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FORMULATION AND EVALUATION OF POLYHERBAL OIL

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ABSTRACT

Even though varieties of synthetic hair care products are available in the market, the consumer requires eco-friendly, natural and environmentally safe cosmeceuticals without producing any side effects. Herbal plants are the richest sources of antioxidants like vitamin A, vitamin C, vitamin E and other components like gallic acid, saponins, amino acids, elemental sulfur, enzymes, mucilage, flavonoid, tannins, essential oils, polysaccharides and other phytoconstituents. In traditional knowledge itself number of plant parts were used for protecting skin and number of herbs were used for hair care preparation like cucumber, burdock, marigold, watercress, daisy flower, witch hazel, hops, birch, amla, arnica, gentian, fir, Indian cress, rosemary, sage, *Jatamansi*, *Shikakai*, *Henna*, horsetail, thyme etc have been mentioned in ancient literature

In this research project we have formulated and evaluated herbal hair oil which consists of main ingredients hibiscus, *Amla*, fenugreek seeds. Compared with commercial cosmeceuticals the herbo-cosmeceutical preparation is more potent, safe, enhanced in activity and without any side effects. So the present work is aimed to develop the herbo-cosmeceutical formulations that can comply with the requirement or consumer's expectations. Herbal medicines are thus a valuable as well as a precious gift from nature, which should be handled with care and respect. The future trend is more towards everything "Natural" and it might be worthwhile looking into the plant world for modern medicine.

INTRODUCTION

The importance of medicinal plants to the mankind is very well proven from ancient time, as early human being solely depended on for their survival on herbs for their food supplement and also for medicines to cure diseases. It is found that majority of the people worldwide depend chiefly on the traditional system of medicines for their health, because of their better adaptability, better compatibility with the human system and fewer or minimum side or untoward effects. The science dealing with herbs and herbal preparation for treating diseases is well known in our country since 3500 BC and traditionally this system of medicine is known as Ayurveda. Various classical Indian texts have described a wide range of medicinal plants and their uses in curing different ailments. The well-established Indian healing processes have been developed from enriched ancient civilizations and scientific heritage [1,2]. The safety and efficacy of natural herbs could not find any suitable alternative i.e. cannot be replaced by synthetics.

➤ Hair

Hair is a thin threadlike epidermal structure of about 0.1mm thick, made up of keratin, which is developed from a hair follicle located in the dermis. It is usually produced only by mammals and is characteristic of a particular group of animals. Diversified hair and hair follicles are found all over the body except on the palms, soles, glabrous foreskin and the lip vermilion. Hair consists of hair shaft, which is a permanent, superficial portion from the bulge upward and a lower, inferior portion which is the root, where the growth cycles anagen, catagen, and telogen are followed in order to produce new hairs. There are about 10,00,000 - 20,00,000 hair follicle (HF) on the scalp alone.

Anatomy of Human Hair

▪ **Hair Structure**

Hair is proteinous in nature made up of keratin. On chemical investigation hair found to contain oxygen, iron, nitrogen, hydrogen, carbon, sulfur and phosphorus. The amount of these chemicals varies with the age, sex, type and color of hair of an individual. Each strand of hair consists of following:

▪ **Medulla (The innermost layer)**

It is only present in large thick hairs. It consists of several layers of large, loosely packed keratinized cells which may be polygonal or cuboidal in shape. Fat granules, melanin pigment granules, intercellular and intracellular air spaces may be present in the medulla.

▪ **Cortex (The middle layer)**

The cortex gives strength, color, and texture to the hair. The mass of hair shaft is formed by the cortex. The cortical cells are spindle-shaped keratinized cells which are cemented together

to form a compact structure. Pigment hair contains longitudinally arranged melanin granules within the cells of the cortex.

- **Cuticle (The outermost layer)**

The cuticle is thin and the layer having no colour which protect the cortex. It is composed of flat, strong, horny cells. These are interlocked with the cells of innermost hair sheath to support the hair firmly in its follicles. The cuticle also serves to bind the cortical cells together to prevent hair shaft from becoming frayed. Hair with split end is resulted when the cuticle breaks and dislodges. Cuticle is damaged if proper care of hair is not taken and if it is frequently exposed to corrosive chemical agents.

- **Dermal Papilla**

The dermal papilla gives direction and becomes instrumental in generation of embryonic hair follicle. It is made up of very active cells which are involved in induction of hair follicular development from the epidermis. Dermal papilla contains various components such as spindle shaped cells, fibroblast, stroma, collagen bundles, nerve fibres and a single capillary loop. It is contiguous with the dermal sheath of connective tissue that encloses the lower part of hair follicle.

- **Hair Loss / Hair Disease**

Loss of hair is associated with problems in the skin. This has derived researchers to explore promising medicinal plants possessing better hair growth enhancing property [3,4]. Hair loss, dandruff, hirsutism, alopecia areata are the common patient complaints, which are the sources of significant psychological and physical stress [5]. A number of natural hair care products in form of herbal formulations are available in the market, which are used against hair loss as well as other hair related diseases [6]. Hair loss is also resulted from various other factors such as aging, genetic pre-disposition, thyroid imbalance, malnutrition or imbalance diet, chronic illness, hormonal effects of contraceptive pills, pregnancy, or menopause, certain medications and radiation therapy /chemotherapy used for treating cancer, etc. The androgenic areata (AGA) also known as male pattern hair loss (MPLS), female pattern hair loss (FPLS) and alopecia areata (AA) are the most common forms of non-scarring hair loss. People are nowadays spending a good amount towards hair related diseases. Ayurveda has also classified hair diseases into three types: 1. *Khalitya* means loss of hairs. 2. *Palitya* means premature hair greying. 3. *Indralupta* means alopecia areata (AA), totalis, univeralis. [7]

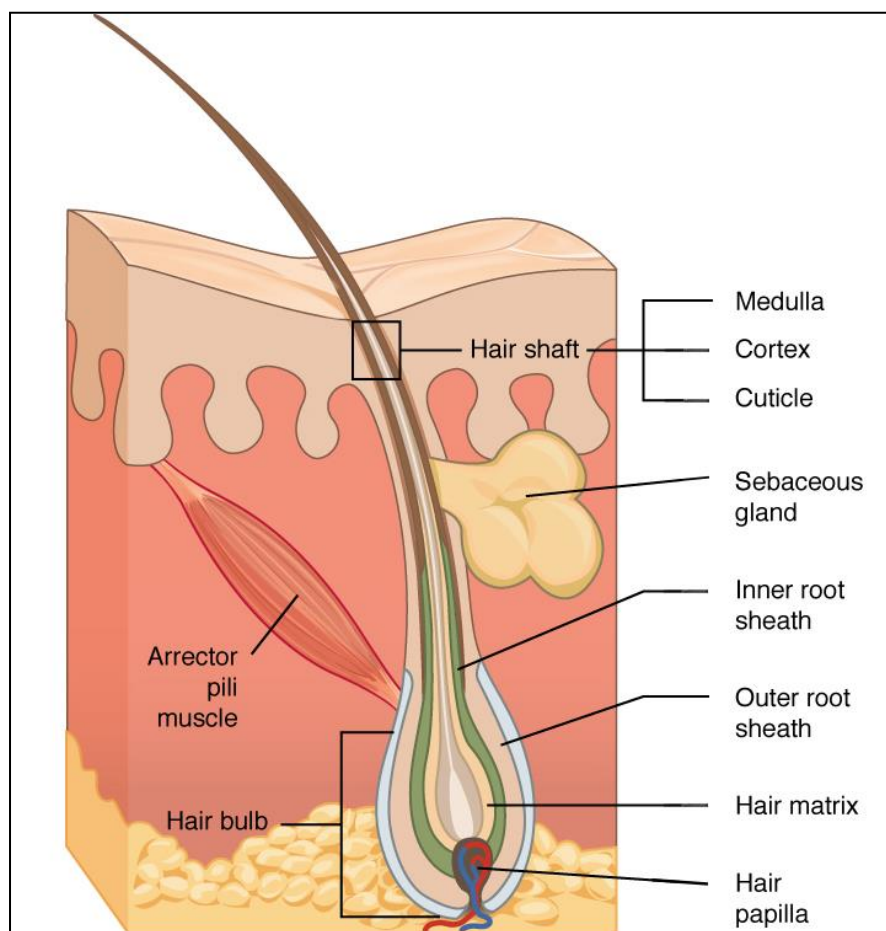


Figure 1: Anatomy of hair

EXPERIMENTAL WORK

➤ Materials used [14,15,16,17]

▪ Hibiscus flowers

Synonym: *Hibiscus mutabilis*

Biological source: Dried flowers of *Hibiscus rosacinus*

Family: *Malvaceae*

Use: Hibiscus aids hair growth from dormant hair follicles helping cover bald patches and also combats dryness and dandruff. Hibiscus flowers are used to clout premature graying of hairs, prevent hair loss and spilt ends

Chemical Constituents: Thiamine, Riboflavin, Ascorbic acid



Figure 2: Hibiscus flower

▪ **Fenugreek**

Synonym: *Trigonella foenum-graecum*

Biological source: Fenugreek consists of dried ripe seeds of *Trigonella foenum-graecum*.

Family : *Fabaceae*

Use: It improves circulation in the scalp, promotes hair growth, and conditions the hair. Methi curbs hair fall and strengthens your hair from root to tip.

Chemical constituents: carbohydrates, proteins, lipids, alkaloids, flavonoids, fibers, saponins, steroidal saponins, vitamins, and minerals, nitrogen compounds.



Figure 3: Fenugreek seeds

▪ **Aloe**

Synonym: *Aloe barbadensis* Miller

The biological source of aloe is dried latex of leaves of it. It is also known as *Curacao Aloe*, *Cape Aloe* and *Socotrine Aloe*.

Family: *Liliaceae*

Use: Anti-bacterial, Antiseptic, Aloe Vera pulp subsumes proteolytic enzymes which repairs dead skin cells on the scalp. It also feat as a great conditioner and leaves your hair all smooth and shiny. It bolsters hair growth, prevents itching on the scalp, reduces dandruff and conditions your hair.

Chemical constituents: Anthraquinine



Figure 4: Aloe vera

▪ **Neem leaves**

Biological source: Dried leaves of *Azardirachta indica*

Family: *Meliaceae*

Use: Leaves Antimicrobial, antiseptic, antidandruff

Chemical constituents: Azadirachtin



Figure 5: Neem leaves

▪ **Amla:**

Synonym: Indian gooseberry

Biological source: Dried fruits of *Emblca officinalis*

Family: *Phyllanthaceae*

Use: hair conditioner, treats scalp ailments, promotes hair growth.

Chemical constituents: Ascorbic acid



Figure 4.1: A-Leaves, B- Fruits, C- Dried fruits, D- Bark, E –Fruit Powder, F- Flower, & G-Seeds

Figure 6: Amla

▪ **Coconut oil:**

Biological source: Oil derived from dried fruits of *Cocus nucifera*.

Family: *Areaceae*

Use: moisturiser, vehicle, stimulates hair growth by unclogging pores.

Chemical constituents: Caprylic acid, capric acid.



Figure 7: Coconut oil

▪ **Nigella sativa**

Synonym: black caraway, also known as black cumin, nigella or kalonji

Family: *Ranunculaceae*

Use: Nigella seeds is used to fight hair fall and even to induce hair re-growth

Chemical Constituents: Nigellone and Thymoquinone



Figure 8: *Nigella sativa* oil

▪ Castor oil

Biological source: Fixed oil obtained by cold expression of the seeds of *Ricinus communis* Linn.

Family *Euphorbiaceae*

Use: Applying fats like castor oil to the hair on a regular basis helps lubricate the hair shaft, increasing flexibility and decreasing the chance of breakage

Chemical constituents: Ricinoleic acid, Linoleic acid



Figure 9: Castor oil

➤ FORMULATION BATCHES

Batch 1: Preparation of 50ml hair oil with Hibiscus (main ingredient)

Sr.no.	Ingredients	Quantity
1.	Hibiscus	15g
2.	Amla powder	2g
3.	Fenugreek seeds	2g
4.	Neem leaves	2g
5.	Aloe Vera	4g
6.	Castor oil	25ml
7.	Coconut oil	50ml
8.	Perfuming agent (Lavender oil)	q.s to 50ml

Batch 2: Preparation of 75 ml hair oil with Neem leaves (main component)

Sr.no.	Ingredients	Quantity
1.	Neem leaves	7.5g
2.	Amla powder	3g
3.	Fenugreek seeds	3g
4.	Hibiscus	5g
5.	Castor oil	50ml

6.	Coconut oil	50ml
7.	Perfuming agent (Lavender oil)	q.s to 75ml

Batch 3: Preparation of 100 ml Fenugreek and Nigella Seeds (main component)

Sr.no.	Ingredients	Quantity
1.	Fenugreek seeds	8g
2.	Nigella seeds	5g
3	Amla powder	2g
4	Hibiscus	5g
5	Neem leaves	2g
6	Castor oil	75 ml
7	Coconut oil	25 ml
8	Perfuming agent (Lavender oil)	q.s to 100ml

Method of Preparation

1. All the herbal ingredients were collected, washed and cleaned using distilled water.
2. Amla fruits were obtained from local market, chopped, placed in a flat plate and dried for 7-8 days in sunlight till crisp.
3. Dry amla fruits, seeds were removed and powder was prepared in grinder.
4. Herbs like Hibiscus, Neem leaves were dried for one week in daylight.
5. In a porcelain vessel castor oil and coconut oil was mixed in respective quantities as per batches.
6. Added all ingredients in the same vessel and soaked for one day.
7. After soaking, the mixture was heated for 15-20 min and then cooled.
8. After cooling, filtered the mixture with muslin cloth.
9. To that mixture coconut oil was added to make up the volume upto 50 ml,75ml and 100 ml respectively.
10. Finally perfuming agent was added to the oil and placed in transparent bottles.
11. Evaluations were performed after preparation in lab.



Figure 10: All ingredients used

OBSERVATION AND EVALUATION

Evaluation of formulation:

The prepared oils were then subjected to physical and biological evaluation.

a. Physical evaluation: The prepared formulations were evaluated using standard methods of general characterization, physical and chemical evaluation including specific gravity, pH, acid value and saponification value.

b. Specific gravity: The specific gravity bottle was taken, rinsed it with distilled water, and dried in oven for 15 minutes, cooled, closed it with cap and weighed (a). The same specific gravity bottle was filled with the sample and closed it with cap and again weighed (b). The weight of sample per milliliter was determined by subtracting the weight (b - a).

c. pH: The pH of herbal hair oil was determined using pH paper.

d. Acid value: Preparation of 0.1 molar solutions: 0.56 g KOH pellets was weighed and dissolved in 100 mL of distilled water and stirred continuously. The prepared 0.1 molar KOH solution was filled in the burette. Preparation of sample: 10 mL oil was measured and dissolved in 25 mL of ethanol and 25 mL of ether mixture and shaken.

1 mL of phenolphthalein solution was added and titrated with 0.1 molar KOH solutions.

$$\text{Acid Value} = a \times 0.00561 \times 1000 \text{ w}$$

Where 'a' is the number of ml of 0.1 N potassium hydroxide required and 'W' is the weight in g of the substance taken.

e. Saponification value: 1 mL of oil was a Chemical Constituents accurately weighed into a 250 mL of conical flask and 10 mL of ethanol: ether mixture (2: 1) was added. To this flask 25 mL of 0.5 N alcoholic KOH was added. The flask was kept for 30 min. and the flask was cooled. The cooled solution was titrated against 0.5 N HCl using phenolphthalein as indicator. Similarly, the blank titration was performed without taking oil (sample). Amount of KOH in mg consumed was calculated.

f. Sensitivity test: The prepared herbal hair oil was applied on 1 cm skin of hand and exposed to sunlight for 4-5 min.

RESULTS

Sr.no.	Evaluation Parameters	Results		
		Batch 1	Batch 2	Batch 3
1.	Color	Brownish	Yellowish	Yellowish
2.	pH	6	7	6
3.	Specific gravity	1.09	1.07	1.30
4.	Saponification value	115.01(coconut) 175 (castor)	115(coconut) 176(castor)	115.09(coconut) 175.1(castor)
5.	Acid value	4.5	4.2	4.6
6.	Sensitivity test	No sensitivity observed		

Role of Herbs in herbal oil

Sr.no.	Ingredients	Role
1.	Hibiscus	Hair growth
2.	Amla	Hair strength
3.	Neem leaves	Antimicrobial
4.	Fenugreek seeds	Circulation in scalp
5.	Nigella seeds	Hair nourishment
6.	Coconut oil	Hair moisturizing
7.	Castor oil	Lubricating hair shaft

CONCLUSION

Usually, the disease pertaining to hair loss is termed as alopecia, which is very common consequence of changes in hair cycle. There exists a major lacuna in availability of medicines for the treatment of alopecia. Only two synthetic drugs have been a Chemical Constituents credited by FDA, to begin with oral Finasteride and topical Minoxidil. However, their efficacy is confined due to the report associated with

primary side effects. As a consequence, there's a demand and need to investigate new molecules from natural origin for stimulating hair growth potential, which should act as an alternative for the available synthetic molecules and which would be safe and effective for the said purpose. The present work addresses a challenge facing with the research and investigation of such molecule, which would be effective and safe and have minimum untoward effect to the patient in comparison to the available synthetic drugs. The main target of the present work was to formulate and evaluate the effect of selected plant extracts and their formulations on hair growth stimulating activities.

We prepared 3 batches b1, b2, b3, and also evaluated all 3 batches. Here batch 3 has more precised result, they match with standard results. As the formulation has specific gravity 1.09 gm/ml(standard 1.09)

The saponification value of formulation was found to be 107.8 (standard-105.8)

The acid value of formulation was found to be 4.5 (standard -4.5)

As the formulation result matches to the standard value. Batch 3 is more appropriate amongst all 3 batches

The utilization of herbal cosmetics has improved many folds in personal hygiene and healthcare system. Hence, there is a tremendous demand for the herbal cosmeceutical individual care or personal health care industry, which is presently focusing and paying extra attention on the development of herbal-based cosmetics. As nowadays, it is a fast-developing segment with a mammoth scope of manifold growth in coming years. Use of bioactive ingredients or phytoconstituents in cosmetic formulations have beneficial effect on body features and provide nutrients, which are essential for maintaining healthy and beautiful skin or hair.

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