



**International Journal of Current Trends in Pharmaceutical Research**  
 Home Page: <https://pharmaresearchlibrary.org/journals/index.php/ijctpr>  
 CODEN (USA): IJCTGM | ISSN: 2321-3760 | Publisher: Pharma Research Library  
 Int. J. Curnt. Tren. Pharm, Res., 2025, 13(1): 41-45  
 DOI: <https://doi.org/10.30904/j.ijctpr.2025.4802>



## Flaxseed Based Rice Water Keratin Treatment Hair Gel

Jyothi S\*, Venkata Ramana B

Prabhath Institute of Pharmacy, Nandyal District, Andhra Pradesh, India- 518523

### ABSTRACT

The goal of the current study was to create and assess a rice water keratin therapy hair gel based on flaxseeds. The ingredients were divided into five different formulas. Silk and healthy hair is provided by the high concentration of 100g of Jatamansi in all five formulations. The measured amount of 15ml aloe vera gel is needed to regulate oily hair and strengthen hair. The 425ml of rice water results in thick, glossy hair. Use ten grams of guar gum to reduce hair frizz. Vitamin B, selenium, and copper are among the replenishing nutrients found in 75% flaxseed that aid in hydrating the hair and scalp. The formulations were evaluated based on a number of criteria, including good physical appearance with the properties of light black and translucent colour, homogeneity and good performance, pH values between 6.92 and 7.02, viscosity values between 9361 and 9379 cps, no gel trace, skin compatibility and non-irritating properties, extrudability values between 84.0 and 89.5±0.001, spread ability values of 13.33 cm/sec, and stability studies conducted for 30 days at room temperature between 25 and 30°C. The work justifies all the evaluation parameters by showing the rice water keratin treatment through hair gels based on flaxseeds.

**Keywords:** Hair gel, Jatamansi, Aloe vera, Flaxseeds

### ARTICLE INFO

#### \*Corresponding Author

Sanga Jyothi  
 Prabhath Institute of Pharmacy  
 Nandyal District, Andhra Pradesh  
 India- 518523

#### Article History:

Received : 09 Mar 2025  
 Revised : 31 Mar 2025  
 Accepted : 24 April 2025  
 Published : 22 May 2025

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**Citation:** Jyothi S, et al. *Flaxseed Based Rice Water Keratin Treatment Hair Gel. Int. J. Curnt. Tren. Pharm, Res., 2025, 13(1): 41-45.*

### CONTENTS

1. Introduction. . . . .	41
2. Materials and Methods. . . . .	42
3. Results and Discussion. . . . .	43
4. Conclusion. . . . .	44
5. References. . . . .	44

### 1. Introduction

#### Gel

A gel is a semi-solid system where a liquid phase is confined inside a network of colloidal particles or polymers that are cross-linked in three dimensions. Gels have qualities that make them both solid and liquid, which makes them helpful in a variety of fields, such as materials science, food, cosmetics, and pharmaceuticals.

#### Types of Gels

Gels can be categorized according to a number of factors, including their source, origin, and structure.

#### 1. Based on the Nature of the Dispersing Medium

**1.1 Hydrogels:** In these gels, water serves as the dispersing agent. Due to their high water content, they are utilized in

biological applications such as wound healing and medication delivery (2).

**1.2 Organgels:** In these gels, an organic solvent serves as the dispersion medium. Pharmaceuticals and cosmetics like ointments and lotions employ them (3).

**1.3 Xerogels:** These are dried gels used in tissue engineering and controlled drug release that can absorb water and swell when hydrated (4).

#### 2. Based on source of the gel

**Natural Gels:** Derived from organic materials such as alginate, agar, and gelatin. The food and pharmaceutical industries make extensive use of these biodegradable gels (5).

**Synthetic Gels:** Comprised of synthetic polymers like polyvinyl alcohol and polyethylene glycol, which offer greater control over characteristics like stability and mechanical strength (6).

### 3. Based on the Type of Cross-Linking

**Physical Gels:** Formed through non-covalent interactions such as van der Waals forces, ionic interactions, and hydrogen bonds. These gels react to changes in the environment and can be reversed (7).

**Chemical Gels:** Formed by covalent crosslinking of polymers, producing an irreversible gel with superior mechanical stability (8).

### Applications of Gels

Many industries make extensive use of gels:

**Pharmaceuticals:** Drug delivery methods (e.g., hydrogels for wound healing, transdermal gels).

### Cosmetics:

Skin care items like face masks and moisturizers.

**Food Industry:** Ingredients that thicken foods like yogurts and jellies.

**Biomedical Engineering:** Biosensors and scaffolds for tissue engineering.

### Hair

Hair follicles in the dermis produce the keratinized structure known as hair. It has several uses, such as protection, thermoregulation, sensory perception, and aesthetic or social importance. The medulla, cortex, and cuticle are the three primary structural layers that make up hair. A complicated mini-organ, the hair follicle goes through three cyclic phases of growth: anagen (growth phase), catagen (regression phase), and telogen (resting phase). These phases are controlled by environmental, hormonal, and genetic variables (9,10).

### Hair anatomy<sup>(11)</sup>

**Hair shaft:** The visible, non-living part of the hair is called the hair shaft. It is made up of three separate layers.

**Medulla:** The innermost layer is made up of loosely attached keratinized cells and is primarily present in thick terminal hairs.

**Cortex:** The deepest layer, composed of closely spaced keratinized cells, gives hair its color, strength, and elasticity because of melanin.

**Cuticle:** The outermost layer shields the hair shaft from harm and is made up of overlapping cells that resemble scales.

**Hair Follicle:** The outermost layer shields the hair shaft from harm and is made up of overlapping cells that resemble scales.

**Hair bulb:** The follicle's base, which contains the dermal papilla, which uses capillaries to deliver nutrients and growth impulses.

**Matrix cells:** New hair is created by these rapidly dividing cells, which are located inside the bulb. In this area, melanocytes provide pigmentation.

**Outer and Inner root sheaths:** Protective coverings that direct the growth of the hair shaft.

**Sebaceous gland:** Provides hydration and keeps the follicle from becoming dry by secreting sebum, or oil.

**Arrector pili muscle:** A tiny, smooth muscle that is connected to the follicle and contracts in reaction to cold or anxiety, giving rise to "goosebumps."

### Physiology of hair growth (12)

There are three primary stages in the cyclical process of hair growth:

#### I. Anagen (Growth Phase)

The longest period, which lasts two to seven years, is when the matrix's cells actively proliferate. Hair grows 1 centimeter each month on average. Hair length is determined by anagen duration, which varies from person to person.

#### II. Catagen (Transition phase)

There is a brief (2–3 week) period during which the follicle shrinks and hair growth slows. When the hair separates from the dermal papilla, the flow of nutrients stops.

#### III. Telogen (Resting phase)

Lasts roughly three months, during which time the hair stops growing but stays in situ. Between fifty and one hundred hairs are lost every day due to normal shedding. The cycle repeats when a new anagen phase starts.

### Functions of Hair (9,10)

**Protection:** Sensitive areas are shielded from dust and germs by nasal hairs and lashes.

**Thermoregulation:** Body hair helps regulate body temperature, whereas scalp hair minimizes heat loss.

**Sensory function:** Touch-sensing mechanoreceptors are found in hair follicles.

**Physiologic and social impact:** Hair has a big impact on psychological health, cultural expression, and self-identity.

#### 1. Plant Profile:

##### 1.1. Flaxseed:

Flaxseed, also known as linseed, is a nutrient-rich food and fiber crop that has been cultivated for thousands of years. It is a versatile crop with various uses, including food, feed, fiber, and medicine (13). Some methods were reported on hair gels with different formulation by taking synthetic and natural materials (14-24).

### 2. Materials and Methods

#### 2.1. Materials Needed For Flaxseed Extract:

Flaxseed, jatamansi, aloe vera gel hot plate, stirrer, beaker, water.

#### Preparation of Jatamansi extract

Twenty grams of jatamansi powder were precisely weighed and then added to the round-bottom flask. Add 80 ml of ethanol to this and allow it to reflux for three hours while keeping the temperature between 40 and 50 °C. After filtering, the resultant solution was set aside. The round-bottom flask was left with the residue. The residue was once more refluxed with 60 milliliters of ethanol for two hours while the temperature was kept precisely between 40 and 50 degrees Celsius. The collected and filtered solutions were mixed together. A rotatory evaporator was then used to concentrate the mixed filtrates. The crude extract was eventually obtained. An airtight container was used to store the extract.

#### Preparation of Flaxseed extracts

Bring the flaxseeds to a boil in water. While the solution is boiling, keep stirring it. The thick mucilage was produced by stirring continuously. A suitable strainer was used to filter the resulting mucilage. The mucilage from flaxseed was finally gathered.

**Preparation of Aloe vera extract**

The leaves of aloe vera 2-4 were gathered. All of the yellow sap substance found in aloe leaves was drained away by cutting the leaves off at a distance of around half an inch from the base. Using a mechanical stirrer, the aloe mucilage was forced to stir vigorously in order to ensure uniformity. Finally, a muslin cloth was used to strain and filter this solution. They stored the filtrate.

**Preparation of rice water**

Place one cup of rice grains in a dry, clean bowl and rinse them with water once to get rid of any dirt or contaminants. After draining the bowl of water, a certain amount of water was added to the rice once more. Afterward, a heavy lid was used to cover the bowl of rice. After that, the dish was left alone at room temperature for a day without being touched. After that, the rice water was gathered and put in a sanitized glass container. For roughly two to three days, the jar was left to ferment.

**Preparation of Herbal hair gel**

The process of making herbal hair gel involved obtaining flaxseed aqueous extract. A sufficient amount of flaxseeds was added to boiling water to create the extract. Continuous stirring was done while the seeds were boiling in water until the thick mucilage that was wanted was achieved. Finally, the thick mucilage that was obtained was filtered using the appropriate sieve. In the last case, the mucilage was kept at room temperature until it was needed again. The precise amount of rice water is used to dissolve the measured aloe vera gel. This can be achieved by using a mechanical stirrer to agitate the mixture at a high speed. Following that, 2g of optimum guar gum was gradually added to the mixture in the beaker while being stirred. Twenty grams was then added after being weighed. The creation of five distinct formulations for herbal hair gel was the most noticeable stage in the process. Guar gum was used as the gel foundation in these formulations, which were made using the straightforward gel preparation procedure. In a beaker, the measured amounts of 3 milliliters of aloe vera gel and 80 milliliters of rice water are combined. That should be added up gradually and perceptibly while stirring continuously. For the sake of gel structure, constant stirring was required. In the last example, different amounts of flaxseed aqueous extract (5%, 10%, 15%, 20%, and 25%) were added to the guar gel. An hour or so was spent stirring the mixture. Therefore, the F4 guar gum formulation contains 5%, 10%, 15%, 20%, and 25% flaxseed extract in order to produce the H1F4, H2F4, H3F4, H4F4, and H5F5. Until further analysis, the synthesized herbal gel

compositions were kept at room temperature. Formulation of the hair gel shown in the table 1.

**3. Results and Discussion**

**Physical appearance**

Like other cosmetics, consumers' perceptions of hair gels' beauty are often based on appearance, therefore it's critical to look beautiful. The gel's formulation had a faint black hue. It has a pleasant scent. The gel was smooth and devoid of strange objects.

**Homogeneity**

By visually inspecting each generated gel for the presence of lumps, flocculates, or aggregates, the gels were evaluated for homogeneity. For every formulation, the consistency was deemed satisfactory.

**pH of the hair gel**

All herbal formulations have a pH between 6.92 and 7.02, which is suitable for hair and ensures that the herbal gel formulation works well with it.

**Viscosity**

All of the formulations had viscosities between 9361 and 9379 cps. The results show that the viscosity of the formulations increased along with the flaxseed extract concentration, which went from 5% to 20%.

**Washability**

After applying the prepared herbal hair gel, it was rinsed with water. After washing, the gel is completely gone.

**Skin irritation**

The prepared herbal hair gel was applied to the hand's skin and left in the sun for four to five minutes. Skin compatibility and non-irritability were determined.

**Extrudability**

Every formulation (table-2) that was extruded from a metallic collapsible tube demonstrated good extrudability. In contrast to H1F4, H2F4, and H3F4, H4F4 and H5F4 exhibited superior extrudability.

**Spreadability**

Spreadability contributes significantly to uniform application and consumer appeal. The produced gel's spreadability was measured (table-3) at 13.33 cm/sec.

**Stability studies**

The prepared hair gel underwent a 30-day stability testing at room temperature, which is typically between 25 and 30°C. The synthesized gel's color, odor, and physical appearance were among the criteria that were observed. Within 30 days, no discernible changes in the hair gel's color or pH were seen.

Table: 1 Formulation of Hair Gel

S.No	Formulation	H1F4	H2F4	H3F4	H4F4	H5F4
1	Aqueous extract of Flaxseed	5	10	15	20	25
2	Guar Gum (gm)	2	2	2	2	2
3	Aloe vera gel (mL)	3	3	3	3	3
4	Jatamansi (gm)	20	20	20	20	20
5	Rice Water (mL)	85	85	85	85	85

Table: 2 Results of Extrudability

S.No	Formulation	% of Extrudability
1	F1	84.0±0.003
2	F2	85.0±0.002

3	F3	86.0±0.002
4	F4	87.0±0.002
5	F5	89.0±0.001

**Table:3** Results of Spreadability

S.No	Formulation	Spreadability (gcm/sec)
1	F1	14.61± 0.002
2	F2	13.33±0.002
3	F3	12.65±0.001
4	F4	10.00±0.001
5	F5	8.92±0.002

#### 4. Conclusion

Herbal gels with natural components and flaxseed and aloe vera herbal extracts may help reduce hair loss and avoid dry split ends. They are also the finest option for nourishing hair and treating other issues with the scalp. Additionally, rice water, which is extremely safe and effective to use, is included in herbal hair gel to promote hair growth and reduce hair loss. Since it nourishes the hair root and promotes hair growth, inositol, a crucial chemical component of rice water, is crucial for reducing hair damage during keratin treatment. In addition to a number of synthetic conditioning agents, using natural conditioning agents helps to reduce hair loss and surface moisture. In order to compete with the synthetic excipients that are already on the market, natural gums can also be modified to create custom solutions for drug delivery systems. Due to the vast amount of research available, guar gum is employed as a natural gelling ingredient in this study and combined with jatamansi extract to create herbal hair gel. The formulations were assessed based on a number of factors, including stability, homogeneity, viscosity, spreadability, extrudability, pH, and physical appearance. By demonstrating that the herbal hair gel is safe for hair, has fewer adverse effects, and yields a value that falls within acceptable bounds, the study supports all of the evaluation criteria.

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