

Formulation and Evaluation of Bioactive Herbal Hair Gel for Hair Care Application

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Abstract: Hair is an imperative part of human body. Due to use of various chemicals and synthetic compounds it usually causes destructive effects. The extensive use of chemical-laden hair care products often leads to detrimental effects on hair health. In response, this study formulates a herbal hair gel using flaxseed, Tridax procumbens, and Jatamansi to promote hair nourishment, prevent hair loss, and strengthen hair. Flaxseed's hydrating and antioxidant properties, Tridax procumbens hair growth promoting activity, and Jatamansi's nourishing effects synergistically work together to create a holistic hair care solution. The optimized formulation, code F4, demonstrates desirable physical parameters including pH, viscosity, spreadability, homogeneity, and stability, with no skin irritation and excellent washability. This herbal hair gel offers a natural and effective alternative for individuals seeking to revitalize and promote healthy hair growth.

Keywords: Flaxseed, Jatamansi, Tridax Procumbens, Gel formulation, Herbal cosmetics, Hair growth promoting activity, nourishment, strengthening.

1. INTRODUCTION

Shakespeare wrote, "There's many a man has more hair than wit" in the Comedy of Errors. However, in today's contemporary society, some patients are so troubled by hair loss they might trade wit for more hair if given the opportunity. The study of alopecia is desperately encouraged by society given the importance of hair to most people's identity.

Phytotherapy is based on the use of herbal remedies to treat and prevent diseases in humans and animals. Nowadays, the importance of phytotherapy is increasing. Many patients prefer herbal medicines and especially value their good tolerability and low side effects profile. Furthermore, herbal medicines are now approached far more scientifically. Alopecia, or hair loss, is a common and often distressing problem.

Various works have been undertaken to document a variety of medicinal plants used to improve hair growth and nourish the health.

Here some common problem overcome by using a hair gel

- **Drying and dehydrating hair:** when that extract of jatamansi is used for dehydration of hair. These make the hair rough and reduce the lusterless of tresses
- **Discoloration:** Discoloration is a one the reason behind the hair loss that why a herbal hair has been use to overcome the discoloration
- **Alopecia:** Alopecia involves hair loss all over or in circular areas, receding hair line, broken hair, a smooth scalp, inflammation, and possibly loss a laches, eye brows or pubic hair. Alopecia is a limited to particular area. symptoms are inflammation at the age of a follicle loss toward the center of lesions, violet color skin and scaling.
- **Dandruff:** Dandruff is common problem in a hair related disease. These gels help maintain a healthy environment by balancing oil production, reducing itchiness, and preventing the buildup of dead skin cells, which are often associated with dandruff.

1.1 Herbs used for hairs:

- **Aloe Vera:** Aloe Vera has been used for centuries to promote hair growth and soothe a dry, itchy scalp. It contains enzymes that can help repair dead skin cells on the scalp and promote healthy hair growth.
- **Flaxseeds:** It Contains omega-3 fatty acids, which give vital proteins and nutrients to hair follicles, boost circulation in the scalp, and inhibit hair follicle inflammation that induces hair fall.
- **Jatamansi:** The rhizome of jatamansi plant is ingested as a bitter tonic which may help accelerate the hair growth cycle. A few studies have indicated that it helps promote hair growth in individuals with male pattern baldness as well as in cancer patients who have completed their chemotherapy.ⁱ
- **Tridax Procumbens:** the plant having a various medicinal use like antiseptic, antioxidant, anticoagulant and also, used as hair tonic to strengthening the hair. Which is also used to substitute to Bringraj.ⁱⁱ
- **Lavender:** Lavender is a calming herb that can help reduce stress and promote relaxation. It is also believed to stimulate hair growth and improve the overall health of the scalp.
- **Peppermint:** Peppermint has a cooling effect on the scalp and can help improve circulation, which may promote healthy hair growth. It also has antimicrobial properties that can help prevent dandruff and other scalp conditions.
- **Nettle:** Nettle is rich in vitamins and minerals that are essential for healthy hair growth, including iron, magnesium, and vitamin C. It is also believed to reduce inflammation and promote circulation to the scalp.ⁱⁱⁱ

1.2 Anatomy of Hair:

Each hair has a hair shaft and a hair root. The shaft is the visible part of the hair that sticks out of the skin. The hair root is in the skin and extends down to the deeper layers of the skin. It is surrounded by the hair follicle (a sheath of skin and connective tissue), which is also connected to a sebaceous gland.

Each hair follicle is attached to a tiny muscle (arrector pili) that can make the hair stand up. Many nerves end at the hair follicle too. These nerves sense hair movement and are sensitive to even the slightest draft.

At the base of the hair, the hair root widens to a round hair bulb. The hair papilla, which supplies the hair root with blood, is found inside the bottom of the hair bulb. New hair cells are constantly being made in the hair bulb, close to the papilla. Each hair has a hair shaft and a hair root. The shaft is the visible part of the hair that sticks out of the skin. The hair root is in the skin and extends down to the deeper layers of the skin. It is surrounded by the hair follicle (a sheath of skin and connective tissue), which is also connected to a sebaceous gland.

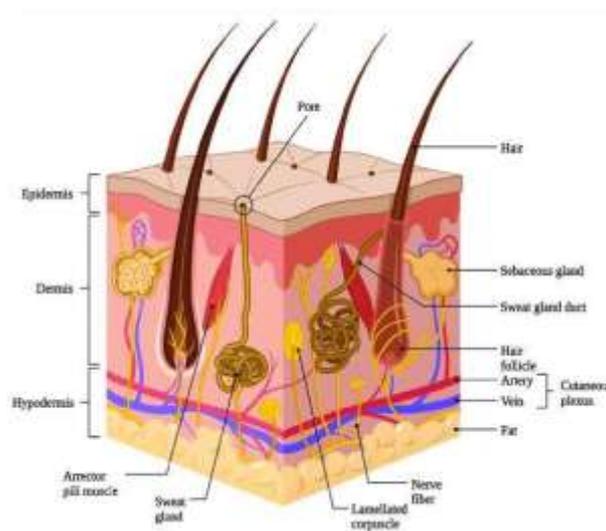


Fig 1: structure of skin and hair^{iv}

2. LITERATURE SURVEY

There is various marketed preparation available as hair gel, but they may possess various side effects like dryness, hair damage etc. So now a days people mostly prefer the herbal formulation.

- D. MANJULA*et al. (2018):** The evaluation of all the formulations (F1 to F4) were done on various parameters like physical appearance, pH, viscosity, spreadibility, extrudability, homogeneity, grittiness and stability. Gels containing 0.5% and 1% of Carbopol 934 formed a very thin gel that liquefied within 4 to 5 hours of preparation. With 1.5% Carbopol 934 the gel formation was better to some extent but the problem of liquefaction after 24 hours was observed. The gel formulation containing 2% of Carbopol 934 formed uniform and smooth gel that did not liquefy even after 24 hrs.^v
- GAIKWAD SAURABH DILIP*et al. (2022)** Flax seed gel has several benefits on hair The omega-3 fatty acids in flaxseed gel is responsible for moisturizing the hair. Flaxseeds are one of dietary sources containing considerable amount of phenolics named lignans. The aim of this study was to evaluate the potential activities of lignan extracts as a potential source of antimicrobial agents like secoisolariciresinol diglucoside (SDG) in variables levels. In the present investigation, we present the antibacterial activity and antifungal activity of Flax seeds extracts with unique composition of different phenylpropanoid compounds. .^{vi}
- ASHIYA CHAUGULE*et al. (2014)** Gel formulations containing Carbopol 934 and in exact concentrations of 0.5% were achieved and evaluated. The evaluation of the formulations were done on various parameters like physical appearance, pH, homogeneity, viscosity, spread ability, extrudability, and stability, In vitro evaluation study. Further there is lot of scope for carrying animal studies also.^{vii}
- KANCHAN JAPADHYA, (2018)** the research work, mouth ulcer gels were formulated incorporating the ethanolic extracts of as Aloe barbedensis, Ocimum tenuiflorum and Azadirachta indica using Carbopol 934 as the gelling agent. Seven batches were formulated by varying the concentration of the herbal ingredients (F1 to F7) the prepared formulations were evaluated for various parameters like physical appearance, pH, Spreadability, Homogeneity and antimicrobial activity against fungi and bacteria. The antimicrobial activity was also compared with a marketed gel formulation.
- SANJAY SINGH NAKOTI* et al. (2017)** The plant has demonstrated several pharmacological activities including hepatoprotective, cardio protective and hypolipidemic and antifungal. Clinical research in Animal with jatamansone, has justified hypnosedative claim of Ayurveda. The review summarizes, phytochemical and pharmacological investigations carried out on the plant. By the virtue of above property this is Tridoshahara. Nardostachys jatamansi contains a number of bioactive chemicals, including crystalline acid, Jatamansic acid, hydrocarbons, a polyoxygenated crystalline solid together with Aendesmol, B-eudesmol, ethanol, angelicin, 4-hydroxythymol dimethyl ether. The present review detailed focus on its pharmacognostical, pharmacodynamics, pharmacological studies and it's therapeutic.^{viii}
- WAHID HERCHI * et al. (2011)** Flaxseed (*Lignum usitatissimum L.*) is a multi-purpose crop and its consumption is beneficial for human health. The nutritional components of flaxseed is oil, protein, lignans, fiber and vitamin. The determination of the minor components is of great importance in establishing the flaxseed oil quality and their genuineness. The qualitative and quantitative determination of its constituents has been carried out by using several analytical techniques most of which are based on gas chromatography and some being based on high-performance liquid chromatography. In the present work, the different methods used for the determination of flaxseed components are revised.^{ix}
- RAMKRISHNA et al. (2022)** The gel was formulated in two steps, firstly extraction of the powdered rhizome of *Nardostachys jatamansi* was carried out by using alcohol by reflux condensation. Secondly Guar gum powder is triturated with water until gel consistency is obtained. Then the *jatamansi* extract was incorporated to this obtained gel. The *jatamansi* extract contains carbohydrates, flavonoids, and alkaloids, sapiens. The formulation was evaluated for varies physical parameters like pH, viscosity, spreadability, homogeneity, stability Studies.

3. AIM

- To formulate and evaluate bioactive herbal hair gel for hair care application.

Objective:

- Collect the all herbs which we need to extract.
- Extract the herbs as per procedure.
- Purify the extract, and mixed it in proper proportion.
- Preparation of herbal gel.

Justification

Natural products from plants are rich sources used for treating a number of diseases. Herbal gel containing herbal agents which are having plant origin. Plant origin products are having no side effects on skin or other body parts. Overall herbal gel is a good choice for styling hairs with the goods of Flaxseeds and Jatamansi , both works for healthy hairs like, nourishes hair, moisturize hairs, show hair growth activity, reduce hair fall, improve shine and texture of hairs.

4. DRUG AND EXCIPIENTS PROFILES

4.1 Jatamansi As per Ayurveda, Jatamansi oil helps control hair fall and promote hair growth when applied to the scalp. This is because hair fall is mainly due to an aggravated Vata dosha in the body. Jatamansi or its oil acts on hair fall by balancing Tridosha (Vata, Pitta andKapha dosha). It also promotes hair^x

Nardostachys grandiflora DC or *Nardostachys jatamansi* Dc belongs to the family Valerianaceae.

Table 1: Taxonomical classification

Kingdom	Plantae
Division	Magnoliophyta
Order	Dipsacales
Class	Magnoliopsida
Family	Valerianaceae
Genus	Nardostachys
Species	Jatamansi



Fig 2: Plant of jatamansi



Fig 3: Rhizome of jatamansi

Table 2: Common Names of plant

Sanskrit	Jatamansi, Bhytajataand Tapaswani	French	Nard Indian
English	Musk-root, Indian spikenardand Indiannard	Kashmir	Bhutijata
Hindi	Balchara, Jatamansi	Marathi	Jatamansi
Punjab	Billilotan	Tamil	Jatamanji
Assamese	<i>Jatamamsi</i>	Bengali	<i>Jatamamsi</i>

Rhizome: A transverse section of the rhizome shows a thin periderm, it can be more or less circular in outline. A large parenchymatous cortex contains starch and an endodermis containing globules of volatile oil. Within a ring of collateral vascular bundles lies large pith containing scattered groups of sclerenchyma Tousecells.

Uses:

- The extract of jatamansi is helpful to strengthen hair.
- Stimulate hair follicle and make the hair healthy
- Helps to impart black color to hair and prevent
- Greying of hair.
- Jatamansi roots are used to reduce hair fall.
- Jatamansi acts on hair fall by balancing Tridosha [vata, pitta, kapha Dosha], which also removes excessive dryness and cure dandruff.^{xi}

4.2 Flaxseed

Common names: Flax seed, linseed, Alsi or teesi (Hindi, Gujarati, and Punjabi), Ali vidai in Tamil

, Atasi and Jawas in Marathi, Tishi in Bengali, Pesi in Oriya, Agasi in Kannada, Aviseginzalu in Telugu, and Cheruchanavithu in Malayalam.

Biological Source:

Linseed is the dried, ripe seed of *Linum usitatissimum* Linn.

Linseed oil is obtained by expression of linseeds, belonging to family Linaceae.

Table 3: Taxonomical classification

Common name	Flaxseeds, linseeds
Binomial name	<i>Linum usitatissimum</i>
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Malpighiales
Family	Linaceae
Genus	<i>Linum</i>
Species	<i>L. usitatissimum</i>

Flaxseed is as an important functional food ingredient, because of its rich contents of a-linolenic acid (ALA), omega-3 fatty acid, fiber and lignans. Alpha linoleic acid is another type of omega-3 fatty acid found in plants^{xii}

FLAXSEED BENEFITS FOR HAIR

The following ingredients can offer specific benefits for your hair:

- **Omega-3 fatty acids:** omega 3 fatty acid provides vitamins, proteins and nutrients to hair and scalp. Omega 3 fatty acid inhibit hair follicle inflammation and help in reducing hair loss. It promotes circulation in the scalp that may effective in hair growth.
- **Antioxidant:** Antioxidant produces by flaxseed is lignans. Lignans may help to suppress or inhibit bacterial growth. Lignans may help in regeneration of hair and reduces hair loss.
- **B vitamins:** Flaxseed is a consistent source of vitamin B. Vitamin b is a group of nutrients that are recognized for making hair stronger and healthier at a more rapid rate.
- **Fiber:** Fiber is the most significant for the hair health. Fiber is made from some protein it significantly known as keratin. Many hair products in the market are enhanced with added fiber for minimizing hair damage. Fibers are very effective in camouflaging hair loss.

- Vitamin E:** Vitamin E is antioxidant is readily available in flaxseed and is vital for hair growth. Vitamin E blocks erosion on scalp tissues and preventing hair loss. Vitamin E is best known vitamin for hair growth. Vitamin E stops hair fall and provides nourishment to hair. Vitamin E help to maintain a healthy hair. ^{xiii}



Fig 4: Extract of Flaxseed

4.3 *Tridax Procumbens*

Tridax procumbens is an Asian traditional herb with a long history of traditional use. It is often referred to as coat buttons or tridaxdaisy. It is a species of a flowering plant belongs to the Asteraceae family. *Tridax procumbens* is best known as a widespread weed and pest plant. The green leaves of *Tridax procumbens* have the cuneate bases, coarsely curved margins, acute apexes, and are opposite, pinnate, oblong to ovate, and 1-2 inches (2.5–5 cm) long. It is an annual herbaceous plant characterized by its prostrate growth habit and branching stems. *Tridax procumbens* is a versatile plant with a wide range of traditional uses and pharmacological activities. Its rich phytochemical composition and therapeutic potential make it a valuable resource in herbal medicine.



Fig 5: *Tridax procumbens*

Kindom	Plantae
Division	Magnoliophyta
Class	Magnoliophyta dicotyledons
Subclass	Asterales
Family	Asteraceae
Species	<i>T. procumbens</i>

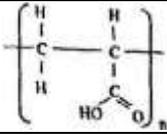
Chemical Composition: *Tridax procumbens* contain variety of active ingredients, including alkaloids, flavonoids, carotenoids, fumaric acid, luteolin, quercetin, oxoester, lauric acid, myristic, palmitic linoleic acid, arachidic, and tannins, among others. Researchers have previously confirmed the presence of dexamethasone, luteolin, glucoluteolin, beta-

sitosterol, and quercetin. Linolenic acid was also detected in the aerial section. A novel flavonoid known as ‘Procumbenetin’ was also isolated from the plant’s aerial portions. Luteolin has antibacterial, anti-inflammatory, anti-allergic, anti-mutagenic, anti-androgenic, anti-estrogenic, hypocholesterolemic, hypotensive, neuroprotective, anti-diabetic, and radio-protective activities. T. procumbens leaves consist of calcium, magnesium, potassium, sodium, and selenium. In an earlier research study, it has been estimated that the leaf of plant mainly contains crude proteins 26%, crude fibre 17%, soluble carbohydrates 39%, and calcium oxide 5%. *Tridax procumbens* has been reported to be a good source of plant protein and potassium supplements, as well as a potential supply of vitamin A (carotenoids) for mankind.^{xiv}

4.4 Excipients Profile

Carbopol 934:

Table 4: Profile of Carbopol

Chemical Name	Carbomer 934 (Technical Grade)
Structure	
Synonyms	Synthalen M; Acrypol 934
Appearance	White to Off-White solid
Melting Point	>255C (dec.)
Storage	200C
Category	Building Blocks; Monomers;
Applications	Carbomer 934 is a synthetic high molecular weight cross-linked water-soluble polymer of acrylic acid.

Glycerin:

Table 5: Profile of Glycerin

Chemical name	Glycerin
Molecular Formula	C3H8O3
Molecular Weight	92.09 g/mol
Melting point	17.8 °c
Boiling point	290 °c
Solubility in water	Miscible
Color	Clear, colorless syrupy liquid
Solubility	Greater than or equal to 100 mg/mL at 64 °F
Uses	Glycerin is also used as a preservative for the storage of food items and also in cosmetics.

Triethanolamine:

Table 6: Profile of Triethanolamine

Chemical name	Triethanolamine
Formula	C6H15N03
Melting point	19-210
Boiling Point	206-2070
Density	1.124
Storage & Sensitivity	Hygroscopic, Light Sensitive.
Solubility	Miscible with water, methanol, acetone, ether, carbon tetrachloride, n-heptane and chloroform. Slightly soluble in petroleum ether.
Applications	Adjusting buffer pH as well as It acts as an effective complexing agent in electroless plating. Further, it is used in hair care products like hair and wave sets.

Polyvinylpyrrolidone:**Table 7: Profile of Polyvinylpyrrolidone**

Chemical name	Polyvinylpyrrolidone
Melting point	>300 °c
Boiling point	90-93 °c
Density	1 ,69 g/cm ³
Storage temp.	2-80C
color	White to yellow-white.
PH	3.0-5.0
Sensitive	Hygroscopic
Applications	In daily cosmetics, PVP and its copolymer has good dispersion property and filming property, and thus being able to be used as a setting lotion, hair spray and styling mousse, as pacifiers for hair care agents, as the stabilizer.

Methyl paraben:**Table 8: Profile of Methyl Paraben**

Chemical name	Methyl paraben
Molecular Formula	C ₈ H ₈ O ₃
Average Molecular Mass	152.147 g/mol
Density	1 .209 g/cm ³
Average Molecular Mass	125-128 ⁰ c
boiling point	270-280 ⁰ (dec)
Solubility	2.5 mg/mL at 25 °C
Uses	Methylparabens are a type of chemical that manufacturers often use as a preservative.

Polyethylene glycol:**Table 9: Profile of Polyethylene glycol**

Chemical name	Polyethylene glycol
Molecular formula	C _{2n} H _{4n+20n+1}
Molecular weight	380 - 420 daltons
Density	1.124 g/cm ³
Boiling point	>200 °c
Melting point	-50 °c
Solubility	70 gn soluble
Uses	It is a product with industrial and pharmaceutical uses. Since many PEG compounds are hydrophilic, industrially, they are utilized in cosmetic products as surfactants, emulsifiers, cleansing agents, humectants, and skin conditioners. As a medication, PEG is a part of the laxative class.

5. EXPERIMENTAL WORK**Formulation of herbal gel**

Drug: Aqueous extract of flaxseeds, Jatamansi extract.

chemicals: Carbopol 934(g), PVP, Methylparaben, Glycerine, PEG, Triethanolamine

Procedure:

5.1 Preparation of aqueous extract of flaxseed

Add flaxseeds to boiling water with constant stirring until a thick mucilage was obtained. Then the mucilage was strained using suitable sieve and stored at room temperature until further use.^{xv}

5.2 Preparation of Jatamansi extract

Weighed 20g of Jatamansi powder is taken in round bottom flask to added 80ml of ethanol. Reflux for 3 hours by maintaining the temperature of 40-50. Filter the filtrate and keep it aside. To the remaining residue again add 60ml of ethanol then Reflux for 2 hours by maintaining the temperature of 40-50⁰. The obtained 1st and 2nd filtrates were combined, then it was concentrated by evaporation. The obtained crude jatamansi extract was stored in airtight contain^{xvi}



Fig 6: Jatamansi extract process

5.3 Preparation of Tridex extract

The powdered leaves of Tridax procumbens about 250 gm were packed in soxhlet apparatus and extracted with ethanol, methanol and distilled water separately, until the completion of the extraction. The extract was filtered while hot, and the resultant extract was distilled in vacuum under reduced pressure in order to remove the solvent completely, and later dried in a desiccator.



Fig 7: Extraction of Tridex

5.4 Preparation of hair gel base

Measured quantity of methyl paraben (75mg), glycerin (3ml) and weighed quantity of polyethylene glycol (6.25ml) were dissolved in about (35 ml) water in a beaker. Then the mixture was stirred at high-speed using mechanical stirrer. Carbopol 934 (2g) (optimized) and PVP (5 mg) were added slowly to the beaker containing above liquid while stirring. Then triethanolamine (0.5ml) was added slowly with continuous stirring to obtain gel structure.



Fig 8: Mechanical Stirrer

5.5 Preparation of hair gel

Finally aqueous extract of flaxseed was incorporated into Carbopol gel and stirred for about 1 hour. then add Jatamansi extract. The prepared herbal gel formulations were stored at room temperature until further evaluation.

Table 10: Formulation of Herbal Hair gel

Formulation code	F1	F2	F3	F4	F5
Carbopol 934(g)	0.5	1.0	1.5	2.0	2.5
PVP (mg)	5	5	5	5	5
Methyl paraben (mg)	75	75	75	75	75
Glycerin(ml)	3	3	3	3	3
PEG (ml)	6.25	6.25	6.25	6.25	6.25
Triethanolamine (ml)	0.5	0.5	0.5	0.5	0.5
Water (ml)	35	35	35	35	35
Aqueous extract of Flaxseed %	5	10	15	20	25
Extract of jatamansi	1.07	1.07	1.07	1.07	1.07
Tridex extract (ml)	3	3	3	3	3

5.6 Evaluation of Herbal Gel

Physical appearance:

The physical appearance was visually checked for the appearance, color and the feel on application of prepared hair gel formulations.

Homogeneity:

After the gel formulations 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.

pH determination:

The pH of all hair gel formulations was 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 each formulation was done in triplicate and average values were calculated.^{xvii}



Fig 9. Digital PH Meter

Spreadability:

Spreadability is expressed in terms of time in seconds taken by two slides to slip off from gel that is placed in between the slides under the direction of certain load. If the time taken for separation of two slides is less then better the spreadability. Spreadability is calculated by using the formula.

$$S = M * L / T$$

Where M = weight tied to upper slide

L = length of glass slides, T = time taken to separate the slide.

Viscosity determination:

Brookfield viscometer was used to determine viscosity. Sufficient quantity of gel was filled in wide mouth jar separately. The height of the gel in the jar should be sufficient to allow to dip the spindle. The RPM of the spindle was adjusted to 2.5 RPM. The viscosities of the formulations were recorded.



Fig 10: Viscometer

Stability studies:

All the formulations were equally good with respect to appearance, homogeneity, pH, viscosity and extrudability. So F4 was selected for stability studies the stability study was conducted for the period of 2 months. The Parameters like appearance, pH, extrudability, and color were tested every month.^{xviii}

❖ Preliminary Phytochemical Investigation

Test for carbohydrates:

Stock solution about 100mg of extract is dissolved in 5ml of distilled water and filtered. The filtrate is subjected to following test.

1. **Molish test:** To 2ml of filtrate two drop of alc. Solution of a-naphtha is added.
2. **Fehling test:** Mix 1 ml Fehling's A and 1 ml of Fehling's B solution, boil for 1 minute. Add equal volume of test solution. Heat in boiling water bath for 5 to 10 min. First yellow, then brick red ppt is observed.

Test for Alkaloid:

Stock solution: About 50 mg of solvent free extract is stirred add little quantity of H₂O and filter it and perform various test for alkaloid.

1. **Mayer's reagent:** To few ml of filtrate add two drop of Mayer's reagent if test is positive it give white/ creamy ppt.
2. **Wagner's test:** To few ml of test solution add 2 drop of Wagner's reagent it gives reddish brown precipitate indicate test is positive
3. **Hager's test:** To few ml of test solution add 1-2 ml of Hager's reagent if test is positive solution gives prominent yellow precipitate
4. **Dragendroffs test:** Add 1-2ml of dragendroffs reagent it gives orange red precipitate.



Fig 11: Test of Alkaloids

Test For Saponin:

1. **Foam test:** A small quantity of extract is diluted with distilled water (20ml). The suspension is shaken in graduated cylinder for 15 min. A two-centimeter layer of foam or froth which is stable for 10 min indicate the presence of saponins.



Fig 12: Test of Saponin

Test for Flavonoid

1. **Lead acetate test:** A small quantity of extract is dissolved in Distilled water and to this 3ml of 10% lead acetate solution is added. A bulky white precipitate indicates the presence of phenolic compound.

6. RESULTS AND DISCUSSION

Physical appearance

The colour of all the herbal gel formulations F 1, F2, F3, F4 and F5 were found to be pale brown with translucent appearance which was found to be smooth on application.

Table 11: Physical appearance

Sr. no.	Parameters	Observations
1	Color	Transparent
2	Odour	Odourless
3	Consistency	Semisolid

Homogeneity

All the developed gels were tested for homogeneity by visual inspection for appearance and presence of any lumps. Flocculates or aggregates. The homogeneity was found to be good for all formulations.

pH determination

The pH of all the herbal gel formulations ranged between 6.7 to 7.3 that suited the hair, indicating the compatibility of the herbal gel formulations with the hair.

Viscosity determination

The viscosity of all the formulations were found in the range of 1, 50,232 to 1, 52, 876 CPS. From the results it is clear that as the concentration of flaxseed extract increased from 5% to 20% the viscosity of the formulations also increased.

Stability studies

The stability studies were conducted for all the formulations for a period of 3 months. No appreciable changes were found for the tested parameters like appearance, pH, and extrudability, at room temperatures (25/60 C% RH).

Phytochemical screening: For evaluation and identification of phytochemical present in plat perform various test, which are describe in table

Qualitative phytochemical investigation of Jatamansi extract

Table 12: phytochemical investigation test

Plant constituents	Test performed	Result
Test forCarbohydrates	Fehling's test	Positive
Test for alkaloids	Mayer's test	Negative
	Dragendorffstest	Positive
	Wagner's test	Positive
	Hanger's test	Positive
Test for saponins	Foam test	Positive
Test for flavonoids	Lead acetate test	Positive

Extract - Ethanolic extract of Nardostachysjatamansi.

"+"Sign shows the presence of phytochemical constituents."-Sign shows the absence of phytochemical constituents.

Phytochemical investigation of jatamansi extract:

- Carbohydrates are present in extract
- Alkaloids are present in extract
- Saponins are present in extract
- Flavanoids are present extract

Table 13: Evaluation of Herbal Hair gel

Formulation code	Physical appearance	Homogeneity	Viscosity (cps)	PH
F1	Translucent, pale brown, smooth on application	Good	1,45,876	6.8
F2	Translucent, pale brown, smooth on application	Good	1,50,342	6.8
F3	Translucent, pale brown, smooth on application	Good	1,65,428	6.9
F4	Translucent, pale brown, smooth on application	Good	2,02,412	7.1
F5	Translucent, pale brown, smooth on application	Good	2,56,654	7.3

Formulation code F3 was found to be optimized from the above observation and result.

Table 14: Formulation Herbal hair gel base

Formulation code	F1	F2	F3	F4	F5
Carbopol 934(g)	0.5	1.0	1.5	2.0	2.5
PVP (mg)	5	5	5	5	5
Methyl paraben (mg)	75	75	75	75	75
Glycerin(ml)	3	3	3	3	3
PEG (ml)	6.25	6.25	6.25	6.25	6.25
Triethanolamine (ml)	0.5	0.5	0.5	0.5	0.5
Water (ml)	35	35	35	35	35

Table 15: Evaluation of Herbal Hair gel

Sr. no.	Evaluation factor	Observation/Result
1.	PH	7.2
2.	Spreadability	12.2cm/sec
3.	Homogeneity	Homogeneous
4.	Skin irritation test	Non-irritant
5.	Washability	Shows good washability

7. SUMMARY

In today's contemporary society, the study of alopecia is desperately encouraged by society given the importance of hair to most people's identity. and Phytotherapy is based on the use of herbal remedies to treat and prevent diseases in humans and animals. Nowadays, the importance of phytotherapy is increasing. Many patients prefer herbal medicines and especially value their good tolerability and low side effects profile.

So, the objective is to make product which have lots of benefits of herbs and also able to nourish and strengthen the hairs.

By the literature survey we get to know about the Jatamansi and its many benefits which is not only limited for the hair but for overall health. And also, the Flaxseeds known as linseeds which is used for hair shine, moisturizing and other properties.

Material collection and formulation is done with the different challenges like choosing gel forming agent, preservatives and their quantities also converting the plant part into desired form.

Then the evaluation is done by the parameters like physical appearance, pH, viscosity, spreadability, homogeneity, stability study and other

Then from all formulation code F4 is able to satisfy the limits so, it called as optimized formulation. Then the thesis work is performed.

The formulate Herbal Hair Gel is have many benefits like able to recover alopecia, prevent the dehydration of hair so that it looks healthy and shiny not only the Hairs it is uses for the like balancing vata, pitta, cough imbalance in the body and also known for its calming peaceful and relaxing features also known as natural stress busters.

This hair gel is an effective natural alternative to commercial hair gels, which often contain harsh chemicals and synthetic ingredients that can damage the hair. Flaxseeds and Jatamansi hair gel can be used to style hair while also providing nourishment and moisture to the hair.

8. CONCLUSIONS

The formulation of Flaxseed hair gel and Jatamansi provides a good base for protection and strengthens the hair thereby preventing the hair fall. There is a further scope for pharmacological studies in lower animals.

In market there is more demand for herbal formulation due to cost effective, less side effect. So above data shown that gel having good characteristics, viscosity, Jatamansi is also provide benefits like balancing vata, pitta, cough imbalance in the body and also known for its calming peaceful and relaxing features also known as natural stress busters. So, overall, it's a product with multiple benefits.

By this discuss we conclude that F4 formulation batch is optimized.

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