Evaluation of Herbs Nutraceutical Products Potential for Hair Growth Promotion: Formulation on Aspects for Polyherbal Hair Oil

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ABSTRACT:

Background: Hair loss affects people of all ages and is a very common condition. Although it can result in alopecia, hair loss is typically permanent. To enhance hair growth and stop hair loss, hair root stimulation is required. The idea of fewer negative effects and a higher degree of safety and security have led to the general population using herbal cosmetics more and more.

Objective: This study's main objective is to make and assess herbal hair oil using fresh plant ingredients.

Methods: The herbs originated from the Faculty of Pharmacy, SBMCH campus, BIHER medicinal garden after being gathered and dried, the herbs were pulverized using a mortar and pestle and mixer and some herbs of *Salvia Rosmarinus* and *rosa damascena* were we extracted the volatile oil by using hydro distillation method using Clevenger apparatus. Adding 50% of *Cocos nucifera* (copra oil) was mixed with 50% of ground herbs *(Allium cepa, Phyllanthus emblica, Eclipta Prostrata (L.), aloe barbadensis miller, chrysopogon zizanioides, azadirachta indica, Murraya koenigii, lawsonia inermis, Salvia Rosmarinus, glycrrhiza glabra, syzygium aromaticum, Hibiscus rosasinensis Linn., Nigella Sava, and Trigonella foe Num-graecum, senna auriculata, rosa damascena)* heated, chilled, and filtered. The developed herbal hair oil's physical attributes, viscosity, pH, sensitivity test, hair growth activity, hair weight, antimicrobial test, stability test, and other parameters were assessed and are detailed in this text.

Results: The herbal hair oil had a greenish-brown color and have good smell. The specific gravity, pH, saponification value, and refractive index of herbal hair oil were all within acceptable ranges. Following application, the herbal oil showed Newtonian flow, healthy weight and hair development, and no discomfort. Phytochemical screening revealed the presence of saponins, sulfur, and ascorbic acid. It was discovered that the formula remained steady for 45 days.

Conclusion: In conclusion, hair growth could be enhanced by combining a variety of useful herbs.

Keywords: Herbs; Herbal hair oil; Physicochemical parameters; Antimicrobial study Hair growth activity test; Hair weight test; Stability study.

INTRODUCTION:

Dermal follicles produce the protein filaments that make up hair. One of the most distinctive characteristics of mammals is their hair. Although hair is most frequently linked to hair types, growth, and care, it is also a necessary biomaterial composed primarily of proteins, especially alpha keratin. Common problems with cosmetics include dandruff, hair loss, dry hair, split ends, frizzy hair, dull hair, heat damaged hair, color damaged hair, gray hair, and more.

There are numerous products on the market to assist with these problems, including hair oils, shampoos, conditioners, serums, gels, masks, and colors. Applying hair oils to the hair helps to nourish, style, and improve its overall health. Additionally, they promote the growth of long, opulent hair. Hair oils that contain herbal remedies are used to make hair tonics.

These are essential plant extracts used in therapeutic applications in an oil base. Herbal hair oil reverses the effects of dry hair and scalp while simultaneously hydrating the scalp. It has many essential elements that support healthy sebaceous gland function and encourage the growth of natural hair. This goal guided the conduct of the current investigation (1–3).

As a medicinally significant herb of Indian origin, *Murraya koenigii (M. koenigii)*, a member of the *Rutaceous* family, is frequently used in the Ayurvedic medical system. According to earlier studies, this plant's leaves, roots, and bark are rich in carbazole alkaloids, which have potent pharmacological and biological effects. They have anti-oxidant, anti-diabetic, anti-inflammatory, anti-cancer, and neuroprotective qualities. The ability of *Murraya Koenigii* to strengthen hair roots has long been recognized.

To encourage hair growth, stimulate the scalp and hair using a blend of organic coconut oil and dry leaf powder. Curry leaf paste can be applied to hair to slow down premature greying. The plant leaves include 63.2 percent of moisture, 8.8 percent amino acids, 39.4 percent carbohydrates, 1.15 percent nitrogen in total, 6.15 percent fat, 18.92 percent overall sugars, 14.6 percent starch, and 6.8 percent fiber by weight.

Numerous vitamins, including vitamin A (B-carotene), have been shown to be present with good amounts in the leaves. Terpenoids, flavonoids, essential oils, and carbazole alkaloids all have vital functions in the organism (4,5). *Trigonella foe Num-graecum* belongs to the *Fabaceae* family and is commonly referred to as fenugreek seeds. estrogen deficiency is one of the many ways that hair loss can occur. A disruption in the hormonal cycle and an elevated risk of cancer have been associated with external estrogen administration (6). Phytoestrogens, which are molecules with low estrogenic activity, are among the natural alternatives to estrogen therapy that can be found in a number of plants. Phytoestrogen competes with estrogen by binding to the estrogen receptor and supplying the estrogen on the phytoestrogen found in fenugreek seeds *(Trigonella foe Num-graecum L.)* is believed to stimulate hair development (7,8).

Black-caraway and "Kalonji," also known as *Nigella sativa (N. sativa)*, are popular seeds all throughout the world. Among the chemical components present in its fixed oil are thymoquinone, thymohydroquinone, dithymoquinone, thymol, nigellicine, carvacrol, nigellimine, nigellicine, nigellidine, and alpha-hederin. Numerous pharmacological actions, including bacterial, viral, an-inflammatory, and wound-healing properties, as well as effects on acne vulgaris, skin cancer, pigmentation, and numerous cosmeceutical applications, have been found to affect various parts of our body (9).

In the tropics, the glabrous shrub *Hibiscus rosa sinensis Linn*. *(Malvaceous)* is sometimes grown as a decorative plant. There are numerous types of it, and each one has a different color of blossom. In medicine, however, the red-flowered kind is favored. The leaves and flowers promote the growth of hair, and the blossoms aid in the healing of ulcers. According to traditional sources, *Hibiscus rosa-sinensis* leaves and blossoms are said to promote hair development and have anti-aging properties. Moreover, extracts from different parts of *Hibiscus*

rosa-sinensis are available in natural hair development products in India. Therefore, the current study is concerned with the scientific evaluation of the hair growth potential of the herb *Hibiscus rosa-sinensis* (10)

The *Arecaceae* family includes *Cocos nucifera* (copra oil), commonly referred to as coconut oil. It works as an antibacterial agent, improves blood flow and circulation, hydrates hair, and stops hair breakage (11)

Allium cepa has an angular bulb and roots, is white-brown in color, has a strong smell, and tastes harsh. Fresh bulbs were examined under a microscope, which revealed that they had vascular tissues including xylem and phloem, palisade tissue, cork cells, starch grains, calcium co-oxalate crystals, and distinctive stomata. The total amount of ash was determined to be 8.5%, the amount of acid-soluble ash to be 2.5%, and the amount of water-soluble ash to be 0.75 percent. According to an animal study, Allium cepa starts hair development on day six and finishes it on day twenty (12).

Traditional medicine has utilized *Emblica (Phyllanthus emblica Linn.)* to encourage hair development, although little is known about its pharmacological effects on hair follicles. The MTT test and cell counts were used to assess the extract's proliferative effects in HaCaT keratinocytes and Dermal Papilla (DP) cells of human hair follicles in order to examine the effects of *emblica* fruit extracts on hair growth stimulation. The findings indicate that while emblica extract had no effect on keratinocytes, it enhanced the proliferation of DP cells in a concentration-dependent manner. This suggests that the extract may boost hair development by extending the anagen phase through the proliferative effect on DP cells (13).

Common names for *Eclipta Prostrata (L.) (Asteraceae)* include false daisy and Bhringraj. This herb is renowned for its exceptional medicinal qualities. In traditional medical systems including Ayurveda, Unani, Sidha, homeopathic, Chinese, and folk, it is one of the most commonly utilized plants. Numerous significant phytochemical elements, including coumestans, triterpenes, flavonoids, steroids, polypeptides, and saponins, are present in every section of this therapeutic plant. It is primarily used to increase hair strength, growth, and blackening. It is the primary component of many hair oils. It effectively addresses hair-related issues such baldness, premature greying, dandruff, and hair loss. Numerous additional significant biological characteristics, including anticancer, antibacterial, antiviral, anti-stress, and immunomodulatory, are also displayed by E. alba (14).

Since ancient times, *aloe vera barbadensis* has been valued as a sacred plant, respected in many cultures for its many health and healing benefits for both the body and hair. The plant's juice has been referred to as the "Blood of the Gods." Another name for *aloe vera* is "the plant of immortality." Because of its anthropomorphized feminine and regal life on the physical realm, the plant has acquired the Sanskrit epithet kumari, which means "princess." Native Americans believed that each of the sharp plant spears was a "wand of heaven," and they used the juice of aloe vera to both beautify and shield their skin and hair from the sun and bad weather (15).

Vetiver, also known as *Chrysopogon zizanioides*, is a perennial grass that is commonly grown in tropical regions. It is known to stabilize soil and limit erosion, and it is being studied for phytoremediation. Its roots contain an essential oil that is well-known in the fine fragrance and cosmetic industries. In South Asia, the essential oil has long been used as an anti-inflammatory, antimicrobial, and healing agent (to name just a few uses) (16).

The mahogany family *(Meliaceae)* includes the *neem* tree, sometimes called *Azadirachta indica*. This tree is grown in Egypt and does well in semi-tropical and tropical climates. The neem tree is regarded as a significant source of unique components, including volatile, phenolic and tannic compounds, terpenoids, and steroids, which are used to improve pharmaceutical products and manufacture medications for a variety of illnesses (17).

Native to the Mediterranean region, rosemary *(Rosmarinus officinalis L. Salvia Rosmarinus) F. Lamiaceae* is a fragrant evergreen shrub that is grown in Egypt. It is valued for its valuable phytoconstituents, which include volatile oil, phenolics, carnosic and rosmarinic acid, and their derivatives. These elements have been used in

numerous pharmaceutical and cosmetic products since Ancient Egypt (18). Antioxidant, antimicrobial, anti-inflammatory, neuroprotective, and anti-diabetic properties have also been demonstrated for these metabolites (19,20).

Lawsonia Inermis Linn, sometimes called *henna*, belongs to the *Lythraceae* family and has been shown to possess a number of chemicals in its stem, bark, roots, flowers, and seeds that have both commercial and therapeutic uses. *Lawsonia inermis* contains a wide range of bioactive compounds, such as flavonoids, coumarins, triterpenoids, steroids, xanthones, polyphenols, fatty acids, alkaloids, quinones, tannins, leucocyandin, epicatechin, catechin, and quercetin. This report offers a thorough analysis of the pharmacological activities, pharmacokinetics, and pharmacological side effects of this plant. Numerous ailments, such as ulcers, bronchitis, lumbago, hemicrania, leukoderma, scabies, boils, ocular diseases, hair loss, and jaundice, have been traditionally treated with the plant (21).

Licorice belongs to the *Leguminosae* family, and its scientific name is *Glycyrrhiza glabra Linn*. It is a medical plant that resembles a herb. The phytochemical components of the plants and their pharmacological effects will be thoroughly examined in the paper that follows. This plant contains several compounds, including glycyrrhizin, glycyrrhizinic acid, isoliquiritin, and glycyrrhizic acid, which have anti-cancer, anti-atherogenic, anti-diabetic, anti-asthmatic, anti-inflammatory, anti-microbial, and antispasmodic properties that can be beneficial to us pharmacologically. These compounds also play a different role in immunologic, memory-enhancing, and hepatoprotective activities. They have the ability to promote hair growth (22).

One of the indigenous spice plants of Indonesia is the *clove (Syzygium aromaticum)*, which is a member of the *Myrtaceae* family. One kind of spice plant with strong antioxidant properties is clove, which has a high eugenol content. Clove is a spice plant that has long been utilized in cuisine, drinks, medications. Clove leaves, flower stalks, and flowers are plant parts that can be used (23–25).

2. MATERIALS AND METHODS

2.1. Collection of Plant Part

Eclipta Prostrata (L.), Lawsonia Inermis Linn*, Murraya Koenigii* Spreng*, Salvia Rosmarinus* Spenn. were collected from the Medicinal Plant Garden of Faculty of Pharmacy, SBMCH campus, BIHER, Chennai, Tamil Nadu, India and were properly authenticated from the National Institute of Siddha (NIS) Certificate No: **NISMB8142025** for the preparation of herbal hair oil.

2.2. Formulation of Herbal Hair Oil

Precisely all the dried and fresh herbs such as *(Allium cepa, Phyllanthus emblica, Eclipta Prostrata (L.), aloe barbadensis miller, chrysopogon zizanioides, azadirachta indica, Murraya koenigii, lawsonia inermis, Salvia Rosmarinus, glycrrhiza glabra, syzygium aromaticum, Hibiscus rosasinensis Linn., Nigella Sativa, and Trigonella foe Num-graecum, senna auriculata, rosa damascena)* were weighed, grinded and mixed in 50% of Cocos nucifera oil. The above content was boiled for 15 min, cooled and filtered through a muslin cloth. To the filtrate 25% Cocos nucifera oil was added to make up the volume (100 mL) (Fig. 1) (26).

2.3. Evaluation of Herbal Hair Oil Preparation

2.3.1. Physical Appearance

The overall characteristics, such as color and smell, were assessed by hand.

2.3.2. pH Test

Buffer solutions of pH 4 and pH 7 were used to calibrate the pH meter. For a few minutes, the electrode was submerged in hair oil until the pH stabilized (27).

2.3.3. Viscosity

Using spindle number 6, viscosity was measured using a Brookfield viscometer (RVDV-II+PRO). The viscosity was measured at 100 rpm after 50 mL of hair oil was added to the beaker (28).

2.3.4. Determination of Refractive Index

Before taking readings, the oil sample was applied to the cleaned prism and the temperature of the refractometer was adjusted. After the measurements were completed, the prism was cleaned with hot water. The readings were recalculated using the following equation (29).

$R = R' + K (T - T')$

where T = prescribed temperature 40 ◦C, K = 0.00385 for oil, R = adjusted reading, R′ = reading at T ◦C, and T′ = temperature at which readings were made.

2.3.5. Saponification Value

After precisely weighing 1 milliliter of oil, 10 milliliters of ethanol: ether mixture (2: 1) was added to a 250-milliliter conical flask. To this flask, 25 milliliters of 0.5 N alcoholic KOH were added. After 30 minutes, the flask was allowed to cool. A phenolphthalein indicator was used to titrate the cooled solution against 0.5 N HCl. The blank test was conducted in the same manner, but no oil (sample) was used. It was calculated how many milligrams of KOH were used (30).

2.4. Phytochemical Screening of Herbal Hair Oil Preparation

The generated herbal oil underwent qualitative chemical analysis using a variety of techniques to identify many key plant components, including sulfur, ascorbic acid, and saponins (27,31).

2.4.1. Ascorbic Acid Test One drop of freshly made 5 percent w/v sodium nitroprusside solution and two milliliters of diluted sodium hydroxide solution were added to one milliliter of 2 percent w/v sodium hydroxide solution and five milliliters of water. Add 0.6 ml of hydrochloric acid, stir, and note the results.

2.4.2. Sulphur Test

A drop of hydrogen peroxide was put on the test paper. The paper turns brown when it comes into contact with fumes.

2.4.3. Saponin Test

By shaking water and oil in a test tube, a stable froth was seen to form.

2.5. Specific Gravity

After taking a specific gravity sample, it was rinsed with deionized water, dried in an oven for fifteen minutes, cooled, and weighed (a). The identical specific gravity bottle of herbal hair oil was filled, sealed, and weighed once again (b). The weight of the sample per milliliter was subtracted from the weight (b-a).

2.6. Antimicrobial Evaluation by Cup Plate Method

Diffusion-dependent bacterial activity of herbal hair oil was investigated using the zone of inhibition on approach. The plate was incubated at 37°C for two days. A measurement of the inhibitory zone was made (31).

2.7. Primary Skin Irritation Test

Rats shaved, healthy skin was subjected to a simple skin irritation test using a tiny quantity of the herbal hair oil that was created. The test location was observed for erythema and edema for three to four hours (10).

2.8. Hair Growth Activity In Vivo

Six rats each were divided into two groups. On a 4 cm2 section of the rats' dorsal surfaces, all of their hair was shaved off and cleansed with surgical spirit. Group I's depleted areas received a daily dose of 10 ml of the generated herbal oil, while Group II, the control group, received no treatment. Rats from each group were chosen, and their hair was randomly removed from the shaved area on days 15, 20, 25, and 30 of the treatment. By measuring the length of 15 hairs, the average length was determined. For the mean length, the results are shown as a standard deviation of 15 hairs (32).

2.9. Hair Weight Measurements

On day 21, the hair was taken out, weighed, and then statically measured in order to determine the weight of each box (32,33).

2.10. Stability Studies

For the stability research, the herbal hair oil was stored at room temperature in the bottle (34).

3. RESULTS AND DISCUSSION

The herbal hair oil was made with the aforementioned ingredients and thereafter subjected to qualitative testing.

3.1. Evaluation of Herbal Hair Oil

The developed herbal hair oil was translucent, reddish brown in color, and silky when applied. The full herbal hair oil had a pH of 7.3, which was appropriate for hair and suggested that it was compatible with hair (35). Newtonian flow behavior was noted, and the viscosity of the herbal hair oil was found to be 30 cps. A Newtonian fluid is one in which the local strain rate—the rate at which its deformation varies over me—is linearly proportional to the viscous stresses produced by its flow everywhere.

No matter how much shear is applied at a constant temperature, a Newtonian fluid's viscosity stays constant. These fluids' viscosity and shear stress are proportional. The quality of herbal hair oil was assessed using the refractive index. It was discovered that the refractive index of herbal hair oil was 1.29 (32). This illustrates that a straightforward laboratory measurement of the refractive index may also be applied as a quality control method.

The mean molecular weight of triglycerides decreases with decreasing average fatty acid length, while the saponification value increases with decreasing fatty acid length. In actual use, the herbal hair oil's saponification value was found to be 25.46.

3.2. Phytochemical Screening

Phytochemical examination of herbal hair oil indicates that it contains saponins, sulfur, and ascorbic acid. Ascorbic acid is one of the most widely used natural oxidants due to its potent antioxidant properties and nutritional significance as vitamin C. In addition to its oxidant potential, it possesses therapeutic properties. Although it is rapidly absorbed, the body does not store this water-soluble vitamin. Collagen, which accounts for around one-third of the body's total protein, requires ascorbic acid to be preserved. To stop the oils from oxidizing and degrading, the right amount of ascorbic acid is utilized. Sulfur is frequently referred to as one of the building materials for good reason.

the components of hair. Keratin, a long-lasting protein with a high sulfur content, makes up our hair. Proteins (such as keratin) require sulfur to retain its structure, which contributes to the general health, strength, and suppleness of hair (36). Research has demonstrated that sulfur stimulates the growth of hair. It has been demonstrated that sulfur lengthens the growing phase of your hair.

A longer growing phase (prior to res ng and shedding) is linked to longer hair (34,35). Lastly, sulfur has been linked to the prevention, treatment, and alleviation of psoriasis, eczema, dandruff, and folliculi. The most prevalent phytochemicals that function as organic surfactants are saponins. Natural saponins give hair body and sheen, which makes it seem softer, silkier, and fuller. The specific gravity of herbal hair oil is 0.83 (36).

3.3. Antimicrobial Study

The results of testing the antimicrobial activity of herbal hair oil and Cocos nucifera oil using the Candida albicans organism and the cup plate method (27).

3.4. Primary Skin Irritation Test

A first skin irritation test on rabbits shaved, uninjured skin was utilized to assess the irritation brought on by herbal hair oil. The prepared herbal hair oil appeared to be non-irritating to skin based on the lack of erythema and/or edema (32).

3.5. Hair Growth Activity and Hair Weight Tests

Hair started to regrow from the denuded area at the end of the second week, and its length increased until the end of the treatment cycle (Table 2). The herbal oil treatment group was found to have a significant impact during the fourth week when compared to the control group. The mild rubbing of shaved skin during the application of extracts and a placebo (liquid paraffin) may be responsible for this, as it enhances local blood circulation and may impact hair development (37).

The herbal oil treatment group had a greater impact on hair length than the control group, with 8.89 mm at the end of the course against 2.91 mm in the latter group. This might be the result of follicles prematurely transitioning from the telogen to the anagen phase of the hair growth cycle. For groups I and II, the hair weight was determined to be 219.49 and 150.12 mg, respectively. Herbal hair oil was linked to a higher weight in the third week (38).

3.6. Stability Study

After the chemical analysis, the manufactured hair oil was stored in a glass jar at room temperature. The same oil was tested once more after the me time. Physical tests showed that the produced oil had a viscosity of 30 cps, a specific gravity of 0.91, and a reddish-brown color after 30 days of storage.

CONCLUSION

Herbal hair oil is one of the most popular hair treatments. In addition to hydrating the scalp, herbal hair oil aids in the healing of dry hair and scalp. It has a number of essential nutrients that promote healthy sebaceous gland activity and promote the growth of natural hair. The potential of the herbal hair oil produced from dried *(Allium cepa, Phyllanthus emblica, eclipta alba, aloe barbadensis miller, chrysopogon zizanioides, azadirachta indica, Murraya koenigii, lawsonia inermis, Salvia Rosmarinus, glycrrhiza glabra, syzygium aromaticum, Hibiscus rosasinensis Linn., Nigella Sativa, and Trigonella foe Num-graecum, senna auriculata, rosa damascena)* as an effective topical recipe for hair growth promotion was assessed in this study. The findings demonstrated that the herbal hair oil was stable at room temperature, had a good pH, and had an acceptable viscosity. Additionally, the

study conducted on animals showed that the herbal hair oil produced had a promising effect on promoting hair development without experiencing any adverse effects. It follows that the herbal plant might be a better option for upcoming formulations.

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