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FORMULATION AND EVALUATION OF HERBAL HAIR GEL

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Abstract: Hair is considered as a sign of beauty in almost every culture. As consumers demand for natural or herbal beauty product continues to rise, herbal cosmetics occupies a prominent place in the market. The present research works aims to develop multifunctional solution in the field of hair care, offering not only styling abilities to hair but also essential nourishment and revitalization benefits. Herbal hair gel has become a popular choice for individual preferring a natural and gentle way to style their hair .The formulation of herbal hair gel involves a blend of botanical extracts, each chosen for their specific role to hair health and styling efficacy. Herbal hair gel incorporating flaxseed , black cumin and marigold presents a promising blend of botanical ingredients with known hair benefits. Flaxseed, known for its high omega-3 fatty acid content , provides hair strength and hydration ,promoting a healthy scalp and reducing frizz . Black cumin for it's antimicrobial and antioxidant property , aids in nourishing the scalp and prevents dandruff and other scalp conditions . Marigold extracts, rich in vitamins and minerals , soothes the scalp and stimulates hair growth , enhancing overall hair health .While the individual benefits of this botanical ingredients are well documented. Further evaluation is necessary which includes – physical appearance, pH determination, homogeneity, spreadability, washability and skin irritancy.

I. INTRODUCTION

Hairs also help in bringing the confidence and pride in a person, no matter of which genders the person belong. It always had been the dream of a person to have black, healthy, shiny and good quality hair. No matter they are long or short and to keep and maintain them are amongst the priority of all the people.^[1]

Hair is a unique character found on all mammals but not on other animals. In humans it is a special and cherished feature, especially in females, but its main functions are in protection of the skin from mechanical insults and to facilitate homeothermy; eyebrows and eyelashes, for example, stop things entering the eyes, while scalp hair prevents sunlight, cold, and physical damage to the head and neck. It also has a sensory function, increasing the perception of the skin surface for tactile stimuli, and subserves important roles in sexual and social communication, considering the psychological impact on quality of life seen in hair disorders, such as hirsutism, hair loss, etc .In particular, regarding this last point, a significantly higher prevalence of personality disorders in subjects with androgenetic alopecia regarding the prevalence of such diagnoses in the general population have been reported.^[2]

An outgrowth from the follicles which was found in the dermis of the scalp is called hair. It is composed of tightly bound dead and keratinized cells. The hair structure is composed of medulla, cuticle and cortex.^[3]

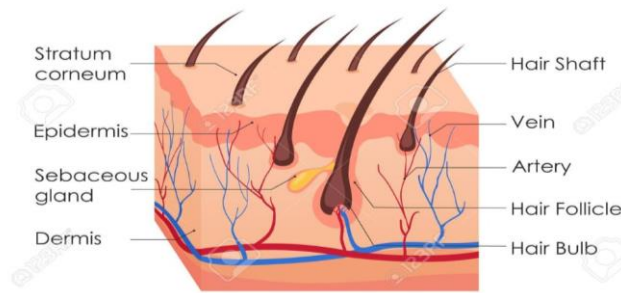


Fig. No. – 1 Structure of hair

A pouch like structure called follicle surrounds the hair root. The base of hair root is in the shape of a bulb. Capillaries and nerve fibers indent this bulb. The cells in the centre of bulb divide. The newly divided hair cells push the previous cells up. The cells, which move upwards, die slowly forming hard hair shaft.

Hair Cycle

Each sort of hair undergoes repeated cycle of active growth and rest. The relative duration of every cycle varies with the age of the individual and therefore the region of the body where the hair grows. The cyclic phase of the follicle is identified by a lively growth period referred to as

- Anagen
- Catagen (the intermediate period)
- Telogen a resting stage.^[4]

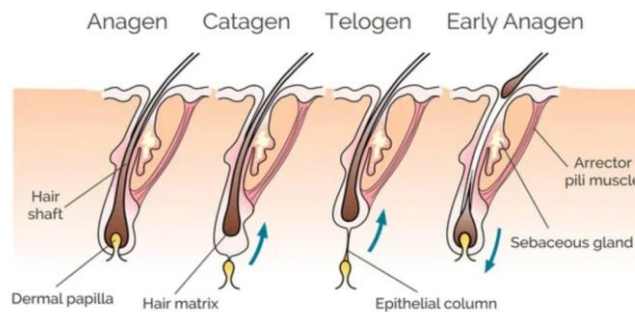


Fig. No. - 2 Hair growth cycle

The first phase is the active phase, which is called the anagen phase. In this phase the hair grows and replaces the old hair and continues growing over several weeks to few years(1-3). The second phase is the catagen, which is the transition phase that changes the active hair to resting hair. This phase lasts up to 3 weeks. Telogen hair is the third phase in which the hair will stay in the scalp without growing and can be removed by pulling and combing the hair. Also, during this phase the hair can stay till the new hair grows and pulls the old hair to fall spontaneously.

Hair Loss

Hair loss is a common condition. It can be caused by variety of disorders that can be congenital or acquired. The ability of the treating physicians to understand the etiological factors and the differences between these disorders helps them to reach the right diagnosis and treatment. A thorough clinical assessment of patient with hair fall is necessary to reach a diagnosis. Physicians must keep themselves updated with the new advances of therapy. This review article will focus mainly on the common acquired causes of hair loss. It will provide general physicians the basic knowledge and management of hair loss and common baldness.^[5]

Gel

Gel are defined as semisolid dosage form consisting of small Or large molecules in liquid vehicle. The word "gel" is derived from "gelatin," and both "gel" and "jelly" can be drawn back to the Latin gelu for "frost and gel are, meaning "freeze" or "congeal." This origin indicates the essential idea of a liquid setting to a solid-like material that does not flow, but is elastic and retains some liquid characteristics .The USP defines gels (sometimes called jellies) as semisolid systems containing either suspensions made up of small inorganic particles, or large organic molecules interpenetrated by a liquid. The gel mass contains a network of small separate particles, the gel is classified as a two- phase system. In a two-phase system, if the particle size of the dispersed phase is relatively large, the gel mass is sometimes called as a magma. Single-phase gels consist of organic macromolecules uniformly circulated throughout a liquid in such a way that no apparent boundaries occur between the dispersed macromolecules and the liquid. [6]

Gel are becoming more popular now a days because they're more stable and can also provide controlled release than other semisolid preparations. The gel formulations can provide better absorption characteristics and hence the bioavailability of drug.

Gel are semisolid systems during which a liquid phase is constrained within a three-dimensional polymeric matrix (consisting of natural or synthetic gums) during which a high degree of physical or chemical cross-linking has been introduced . Gels are relatively newer class of dosage forms created by entrapment of larger amount of aqueous hydro alcoholic liquids during a network of colloidal solid particles which can contains inorganic substance like aluminium salts or organic polymers of natural or synthetic origins. Most topical gels are prepared with organic polymers, like Carbopol 934, which impart an aesthetically pleasing, clear sparkling appearance to the products and are usually washed of skin with water. [7]

Properties of Gel

1. Ideally, the gelling agent must be inert, safe and cannot react with other formulation constituents.
2. The gelling agent should produce a sensible solid-like nature at the time of storage which is easily broken when exposed to shear forces produced by squeezing the tube trembling the bottle or at the time of topical application.
3. It should have suitable anti-microbial agent.
4. The topical gel must not be sticky.
5. The ophthalmic gel must be sterile.

Characteristics of Gel

Gel can swell, absorbing liquid with an increase in volume. This can be looked on as the initial phase of dissolution Solvent penetrates the gel matrix so that gel-gel interactions are replaced by gel-solvent interactions. Limited swelling is usually the result of some degree of cross-linking in the gel matrix that prevents total dissolution. Such gel swells considerably when the solvent mixture possesses a solubility parameter comparable to that of the gallant.

Uses of Gel

1. As delivery systems for orally administered drugs.
2. For topical drugs applied directly to the skin, mucous membrane or the eye.
3. As long acting forms of drug injected intramuscularly or implanted into the body.
4. As binders in tablet granulation, protective colloids in suspensions, thickeners in oral liquid and suppository bases.
5. In cosmetics like shampoos, fragrance products, dentifrices and skin and hair care preparations.
6. Lubricant for catheters.
7. Bases for patch testing.
8. NaCl gel for electrocardiography

Advantages of Gel

1. Non-greasy application.
2. Being easy to formulate with active ingredients
3. Adhering well to the application site
4. Being washable and non-toxic
5. Stability over time
6. Easy Spreading
7. Skin retention
8. Cooling effect on the skin^[8]

Hair gel

Herbal hair gel is formulated from natural ingredients and herbal extracts helps in controlling hair falling, removes dandruff.

Hair gel provides better application property and stability compare to creams and lotions. It gives non greasy and nonsticky application. Gels have good spreading property Compare to shampoo and other products Gels are not time consuming application. Gels are used for styling hairs so it has multiple uses.^[9]

2.Plant Profile

2.1 Flaxseed



Fig. No. – 3 flaxseed

Kingdom	Plantae
Class	Eudicots
Order	Malpighiales
Family	Linaceae
Genus	Linum
Species	Usitatissimum

Table No. -1 Taxonomy of flaxseed

Chemical Composition :

- Lignans, Linolenic acid, cyclic peptides.
- alkaloids, polysaccharides, cyanogenic glycosides, phenolics phytic acid, linatine, trypsin inhibitor, lignans (phytoestrogens).
- minerals, cadmium vitamins and selenium.^[10]

Pharmacological Activity :

1. Improve Immunity
2. Prevents Cardiovascular system illness
3. Anticancer
4. Antioxidant
5. Relieves Constipation
6. Antidiabetic.^[11]

2.2 Black cumin**Fig. No. -4 black cumin**

Kingdom	Plantae
Phylum	Magnoliophyta
Class	Magnoliopsida
Order	Ranunculales
Family	Ranunculaceae
Genus	Nigella
Species	Sativa

Table No. -2 Taxonomy of Black cumin**Chemical Composition**

- Oleic acid, flavonoids, amino acids.
- Volatile oils (Consists of Nigellone, Thymoquinone, Thymo hydroquinone).
- Vitamins (thamin, riboflavin, pyridoxine and folic acid).[12]

Biological Activity:

1. Anti-bacterial Activity
2. Antiviral activity
3. Antifungal Activity
4. Wound Healing Properties
5. Antioxidant Properties
6. Antiinflammatory Effect
7. Anticancer activity
8. Antidiabetic Effect[13]

2.3 Marigold



Fig. No. -5 Marigold

Kingdom	Plantae
Class	Magnoliopsida
Order	Asterales
Family	Asteraceae
Genus	Calendula
Species	Officinalis

Table No. -3 Taxonomy of Marigold

Chemical Constituents :

- flavanoids, polysaccharides
- linoleic acid,
- carotenoids and triterpenes.[14]

Pharmacological Activity :

1. Antioxidant
2. Antiinflammatory
3. Antibacterial Activity
4. Anticancer Activity
5. Antifungal Activity
6. Wound Healing Activity[15]

3. Material and method

Methodology

□ **Flaxseed**- The flax seed collected from the local market Kasrawad, Local Nimar Region Dist. Khargone (M.P) .The flax seed extract will be prepared by boiling the seeds in water. The extract will be strained using suitable sieve and collected. The extract can be stored in cool and dry place. [16]

□ **Black Cumin** - The black cumin seed collected from the home Kasrawad. The black cumin seed extract will be prepared by boiling the seeds in water. The extract will be strained using suitable sieve and collected. The extract can be stored in cool and dry place.[17]

□ **Marigold** - Marigold flowers were collected from the garden . All the flowers were washed with distilled water and were subjected for drying at room temperature, ensuring that the temperature is regulated and will not harm the phytochemicals of the leaf. The dried flowers(450g) will be homogenized and ground into very fine powder in a motor pestle and the flower extract was prepared using 700 ml ethanol as a solvent using soxhlet extractor. The extract thus obtained will be filtered. The extract can be stored in cool and dry place.[18]

PHYTOCHEMICAL SCREENING OF MARIGOLD EXTRACT

S.no	Product	Test	Result
1.	Carbohydrate	<i>Molisch's test</i>	Positive
2.	Glycosides	<i>Liebermann's test</i>	Positive
3.	Tannins	<i>Lead acetate test</i>	Positive
4.	Alkaloids	<i>Mayer's test</i>	Positive
5.	Steroid	<i>Liebermann Burchard's reaction</i>	Negative
6.	Saponin	<i>Froth test</i>	Negative
7	Flavanoids	<i>Alkaline reagent test</i>	Positive

Table No. -4 Results for phytochemical screening

Preparation of hair gel

Formulation of the herbal hair gel was done as per the formula given in Table5. 1 g of Carbopol 934 was dispersed in 50 ml of distilled water with continuous stirring. 5 ml of distilled water was taken and required quantity of methyl paraben and propyl paraben were dissolved by heating on water bath. Cool the solution, then to that added Propylene glycol 400. Further required quantity of flaxseed 150mg , marigold 5mg and black cumin 5mg extract was mixed to the above mixture and volume made up to 100 ml by adding remaining distilled water. Finally full mixed ingredients were mixed properly to the Carbopol 934 gel with continuous stirring and triethanolamine was added drop wise to the formulation for adjustment of required skin pH (6.8-7) and to obtain the gel at required consistency. [19]

S.no	Name of ingredient	Role of ingredient
1	Carbopol 934	Gelling Agent
2	Methyl Paraben	Preservative
3	Propyl Paraben	Preservative
4	Propylene glycol	Moisturing
5	Triethanolamine	pH adjuster
6	Flaxseed,Marigold,Black cumin extract	Antifungal ,hair growth ,shine to hairs

Table no. -5 Material used in the preparation of herbal hair gel

S.no	Name of ingredient	Quantity
1	Carbopol 934	1gm
2	Methyl Paraben	0.2 ml
3	Propyl Paraben	0.1ml
4	Propylene glycol	5 ml
5	Triethanolamine	1.2 ml
6	Flaxseed extract	150 mg
	Marigold extract	5mg
	Black cumin extract	5mg

Table no. – 6 Formula for preparation of Hair gel

4.Evaluation of herbal hair gel

To evaluate the prepared formulations, quality control tests including visual assessment and physicochemical controls such as physical appearance, pH, ,homogeneity , spreadability , washability and skin irritancy were performed using standard protocols.

1. Physical Properties:-

The physical appearance was visually checked for the appearance, colour and the odour application of prepared base gel formulations.

• Colour, Odour, Appearance.

2. pH determination :-

The pH of hair gel formulations were determined by using the digital pH meter. One gram of gel was dissolved in 100 ml distilled water and stored for two hours. Electrodes were completely dipped into the hair gel formulations and pH was noted. The measurement of pH of formulation was done.

3. Homogeneity :-

After the gel formulation have been set in the container, all developed gels were tested for homogeneity by visual inspection. They were tested for their appearance and presence of any lumps, flocculates or aggregates.

4. Spreadability:

Area of extent to which topical application spread on skin is called as spread ability.

Topical formulations need to spread over surface of site for their therapeutic action so their efficacy depends upon its spreading value. Those Formulation shows lower sliding time having better spread ability.

Spreadability (S) can be calculated as in Eq 1.

$$S = M.L/t \dots\dots\dots (Eq 1)$$

Where,

M is the weight (g) tied to the upper glass slide L is the length (cm) moved on the glass slide, and t is time (sec).
[20]

5. Skin Irritancy

Apply a small quantity on the dorsal part of the hand, check for irritation and redness.

6. Washability

Apply on skin, wash with normal water, observe for clean and clear skin. [21]

Result and Discussion

S.no	Parameter	Observation
1.	Physical appearance	Colour-Yellow Odour – Pleasant Appearance - Smooth
2.	pH	6.9
3.	Homogeneity	Homogenous
4.	Spreadability	Good
5.	Skin irritancy	Nil
6.	Washability	Easy

Table no. -7 Results for Evaluation of hair gel

Conclusion

The herbal hair gel was formulated by mixing the required amount of flaxseed ,black cumin and marigold extract. The above extract contain Phytoconstituents like alkaloids, glycosides, carbohydrate and steroid etc. We are using excipients like propylene glycol provides Moisturising property, Methyl paraben and Propyl paraben are used as a preservative, Carbopol 934 acts as gelling agent and Triethanolamine used as a pH adjuster .But ingredients flaxseed ,black cumin and marigold promote healthy hair growth, reduce hair damage, nourishes hair and overall multipurpose effect on hair and scalp. The evaluation of the formulations was done on various parameters like physical appearance, pH, homogeneity, spreadability, skin irritancy, and washability .The evaluation results shows that the flaxseed hair gel is compatible for hair and it having less side effects . The evaluation parameter of hair gel was determined and the formulation was found to be good, exceptable which is desirable as a cosmetic formulation.

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