nourish the growing hair.
- Germinal Matrix: A region where cells rapidly divide and form the hair shaft.
- Bulb: The rounded base of the follicle, housing stem cells that produce hair and contribute to follicle regeneration.
- Bulge: An area above the bulb containing stem cells that regenerate hair follicles and other skin components.
- Arrector Pili Muscle: A small muscle attached to the follicle; its contraction causes hair to stand on end, a phenomenon known as "goosebumps."

Sebaceous Gland: Secretes sebum (natural oil) into the follicle, lubricating the hair and skin

.


**Fig no 1 – structure of hair**

**Hair growth cycle :-**

The hair growth cycle, although it may seem like a simple process, actually consists of four distinct phases. This process has been studied in detail to better understand how hair grows and what can be done to prevent or treat premature hair loss. The first three phases—anagen, catagen, and telogen—are responsible for the growth and maturation of hair, as well as the activity of hair follicles that produce individual hairs. During the final phase, exogen, old hairs are shed, and new hairs begin to take their place.

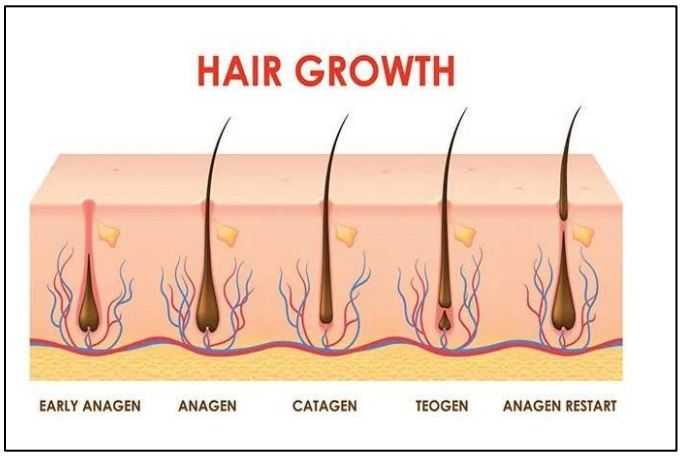


**Fig no 2 – Hair growth cycle**

**a.. Anagen phase (Growth phase )**

- Duration -approximately 2 to 7 years
- Description – During this phase , hair follicles are actively producing new hair cells , leading to human hair length of this phase determines the maximum length of hair growth cycle .
- Propertion – About 85 -90% of hair on your scalp are in the anaphase at any given time .

**b. . Catagen phase (Transition Phase )**

- Duration – Approximately 2 to 3 weeks .
- Description – This short transitional phase marks the end of active hair growth . during this phase , hair follicle shrink , and hair detecha from the blood supply , transiting into a resting state .
- Proportion – only about 1-3 %of your hair is in this phase at given any time .

**c.. Telogen phase (Resting phase)**

- Duration – Approximetly 2 to 4 months .
- Description – A resting period where hair growth ceases and the hair ranaim in the follicle without actively growing .
- Proportion – the hair on your scalp are in this phase .

**d. . Exogen phase (Sheding Phase )**

- Duration – Overlapes with the telagen phase .
- Description – The final stage when individual hair strand are released from the follicle and fall out . This shedding process is a natural part of the cycle with individual losing an average of 50 – 100 hair per day .
- Proportion – This phase is considered part of the telogen phase and is not always distinguished seperatly.

**Table no 1 - Vernacular names of Cyperus rotundus**

| | |
|---|---|
| English | Coco grass , nut grass , nut sedge , purple nutgrass , purpie nutsedge |

| | |
|---|---|
| Hindi | Nagarmotha , korehi-jhar , motha , mutha |
| sanskrit | Chakranksha , charukesaradba , ambuda |
| Urdu | Saad kuf |
| Arabic | Soad , soadekufi |
| bengali | Nagarmotha , moothoo , musta |
| Burma | Vomonniu |
| Gujrat | Nagaramothaya |
| Malya | Muahkezamin |

**Table no 2 – Taxonomic Classification of Cyperus rotundus**

| | | |
|---|---|---|
| 1. | Kingdom | plantae |
| 2 . | Sub kingdom | tracheobionta |
| 3 . | Division | magnoliophyta |
| 4 . | Class | Liliopsida |
| 5 . | Subclass | Poales |
| 6 . | Family | Cyperacae |
| 7 . | Genus | Cyperus |
| 8 . | Species | Rotundus |

**Fig no 3 - Nagarmotha roots**

**Table No 3 - Organoleptic Properties of Cyprus Rotundus Rhizomes**

| Sr. No. | Organoleptic Characters | Cyprus Rotunds rhizomes |
|---|---|---|
| 1 . | Type | Simple |
| 2 . | Colour | Dark brown |
| 3 . | Odour | Distinct |
| 4 . | Taste | Tastless |
| 5 . | Texture | Coarse |
| 6 . | Fracture | Fibrous |
| 7 . | Size | 10-20 cm in length and 0.8-2.5 cm in width |

**C. Benefits of Nagarmotha**

1. Nagarmotha helps reduce hair fall caused by dandruff.
2. Consistent use of nagarmotha oil enhances hair texture, adds shine, and promotes hair growth.
3. Dandruff is commonly caused by an imbalance of pitta or kapha dosha.
4. Nagarmotha and its oil have balancing effects on pitta and kapha, helping to control dandruff and alleviate excessive dryness.
5. Nagarmotha aids in preventing hair loss linked to dandruff.
6. By effectively reducing stress, it helps prevent hair fall and premature graying.
7. It is beneficial for treating split ends.
8. It repairs damaged hair.
9. It promotes healthy hair growth.
10. It adds volume to the hair.
11. It treats and moisturizes a dry scalp

**D. Description of Nagarmotha Roots**

1. Nagarmotha is a perennial plant with fibrous roots, typically growing to a height of 7 to 40 cm.
2. It reproduces through the production of tubers, basal bulbs, rhizomes, and fibrous roots.
3. The rhizomes initially appear white and fleshy, covered with scaly leaves.
4. Over time, these rhizomes become wiry, fibrous, and turn dark brown.
5. The rhizomes are highly valued for the oil they contain .

**Therapeutic uses of Cyperus rotundus**

- Anti-inflammatory Activity
- Analgesic Activity .
- Anti-convulsant Activity .
- Anti-diarrheol Activity .
- Anti-microbial Activity .
- Anti-cancer Activity .
- Anti-oxidant Activity.

## LITERATURE REVIEW –

**1. . Pooley E . A (Natal Flora Publication Trust ; Durban 1998)**

A Nagarmotha (*Cyperus scariosus*) hair oil can incorporate the broader scientific knowledge of the plant's properties and its applications in hair care. It should be noted that this review does not rely on the Pooley reference mentioned earlier, as that particular source focuses on wildflowers native to KwaZulu-Natal and the Eastern regions of South Africa, and is unlikely to provide in-depth information on the pharmacological or cosmetic uses of *Cyperus scariosus*. Nonetheless, regional specifics can be explored if required. Nagarmotha, or *Cyperus scariosus*, is a herbaceous perennial plant that thrives in tropical and subtropical climates. It is part of the Cyperaceae family and shares a close botanical relationship with *Cyperus rotundus* (commonly known as nut grass). In Ayurvedic medicine, Nagarmotha is valued as a "Rasayana" herb, recognized for its rejuvenating and restorative qualities. The essential oil derived from its roots is frequently utilized in traditional healing practices and cosmetic products, particularly for hair and skin treatments .

**2. Gordon-Gray K . D (National Botanical inatituent ; Pretoria 1995)**

This explores the scientific, traditional, and cosmetic significance of Nagarmotha (*Cyperus scariosus*) hair oil. It does not draw directly from Gordon-Gray K.D. (1995), as that publication mainly focuses on the botanical characteristics of the Cyperaceae family in the Natal region, offering limited insight into the plant's medicinal or cosmetic applications. Nonetheless, such botanical references are useful for understanding the species' classification and geographic distribution. *Cyperus scariosus*, also referred to as Nagarmotha or Nutgrass, is a perennial plant belonging to the Cyperaceae family, commonly found in tropical and subtropical regions of Asia and Africa. It is often mistaken for its close relative, *Cyperus rotundus*. The plant has a long history of use in traditional Indian healing systems such as Ayurveda, Siddha, and Unani. The essential oil extracted from its dried rhizomes is highly valued for its therapeutic and aromatic qualities, particularly in formulations designed for skin and hair care.

**3. Oliver-Bever B . (Medical Plant in tropical west Africa .1986)**

The scientific, traditional, and cosmetic importance of Nagarmotha (*Cyperus scariosus*) hair oil. It does not specifically reference Oliver-Bever B. (1986), as that work primarily addresses the use of medicinal plants in West Africa and lacks detailed information on the cosmetic or pharmacological applications of *Cyperus scariosus*. Nevertheless, such ethnobotanical sources are valuable for understanding the traditional use of related species within the Cyperaceae family. Commonly referred to as Nagarmotha or Nutgrass, *Cyperus scariosus* is a perennial herb from the Cyperaceae family, native to tropical and subtropical parts of Asia and Africa. Due to its physical resemblance, it is frequently mistaken for *Cyperus rotundus*. The plant holds a significant place in traditional healing systems such as Ayurveda, Siddha, and Unani, where it is used for its diverse therapeutic benefits. The essential oil derived

from its rhizomes is especially prized for its distinctive fragrance and its anti-inflammatory and antimicrobial properties, making it a common ingredient in natural hair and skincare products.

4. **. Samuelsson G. (Drug of natural origin . 2004**)

The scientific, traditional, and cosmetic significance of Nagarmotha (*Cyperus scariosus*) hair oil. It does not specifically reference Samuelsson G. (2004) — *Drugs of Natural Origin: A Textbook of Pharmacognosy* — as that text provides a general overview of natural compounds without focusing on the cosmetic uses of *Cyperus scariosus*. However, such resources are helpful for understanding the broader context of essential oils from medicinal plants. *Cyperus scariosus*, commonly called Nagarmotha or Nutgrass, is a perennial herb from the Cyperaceae family, native to tropical and subtropical areas of Asia and Africa. Often mistaken for *Cyperus rotundus* due to their similar appearance, the rhizomes of *C. scariosus* are used to extract an essential oil. This oil is highly valued in traditional medicine systems like Ayurveda, Siddha, and Unani for its medicinal properties. It is particularly popular in hair care formulations due .

5. **. Hikino H ( Chemical ana Pharmaceutical Bulleti . 1968 )**

Nagarmotha (Cyperus rotundus), also known as Nutgrass, is a perennial plant widely utilized in Ayurvedic medicine for its diverse therapeutic properties. Its essential oil, extracted from the rhizomes, has gained popularity in hair care formulations due to its purported benefits in promoting scalp health and hair vitality. Nagarmotha essential oil is rich in essential fatty acids, proteins, and B vitamins, along with minerals such as calcium, iron, and phosphorus. These constituents contribute to its anthelmintic, anti- inflammatory, antispasmodic, carminative, antifungal, and antibacterial properties. The presence of alkaloids in the plant's active components imparts analgesic effects, further enhancing its therapeutic profile.

6. **. Ohira s ( Phytochemistry . 1998)**

Nagarmotha, also known as **Cyperus rotundus**, is a perennial plant belonging to the Cyperaceae family. The rhizomes of this plant are rich in essential oils, alkaloids, and flavonoids, contributing to its therapeutic properties. These constituents are believed to possess antioxidant, anti-inflammatory, and antimicrobial activities, which are beneficial for scalp health and hair growth.

7. **. Gurib – fakim A (Medicinal plant traditional of yesterday and drug of tommarow 2006 )**

A study on the formulation and evaluation of Nagarmotha hair oil highlighted its efficacy in promoting hair growth and improving scalp condition. The research underscored the importance of integrating Nagarmotha oil with other herbal ingredients to enhance its therapeutic effects. The formulation was subjected to various tests, including moisture content, total ash, acid insoluble ash, water soluble ash, water insoluble ash, and

sulphated ash, to ensure its quality and effectiveness. The study concluded that Cyperus rotundus essential oil is a safe and cost-effective option for hair care.

**Need Of Work**

1. **Rising Demand for Herbal and Natural Hair Care Products**

- Consumers increasingly prefer herbal products over synthetic ones due to safety, fewer side effects, and environmental sustainability.
- Nagarmotha, a medicinal plant used in Ayurveda, has traditional significance in promoting scalp and hair health.

2. **Medicinal Properties of Nagarmotha**

- Nagarmotha (Cyperus rotundus) contains flavonoids, terpenoids, and essential oils that exhibit:
  - Anti-inflammatory
  - Antibacterial
  - Antifungal
  - Antioxidant properties
- These properties help in treating dandruff, itchy scalp, and hair fall

3. **Lack of Standardized Herbal Formulations**

- Although traditionally used, there are few standardized, scientifically evaluated formulations containing Nagarmotha.
- Formulating a stable and effective hair oil ensures consistency in therapeutic action and consumer acceptability.

4. **Evaluation Ensures Safety and Efficacy**

- Systematic evaluation (physicochemical tests, stability studies, antimicrobial activity, etc.) ensures:
  - Product safety
  - Efficacy against scalp disorders
  - Shelf-life stability
- Evaluation helps meet regulatory and consumer quality standards.

5. **Scope for Value Addition and Commercialization**

- A scientifically validated herbal hair oil can lead to:
  - Value addition to traditional medicine
  - Scalable commercial product development
  - Income generation for small-scale producers and AYUSH sectors

6. **Contribution to Traditional and Modern Medicine Integration**

- Promotes integration of Ayurvedic wisdom with modern pharmaceutical approaches.
- Encourages scientific validation of ethnomedicinal claims.

**Aim and Objective:-**

**Aim** – To perform Formulation and Evaluation of Nagarmotha Hair Oil .

**Obejective : -**

1. Reduces Hair Fall and Promotes Growth Regular use of Nagarmotha oil nourishes the scalp, fortifies hair follicles, and stimulates hair growth, effectively reducing hair fall and promoting healthier hair.
2. Combats Dandruff and Dry Scalp

The oil's Pitta-Kapha balancing properties help control dandruff and alleviate dryness, leading to a healthier scalp environment.

3. Prevents Premature Greying
   Nagarmotha oil contains antioxidants that help prevent premature greying, maintaining natural hair color.
4. Enhances Hair Texture and Shine
   Regular use improves hair texture, adds shine, and provides volume, resulting in soft, silky, and full-bodied hair.
5. Alleviates Scalp Irritation and Itchiness

The oil's antibacterial and antifungal properties help soothe an itchy, flaky scalp, providing relief from irritation.

6. Moisturizes and Repairs Damaged Hair

Nagarmotha oil moisturizes the scalp and repairs damaged hair, preventing split ends and promoting overall hair health.

7.Reduces Stress and Improves Sleep Quality

The oil's calming effects help manage stress and anxiety, contributing to better sleep quality and overall well-being.

**PLAN OF WORK :-**


**Experimental Work Material and methods –**

**Material –**

**Crude drug :**

- Nagarmotha powder
- Almond oil
- Aloe vera gel
- Amla powder Hibiscus
- Coconut oil

**Apparatus –**

| **Sr . No** | **Apparatus** | **Requirment / quantity** |
|---|---|---|
| 1 | Beaker | 3 |
| 2 | Measuring cyliender | 4 |
| 3 | Mortar peatle | 1 |
| 4 | Glass rod | 2 |
| 5 | Burner | 1 |
| 6 | pipette | 2 |
| 7 | Muslin cloth | 1 |
| 8 | funnel | 1 |
| 9 | Amber colour bottle | 1 |

**Table no 4 - Role of herbs in herbal hair oil**

| **Sr . No .** | **Ingredient** | **Picture** | **Important** |
|---|---|---|---|
| 1 . | Nagarmotha powder |  | Control excess 0il<br>Promotes hair growth<br>Reduce dandruff<br>Natural fragrance<br>Prevent hair fall<br>Detoxifies the scalp. |
| 2 . | Amla |  | Hair growth |

| | | | |
|---|---|---|---|
| 3 . | Hibiscus |  | Stop prevent hair breakage |
| 4 . | Aloe vera |  | Reduce dandruff |
| 5 . | Almond Oil |  | Hydrating and nourshing properties . |
| 6 . | Coconut oil |  | Hair growth |

**Drug and Excipient profile**

**Nagarmotha Roots**

**Fig no 4 – Nagarmotha root Botanical Name – Cyperus Scariosus**

**Family –** cypereceae

**Chemical Constituent –**

1. **Sesquiterpenes:**
- Rotundone: A sesquiterpene ketone imparting a peppery aroma, also found in black pepper and certain wines.
- Mustakone: A tricyclic sesquiterpenoid contributing to the plant's distinctive scent.
- Cyperotundone: An organic ketone identified in the essential oils of Cyperus species.

2. **Other Terpenoids:**
- Cadalene: A bicyclic sesquiterpene with a woody aroma.
- Cyprotene: A sesquiterpene hydrocarbon.
- Cyperene: A sesquiterpene hydrocarbon.
- Cyperol: A sesquiterpene alcohol.
- α-Cyperone: A sesquiterpene ketone.

Valencene: A sesquiterpene with a citrus aroma

- Copaene: A sesquiterpene hydrocarbon.
- Gurjunene: A sesquiterpene hydrocarbon.
- Trans-calamenene: A sesquiterpene hydrocarbon
- D-cadinene: A sesquiterpene hydrocarbon.
- Gcalacorene: A sesquiterpene hydrocarbon.
- Amuurolene: A sesquiterpene hydrocarbon.
- Gmuurolene: A sesquiterpene hydrocarbon.
- Isocyperol: A sesquiterpene alcohol.
- Isokobusone: A sesquiterpene ketone.
- Kobusone: A sesquiterpene ketone**.**
- Limone: A monoterpene.
- Myristic acid: A fatty acid.
- Oleanolic acid: A triterpenoid.
- Oleic acid: A fatty acid.
- β-Pinene: A monoterpene.
- Patchoulenone: A sesquiterpene ketone.
- Rotundene: A sesquiterpene hydrocarbon.
- Rotundenol: A sesquiterpene alcohol.
- β-Selinene: A sesquiterpene hydrocarbon.

- Selinatriene: A sesquiterpene hydrocarbon.
- Sitosterol: A phytosterol.
- Stearic acid: A fatty acid.
- Sugeonol: A phenolic compound
- Sugebiol: A phenolic compound

**3. Flavonoids:**

- Kaempferol: A flavonoid with antioxidant properties.
- Luteolin: A flavonoid with anti-inflammatory properties.
- Quercetin: A flavonoid with antioxidant and anti-inflammatory properties**.**

**4. Other Compounds:**

- Cellulose triacetate: A compound with potential applications in materials science.

These constituents contribute to Nagarmotha's use in traditional medicine systems like Ayurveda and Traditional Chinese Medicine, where it is utilized for its digestive, anti- inflammatory, and antimicrobial properties. Additionally, its essential oil is employed in perfumery for its distinctive scent profile.

**Uses**

1. Nagarmotha helps reduce hair fall caused by dandruff.
2. Consistent use of nagarmotha oil enhances hair texture, adds shine, and promotes hair growth.
3. Dandruff is commonly caused by an imbalance of pitta or kapha dosha
4. Nagarmotha and its oil have balancing effects on pitta and kapha, helping to control dandruff and alleviate excessive dryness.
5. Nagarmotha aids in preventing hair loss linked to dandruff
6. By effectively reducing stress, it helps prevent hair fall and premature graying.
7. It is beneficial for treating split ends.

**Amla (Indian Gooseberry)**

**Fig no -5 Amla**

**Botanical name** – Phyllanthus emblica linn (phyllanthaceae)

**Family** – Euphorbiaceae

**Chemical constituent** –

**1. Phenolic Compounds**

Amla is rich in various phenolic compounds, including:

- Ellagitannins: Notably, emblicanin A and B, which constitute a significant portion of amla's tannin content. Other ellagitannins present are punigluconin, pedunculagin, chebulagic acid, chebulinic acid, corilagin, geraniin, isocorilagin, and corylagin.
- Gallotannins: Such as gallotannin and 1,2,3,6-tetra-O-galloyl-β-D-glucose.
- Other Phenolics: Including gallic acid, ellagic acid, cinnamic acid, mucic acid, 2,4-di-tert-butylphenol, and phenol, 3,5-bis (1,1-dimethylethyl).

**2. Flavonoids**

Amla contains several flavonoids, such as:

- Flavonols: Kaempferol and its derivatives like dihydrokaempferol, kaempferol 3- β-D-glucopyranoside, kaempferol 3-O-rhamnoside, and others.

Flavones: Apigenin, luteolin, and myricetin.

- Flavanones and Flavan-3-ols: Eriodictyol, naringenin, epicatechin, epigallocatechin 3-O-gallate, and gallocatechin.

**3. Alkaloids**

Amla contains alkaloids like:.

- Phyllantine and Phyllantidine: Nitrogenous compounds with potential medicinal properties.

**4. Vitamins**

Amla is an excellent source of vitamins:

- Vitamin C: Concentrations ranging from 600 to 1,300 mg per 100 g of fresh fruit.
- Other Vitamins: Includes carotene, niacin, riboflavin**.**

**5. Amino Acids**

Amla contains various amino acids, including:

- Glutamic acid, proline, aspartate, alanine, lysine, cystine**.**

**6. Fatty Acids**

Amla contains both saturated and unsaturated fatty acids:

- Saturated Fatty Acids: Palmitic acid, stearic acid, myristic acid.
- Unsaturated Fatty Acids: Linoleic acid, linolenic acid, oleic acid.

**7. Sugars**

Amla contains various sugars, including:

- D-glucose, D-fructose, D-myo-inositol, D-galacturonic acid, D-arabinosyl, D-rhamnosyl, D-xylosyl, D-glucosyl, D-mannosyl, D-galactosyl**.**

**8. Other Compounds**

Amla also contains:

Phytosterols: Such as lupeol

Terpenoids: Including lupol and glochidone.

- Essential Oils: Present in various parts of the plant.

Amla's rich chemical profile contributes to its potent antioxidant, anti-inflammatory, and neuroprotective properties, making it a valuable component in traditional medicine and modern nutraceuticals.

**Uses –**

1. Fortify the scalp and hair.
2. Delay premature hair graying.
3. Promote hair growth.
4. Address dandruff and dry scalp issues.
5. Combat parasitic scalp infections, such as lice.
6. Minimize hair loss.

**Hibiscus**

**Fig no 6 - Hibiscus Botanical name – Hibiscus rosa-sinensis**

**Family –** Malvaceae

**Chemical Constituent –**

**1. Phenolic Compounds**

**1.**Anthocyanins: The primary anthocyanins in Hibiscus sabdariffa are delphinidin- 3-sambubioside and cyanidin-3-sambubioside, contributing to the plant's red color and exhibiting significant antioxidant properties.

**2.**Flavonoids: Flavonoid compounds such as quercetin, kaempferol, and their derivatives are present in various parts of the plant, including leaves, flowers, and stems.

**3.**Phenolic Acids: Protocatechuic acid, a potent antioxidant, is found in the flowers and calyces of Hibiscus sabdariffa.

**2. Organic Acids**

- Citric Acid: Present in the flowers and calyces, contributing to the tart flavor.
- Tartaric Acid: Found in the leaves and stems.
- Oxalic Acid: Detected in various plant parts.

**3. Sugars**

- Monosaccharides: Glucose and fructose are present in the flowers and calyces.

- Disaccharides: Sucrose has been identified in the plant.

**4. Amino Acids**

- Essential Amino Acids: Leucine, isoleucine, and valine are among the amino acids identified in Hibiscus species.

**5. Fatty Acids**

- Saturated Fatty Acids: Palmitic acid and stearic acid are present in the seeds.
- Unsaturated Fatty Acids: Linoleic acid and oleic acid are found in the seeds.

**6. Alkaloids**

- Hibiscine: An alkaloid identified in the leaves and flowers.
- Other Alkaloids: Trace amounts of other alkaloids have been detected in various plant parts.

**7. Vitamins**

- Vitamin C: Present in the flowers and calyces, contributing to the plant's antioxidant properties.
- B-Vitamins: Thiamine, riboflavin, and niacin are found in the flowers.

**8. Terpenoids**

- Essential Oils: Contain compounds like eugenol and β-caryophyllene, contributing to the plant's aroma and potential medicinal properties.

**9. Sterols**

- β-Sitosterol: Detected in the seeds and leaves.
- Campesterol and Stigmasterol: Also present in various plant parts.

These chemical constituents contribute to the diverse pharmacological activities of Hibiscus sabdariffa, including antioxidant, anti-inflammatory, and antimicrobial effects. The presence of anthocyanins and flavonoids, in particular, underscores the potential health benefits of Hibiscus in traditional and modern medicine

**Uses –**

1. Promote hair growth
2. Prevent premature graying
3. Enhances hair texture
4. Strengthen hair follicle
5. Nourishes the scalp
6. Provide shine
7. Reduce dandruff and itchiness

**Aloe vera**

**Fig no 7 – Aloe vera Botanical name – Aloe barbadensis miller**

**Family –** Liliaceae

**Chemical Constituent -**

1. **Polysaccharides**
   - **Acemannan:** A prominent mannose-rich polysaccharide known for its immunomodulatory and wound-healing properties.
   - **Glucomannan:** polysaccharide with potential anti-inflammatory effects.
   - **Glycoproteins:** Comprising mannose, glucose, and rhamnose, these contribute to Aloe vera's soothing and moisturizing effects.
2. **Anthraquinones**
   - **Aloin A and B (Barbaloin):** Anthraquinone glycosides with laxative properties.
   - **Aloe-emodin:** An anthraquinone aglycone exhibiting potential anticancer and anti-inflammatory activities.
   - **Emodin:** Known for its antimicrobial and anti-inflammatory effects.
   - **Chrysophanol:** Displays antioxidant and antimicrobial properties.
3. **Flavonoids**
   - **Quercetin:** A flavonoid with antioxidant and anti-inflammatory properties.
   - **Rutin:** Known for its antioxidant and vasoprotective effects.
   - **Kaempferol:** Exhibits anti-inflammatory and anticancer activities.
4. **Vitamins**
   - **Vitamin C:** An antioxidant that supports skin health and immune function.
   - **Vitamin E (α-tocopherol):** Protects against oxidative stress and supports skin health.
   - **B-Vitamins:** Including B1, B2, B6, and B12, which play roles in metabolism and skin health.
   - **β-Carotene:** A precursor to vitamin A, important for skin health.
5. **Amino Acids**
   - Aloe vera contains 20 of the 22 required amino acids, including all 8 essential ones, which are vital for protein synthesis and tissue repair.
6. **Enzymes**
   - Amylase: Breaks down carbohydrates.
   - Lipase: Aids in fat digestion.
   - Cellulase: Assists in the breakdown of cellulose.
   - Catalase: Protects cells from oxidative damage.
   - Bradykinase: May reduce inflammation and pain.
7. **Fatty Acids**
   - Linoleic Acid: An essential fatty acid with anti-inflammatory properties.
   - Palmitic Acid: A saturated fatty acid found in Aloe vera.
8. **Minerals**
   - Aloe vera contains essential minerals such as calcium, magnesium, zinc, potassium, and iron, which support various physiological functions.
9. **Sterols**
   - **β-Sitosterol**: A plant sterol with anti-inflammatory and cholesterol-lowering effects.

- **Campesterol**: Contributes to the anti-inflammatory properties of Aloe vera.
- **Lupeol**: Exhibits anti-inflammatory and antimicrobial activities.

**10. Other Compounds**

- **Salicylic Acid**: Possesses analgesic and anti-inflammatory properties.
- **Lignins**: Enhance the penetration of other compounds through the skin.
- **Saponins**: Act as natural surfactants with antimicrobial properties.

These constituents collectively contribute to Aloe vera's renowned therapeutic and cosmetic benefits, including its antioxidant, anti-inflammatory, antimicrobial, and wound-healing properties. The plant's versatility makes it a valuable component in various health and skincare products.

**Uses –**

1. Aloe vera serves as an excellent conditioner, leaving your hair feeling smooth and looking shiny.
2. It supports hair growth, alleviates scalp itching, reduces dandruff, and nourishes your hair.
3. Hydration
4. Soothing and anti-inflammatory

**Almond Oil**

**Fig no 8 – Almond oil Botanical name – Prunus amygdalus dulcis**

**Botanical name** – Prunus amygdalus dulcis

**Family –** Rosaceae

**Chemical Constituent –**

Almond oil is primarily composed of triglycerides, with a significant proportion of unsaturated fatty acids. The major fatty acids in almond oil include oleic acid (C18:1), linoleic acid (C18:2), and palmitic acid (C16:0). Minor fatty acids such as stearic acid (C18:0), palmitoleic acid (C16:1), linolenic acid (C18:3), and arachidic acid (C20:0) are also present in smaller amounts. These fatty acids contribute to the oil's emollient properties, making it suitable for various applications.

In addition to fatty acids, almond oil contains several minor components:

- **Tocopherols (Vitamin E):** Almond oil is a good source of tocopherols, particularly α-tocopherol, which possess antioxidant properties beneficial for skin health.
- **Sterols:** The oil contains phytosterols such as β-sitosterol, Δ5-avenasterol, campesterol, and stigmasterol, which contribute to the oil's stability and potential health benefits.
- **Volatile Compounds:** Sweet almond oil may contain trace amounts of volatile compounds, though these are not typically present in significant concentrations.

These chemical constituents collectively contribute to almond oil's versatility and efficacy in various applications.

**Uses –**

1. Enhance Scalp Hair .
2. Improved Hair Texture .
3. Nourisshment and strength .
4. silkiness and shine.

**Coconut oil**

**Fig no 9 – Coconut oil**

**Botanical name –** cocos nucifera

**Family –** Arecaceae

**Chemical Constituent –**

Coconut oil, derived from the meat of mature coconuts (Cocos nucifera), is predominantly composed of saturated fatty acids, with a minor presence of unsaturated fats. The fatty acid profile includes:

- Lauric acid (C12:0): Approximately 41.8–50%
- Myristic acid (C14:0): Around 13.1–18.5%
- Palmitic acid (C16:0): About 7.5–10.5%
- Caprylic acid (C8:0): Approximately 5.4–9.5%
- Capric acid (C10:0): Around 4.5–9.7%
- Stearic acid (C18:0): About 1.0–3.2%
- Oleic acid (C18:1n-9): Approximately 5.0–8.2%

- Linoleic acid (C18:2n-6): Around 1.0–2.6%

These fatty acids contribute to coconut oil's emollient properties and its suitability for various applications.

In addition to fatty acids, coconut oil contains several minor components:

- **Tocopherols (Vitamin E):** Almond oil contains tocopherols, which have antioxidant properties beneficial for skin health.
- **Sterols:** Compounds like β-sitosterol, Δ5-avenasterol, and brassicasterol are present, contributing to the oil's stability and potential health benefits.
- **Volatile Compounds:** Sweet almond oil may contain trace amounts of volatile compounds, though these are not typically present in significant concentrations.

These chemical constituents collectively contribute to almond oil's versatility and efficacy in various applications.

**Uses –**

1. Prevent hair damage .
2. Improve scalp health .
3. prevent dandruff .
4. Stimulat hair growth and prevent hair fall

## Methodology :

**Formulation Of Nagarmotha hair oil**

1. Begin by accurately measuring the dried roots of Nagarmotha along with other herbs such as aloe vera, amla, coconut oil, and hibiscus.
2. Grind these ingredients together and mix them with 12 ml of almond oil.
3. Heat this mixture for 15 minutes, then filter it through muslin cloth.
4. Add more almond oil to the filtered solution to bring the volume back to 12 ml.
5. Finally, incorporate small amounts of color and flavoring agents, and store the oil in an amber-colored bottle to protect it from light.

**Table no 5 – Formulation of nagarmotha hair oil**

| Sr . No . | Ingredients | Quantity |
|---|---|---|
| 1 . | Nagarmotha powered | 10gm |
| 2 . | Almond oil | 12ml |
| 3 . | Aloe vera gel | 8gm |
| 4 . | Amla powdered | 8gm |
| 5 . | Hibiscus | 4gm |
| 6 . | Coconut oil | 4gm |

**Evaluation Of Nagarmotha Hair Oil :-**

1. **Sensitivity Test:**

- The formulated Nagarmotha hair oil was applied to a 1 $cm^2$ area of skin on the hand, which was then exposed to sunlight for 4–5 minutes.

2. **Acid Value Determination:**

- Preparation of 0.1 M KOH Solution: 0.56 grams of KOH pellets were dissolved in 100 ml of distilled water with continuous stirring.
- Sample Preparation: 10 ml of the hair oil was mixed with 25 ml each of ethanol and ether, then shaken well.
- Titration: 1 ml of phenolphthalein solution was added to the mixture, which was then titrated with the 0.1 M KOH solution until a faint pink endpoint was reached.


**3 . Saponification Value Determination:**

Procedure: 1 ml of the hair oil was accurately weighed and placed into a 250 ml conical flask. To this, 10 ml of an ethanol: ether mixture and 25 ml of 0.5 N alcoholic KOH were added. The flask was heated for 30 minutes, then cooled

Titration: The cooled solution was titrated with 0.5 N HCl using phenolphthalein as an indicator. A blank titration was performed simultaneously without the oil sample. The amount of KOH in mg was calculated based on the titration results.

**5.pH Measurement:**

The pH level of the Nagarmotha hair oil was measured using a pH meter.

6. **Spreadability Test:**

- The oil's spreadability was evaluated by assessing its ease of spreading on the skin without excessive friction or resistance.

**7 . Organoleptic Properties Evaluation:**

- Sensory characteristics such as color and odor of the oil were evaluated manually.

## RESULT AND DISCUSSION

| Sr . No . | Parameter | Inference |
|---|---|---|
| 1 | Sesitivity Test | No irritation |
| 2 | Irritation Test | No irritation |
| 3 | Acid Value | 1 . 5 |
| 4 | Grittiness | Smooth |
| 5 | PH | 5 |
| 6 | colour | Dark Brown |
| 7 | Odour | Characteristic |

**DISCUSSION –**

**1** Background and Relevance

Nagarmotha, also known as Cyperus rotundus or Nutgrass, is a medicinal plant extensively used in Ayurvedic, Unani, and Siddha systems of medicine. Traditionally, its rhizomes have been used for gastrointestinal, skin, and inflammatory disorders. More recently, its essential oil has found increasing application in cosmeceuticals, particularly hair care, due to its multifaceted biological properties**.**

**2** Phytochemical Profile and Mechanism

Nagarmotha essential oil contains:

- Sesquiterpenes (e.g., cyperene, cyperol)
- Flavonoids
- Alkaloids
- Antioxidants

These compounds contribute to:

- Antimicrobial activity – combating scalp infections and dandruff
- Anti-inflammatory effects – soothing itchy or inflamed scalps
- Antioxidant properties – countering oxidative stress, which contributes to hair fall and premature aging
- Strengthening the hair shaft and roots.

**Hair Care Benefits**

Nagarmotha oil, derived from the roots of the nutgrass plant, offers a multitude of benefits for hair health. Regular application of this oil enhances hair texture, imparts a natural shine, and stimulates growth by nourishing the scalp. Additionally, it effectively reduces hair fall and delays premature greying.

| Benefit | Mechanism of Action |
|---|---|
| Reduces hair fall | Strengthens follicles, reduces breakage, improves scalp health |

| | |
|---|---|
| Dandruff treatment | Antifungal and antibacterial actions combat Malassezia spp. |
| Promotes hair growth | Enhances blood circulation in the scalp, improves nutrient delivery |
| Delays graying | Antioxidants reduce oxidative damage to melanocytes |
| Soothes scalp | Anti-inflammatory action calms irritation, itching, and flaking |

**Formulation and Application**

Nagarmotha oil is often blended with:

- Carrier oils: Coconut, almond oil
- Other herbs: hibiscus , Amla, and aleo vera for synergistic effects

Typical use includes:

- Scalp massage: 2–3 times weekly to stimulate follicles
- Hot oil treatment: Enhances absorption of active constituents.

**CONCLUSION:-**

The Cyperus rotundus, commonly known as Nagarmotha, is a significant medicinal herb utilized since ancient times to address various ailments. It is particularly effective in treating dandruff and rejuvenating dull, lifeless hair. The current study confirms that the formulated hair oil meets desired quality standards. Naharmotha Hair Oil, derived from the roots of the Cyperus rotundus (also known as Nagarmotha), provides a natural remedy for a range of hair issues. It is valued for its anti-inflammatory, antimicrobial, and calming effects on the scalp. The oil supports the reduction of dandruff and hair fall while encouraging healthier hair growth. With its light, non-greasy formula, it's ideal for regular application. Its herbal ingredients also lower the likelihood of side effects, making it a great choice for those looking for a natural and holistic approach to hair and scalp care.

**Scope and Future-**

**Scope –**

Nagarmotha Hair Oil (also known as Cyperus Scariosus or Nutgrass Oil) is a natural, herbal oil known in Ayurvedic and traditional medicine for its multiple benefits for hair health. Its scope lies in:

1. Hair Care Industry: Used in herbal and Ayurvedic hair oils, shampoos, and serums for scalp nourishment and hair strengthening.

2. Cosmetic & Wellness Sector: Incorporated into natural beauty and wellness products due to its therapeutic properties.

3. Alternative Medicine & Ayurveda: Employed in Ayurvedic treatments for scalp disorders, dandruff, and hair fall.

4. Personal Care/Home Use: Marketed as an at-home treatment oil for daily or weekly hair nourishment.

**Future –**

**Promotes Hair Growth**:

- Stimulates the scalp and strengthens hair roots.
- Improves blood circulation, encouraging healthier hair follicles.

**Reduces Hair Fall**:

- Nourishes scalp tissues, which helps reduce breakage and hair shedding.
- Balances sebum production to prevent clogged hair follicles.

**Anti-Dandruff Properties**:

- Its antifungal and antibacterial properties combat scalp infections and dandruff.

**Improves Hair Texture**:

- Softens and smoothens rough or dry skin
- Adds natural shine and manageability.

**Balances Scalp Oil :**

- Suitable for oily or combination scalp types as it helps regulate excess sebum.

**Soothing Fragrance**:

- Has a calming, earthy scent that can aid in stress relief during head massages.

**Rich in Nutrients**:

- Contains natural fatty acids, flavonoids, and antioxidants that support scalp health.

**Chemical-Free Option**:

- Usually free from sulfates, parabens, or synthetic fragrances when made traditionally.

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