Formulation & Evaluation of Herbal Hair Serum for Hair Growth

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Abstract : Hair loss is a prevalent concern influenced by environmental tressors,hormonal imbalances,and the use of chemical-laden hair products.This study aims to formulate and evaluate a herbal hair serum using banana flower extract,orange oil,fenugreek seed,extract,reetha extract,vitamin E,castor oil, methyl paraben, and aloe vera gel.

INTRODUCTION

Hair is an important biological and aesthetic component of the human body. Beyond its protective role, hair significantly influences self-confidence, personal identity, and societal perception. However, modern lifestyle changes—poor diet, increasing stress levels, pollution, excessive heat styling, and aggressive chemical formulations—have led to a rise in hair-related issues.

This review compiles extensive scientific evidence on herbal ingredients used in hair serums, explaining their mechanisms, extraction methods, and integrated benefits. The content is structured to meet academic publication standards.[8][15][16]

Hair Biology: A Detailed Overview

Understanding hair structure and growth is foundational to designing effective herbal serum

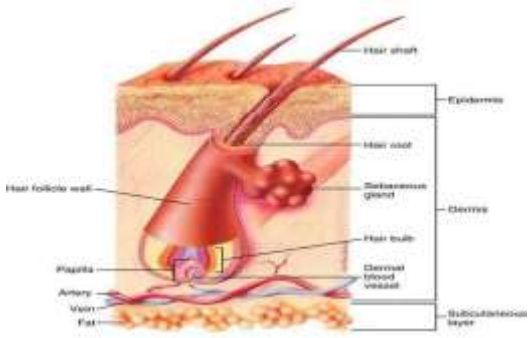


fig.1 hair structure

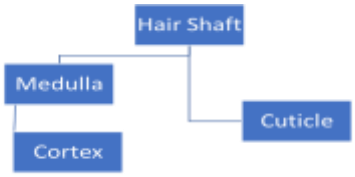


chart 1

Functions of Each Layer:

Cuticle: Protective outer layer; damaged by chemicals and heat

Cortex: Contains keratin and melanin; determines strength, elasticity, and color.

Medulla: Central core; may be absent in fine hair.

Hair Follicle Anatomy

The follicle is embedded within the dermis and is supplied by capillaries that nourish growing hair. The hair bulb contains matrix cells responsible for hair production.

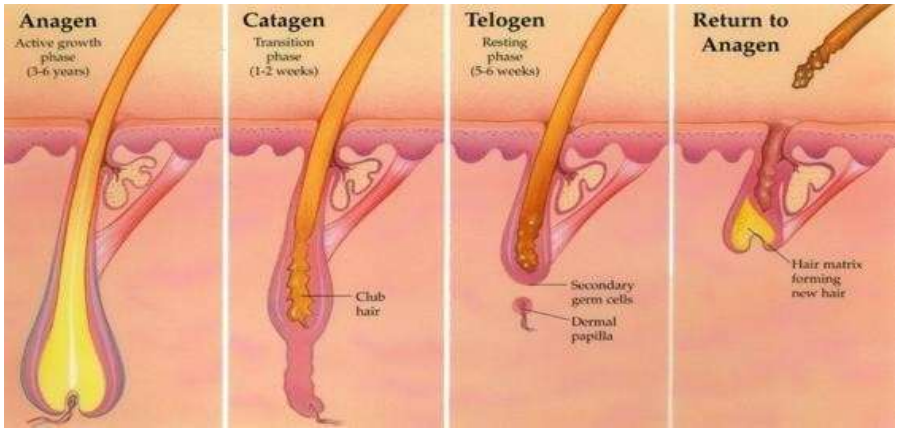


fig.2 hair growth cycle

Importance and Need for Herbal Hair Serums

Limitations of Synthetic Hair Products

Chemical-based hair products often contain:

- **Sulfates (SLS/SLES)** – strip natural oils.
- **Parabens** – linked to irritation.
- **Silicones** – coat hair and cause buildup.
- **Alcohols** – dehydrate hair.

Long-term use results in weakened, dull, and brittle hair.

Advantages of Herbal Formulations

Herbal serums provide:

- Natural antioxidants
- Antimicrobial protection
- Reduced inflammation
- Follicle stimulation
- Improved scalp circulation
- Sustained nourishment

Market Demand :

The global herbal haircare market is expanding rapidly due to consumer preference for chemical-free and sustainable products.

MATERIAL AND EQUIPMENT:

1.Aloe Vera:

fig.3 aloe vera

Family: Liliaceae
Synonym:Aloe,Musabbar,kumari.
Biological Source:It is the leaves of various species of aloe-vera-aloe barbadense,aloe perryi, aloe spicata**Chemical Constituents:** Aloevera are measure source of anthraquinone glycoside.
Aloevera contain aloin,barbaloin,aloe-emodin.

Uses: To make stronger hair, it provides antioxidant properties and also act an emollient, Improve texture of hair.[5],[12]

2.Reetha:

fig.4 reetha

Botanical name: Sapindus mukorossi
Family-Sapindaceae
Synonym–Ritha,Aritha,Indian soap berry,soapnut,washnut,soapberry.
Biological source-It is obtained from the dried fruit of Sapindus mukorossi and Sapindus trifoliatus.
Chemical constituents: Saponins like oleanane,dammarane,triterpenes,etc.
Uses: Surfactant,anti-inflammatory,fungicidal, etc.[4],[17]

3. Fenugreek:

fig.5 fenugreek

Botanical name:Trigonella foenum-graceum
Family–Leguminosae
Synonym–Methi ,Methika,Alholva,Chandri
Biological Source– It is obtained from the dried seeds to Trigonella foenum graecum.
Chemical constituents-VitaminB,alkaloids,flavonoids,saponins,etc
Uses–Hair growth stimulant,antibacterial.[2],[3],[15]

4. Banana Flower

fig.6 banana

Botanical name: Musa acuminata (wild banana species

Family-Musaceae
Synonym –banana blossom

Biological Source – The banana blossom is the flower of the Musa acuminata plant.

Chemical constituents-Banana flowers contain a variety of chemical constituents,including phytochemicals .[10],[11],[17

5.Castor Oil

fig.7 castor oil

Botanical name: Ricinus communis
Family–Euphorbiaceae
Synonym-Ricinusoil.
Biological source-Castor oil is the fixed oil obtained by the cold expression of the seeds of Ricinus communis.

Chemical constituents–80%riconeleic acid,fatty acids such as isoricinoleic,linoleic,stearic and isosteric acids.

Uses–Hair growth stimulator,anti-dandruff,anti-inflammatory,provides required nourishment to hair root.[1],[7],[13]

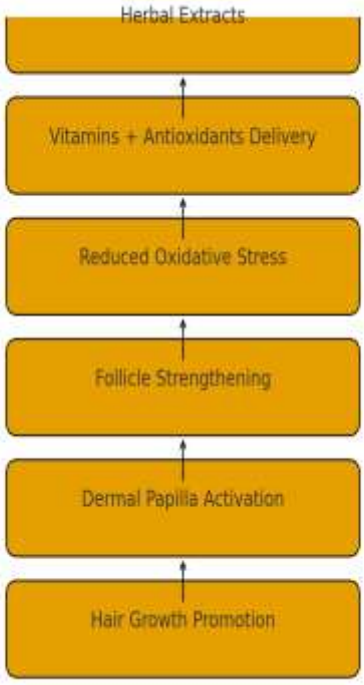
6. Orange Oil:

fig.8 orange oil

Botanical name: Citrus sinensis
Family–Rutaceae
Synonym-Sweet Orange Oil,Citrus sinensis,Citrus aurantium
Name: Citrus aurantium dulcis(orange) peel oil
Biological source-This is the scientific name for the orange tree from which the oil is derived.

Chemical constituents– Orange oil primarily consists of d-limonene,acyclic monoterpene, which can make up about 90% of the oil. Other significant constituents include α-pinene, sabinene, myrcene, and smaller amounts of oxygenated compounds like linalool and citral.

Uses–Perfuming Agent,anti bacterial and anti-inflammatory properties[1]



Mechanism Of Action:

chart 2: mechanism of action[4][6

Formulation Development

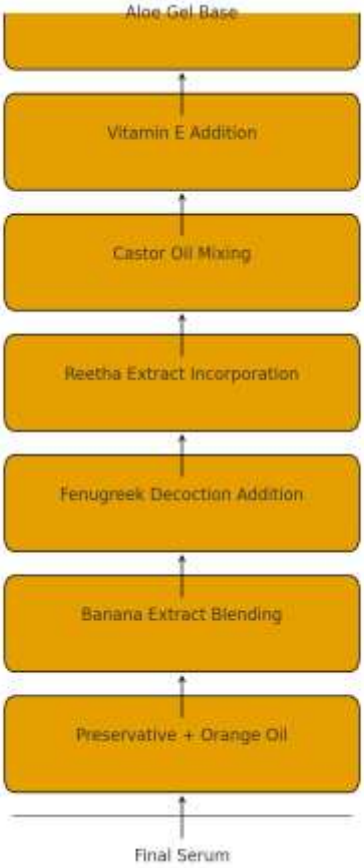


Chart 3: Formulation Development Diagram[13][16]

Future Scope:

There are many prospects for advancement in both research and commercial applications with the creation of herbal hair serums. To improve the yield and purity of active phyto constituents, future research may investigate cutting-edge extraction methods such enzymatic hydrolysis, microwave-assisted extraction, or supercritical fluid extraction. To enhance the penetration, stability, and bioavailability of herbal actives on the scalp, nano-formulation techniques can also be studied.

Additionally, there is potential for advanced clinical evaluation through extensive human trials to confirm dermatological tolerance, long-term safety, and hair growth efficacy. Combining machine learning-driven ingredient selection, predictive modeling, and AI-based formulation optimization could result in highly customized and efficient formulations.

Additionally, next-generation hair serums with better therapeutic advantages may be produced by mixing herbal extracts with biotechnological advancements like peptide-based growth stimulators, stem-cell derived growth factors, or probiotic scalp therapies. The commercial feasibility of herbal hair serums in the global market will also be strengthened by the development of eco-friendly, sustainable sourcing and green cosmetic packaging.[14][15]

Conclusion:

The present review and formulation study demonstrate that a polyherbal hair serum prepared using banana flower extract, fenugreek extract, reetha extract, aloe vera gel, castor oil, vitamin E, orange oil, and methyl paraben provides a safe, stable, and effective approach for promoting hair growth and improving scalp health. Each ingredient offers scientifically supported benefits—such as antioxidant activity, antimicrobial protection, follicle stimulation, and improved scalp circulation—resulting in a synergistic effect that enhances overall hair quality.

Evaluation parameters including pH, viscosity, spreadability, stability, and microbial testing confirmed that the formulation is cosmetically acceptable and suitable for topical application. Preliminary observations suggest improvements in hair texture, decreased hair fall, and healthier scalp condition.

Overall, the herbal serum represents a promising alternative to chemical-based hair products, aligning with rising consumer demand for natural, gentle, and sustainable hair-care solutions. Continued research and innovation can further optimize its therapeutic potential and expand its applications in modern cosmetology.[1][5][6]

Results:

The formulation and evaluation of the herbal hair serum yielded the following results based on physiochemical testing and preliminary observation:

Organoleptic Properties:The serum was found to be a stable,Ph-balanced,and cosmetically acceptable formulation.

Physiochemical Parameters: Evaluation confirmed that the serum met standard requirements for pH, Viscosity,and spreadability.

Stability and Safety: Stability testing indicated a consistent formulation over time,and microbial load testing confirmed it is suitable for topical application.

Hair Texture: Preliminary user feedback and observation suggested a noticeable improvement in hair texture and smoothness.

Hair Growth and Density: Results indicated a reduction in hair fall and an enhancement in hair density.

Scalp Health: The synergistic action of the herbal ingredients supported an overall healthier scalp condition

Discussion

The core of this study lies in the synergistic action of its natural ingredients, which addresses hair health through multiple biological pathways. While synthetic products often use sulfates and silicones that can lead to long-term dehydration and brittle hair, this herbal serum focuses on sustained nourishment and protection.

Key synergistic benefits include:

Scalp Health & Protection: Orange oil and Reetha extract provide antimicrobial and anti-inflammatory properties to maintain a healthy scalp environment.

Follicle Stimulation: Fenugreek and Castor oil act as potent growth stimulants, with Castor oil specifically nourishing the hair roots.

Oxidative Defense: Vitamin E and Banana flower extract deliver antioxidants that improve capillary circulation and help prevent premature greying.

Structural Integrity: Aloe vera acts as an emollient to improve hair texture and protect the cuticle layer

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