



# Formulation And Evaluation Of A Novel Flaxseed-Based Hair Mask Enriched With Tulsi And Garlic Oil

<sup>1</sup>Mrs.Prinkle Kudale, <sup>2</sup>Miss. Sakshi Wable, <sup>3</sup>Miss. Priyanka Khanvilkar, <sup>4</sup>Miss. Sakshi Budhawant.

<sup>1</sup>Assistant Professor , Student, student, student, student, student

<sup>1</sup>AISSMS College of Pharmacy

<sup>2</sup>AISSMS College of Pharmacy

<sup>3</sup>AISSMS College of Pharmacy

<sup>4</sup>AISSMS College of Pharmacy

<sup>1</sup>AISSMS College of Pharmacy, Pune, India

**ABSTRACT :** In this research, we developed and evaluated a novel flaxseed-based hair mask containing tulsi (holy basil) and garlic oils aimed at addressing hair diseases like candidiasis. Tulsi is renowned for its diverse therapeutic properties like vitamin K content, antioxidant benefits, and its ability to stimulate hair growth. Garlic, another important component, has antimicrobial properties and contains selenium, which aids in eliminating scalp bacteria and enhancing blood circulation for improved hair growth. Tulsi and Garlic were selected as they show no or minimum side effects. Flaxseed contributes to hair nourishment and smoothing effects, complementing the therapeutic properties of tulsi and garlic. The formulation involves carbopol 934 at varying concentrations (1% to 2%) as gelling agent, while tulsi and garlic oils were incorporated at concentrations of 2%, 5%, and 8. Out of the nine formulations tested, F8 emerged as the most promising, demonstrating superior performance and stability over an extended duration. This report presents the findings of a comprehensive study involving Design of Experiments (DOE), preliminary testing, texture analysis, zeta potential measurements, and freeze-thaw evaluations. The developed formulation have the potential of integrating Ayurvedic principles into cosmetic formulations, leveraging the synergistic effects of traditional ingredients to combat specific hair ailments like candidiasis. The developed flaxseed hair mask offers a promising alternative in the realm of natural hair care products, with potential implications for broader cosmetic applications rooted in Ayurvedic knowledge.

**Index terms:** flaxseed, tulsi (*Ocimum sanctum*), garlic (*Alluvium sativum*), carbopol, hair mask.

## I.Introduction:

In recent years, the shift towards herbal and natural cosmetic products has gained considerable momentum owing to concerns about the adverse effects associated with synthetic alternatives<sup>20</sup>. Flaxseed also known as linseed, has therapeutic properties in treating damaged hair and scalp conditions<sup>16,17</sup>. The application of flaxseed mask on the scalp acts as a moisturizer and promotes hair growth, making it a preferred choice in the realm of herbal cosmetics<sup>18,20</sup>. Tulsi (*Ocimum sanctum*) benefits hair by rejuvenating follicles, strengthening roots, curbing excess oil, thoroughly removing impurities, stimulating blood circulation, and

promoting hair growth due to its richness in vitamin K and antioxidants<sup>2</sup>. Tulsi aids in controlling fungal strains responsible for dandruff, thereby reducing scalp itchiness and redness<sup>4,6</sup>. Its inclusion in hair formulations is regarded as pivotal, underscoring its role as a beneficial ingredient in combating various hair ailments<sup>5</sup>. Garlic (*Allium sativum*) is another essential botanical agent containing allicin, vit. C and has antimicrobial properties, making it effective in treating dandruff and hair loss<sup>1</sup>. Garlic also protects keratinocytes (cells responsible for keratin production) from UV damage<sup>13,14</sup>. The presence of free radicals in garlic helps prevent hair thinning and loss, further highlighting its therapeutic potential in hair care formulations<sup>7</sup>.



fig 1.1: Flaxseed



Fig 1.2: Tulsi Oil

fig1.3: Garlic Oil

## II. Material and methodology<sup>8</sup>:

### 2.1 Ingredients:

**Flaxseed** : 500 g flaxseed were obtained from the shop blalaji traders.

**Oils**: garlic and tulsi oil were obtained from a Shree oils shop.

### Methodology:

**Extraction of flaxseed gel** - Flaxseeds were cleaned for any impurities. 5 gm of flaxseeds were weighed. 100ml of distilled water was measured. Flaxseed were added to the beaker containing water. It was heated at 70° for 30 mins. After cooling the flaxseed extract was strained using a cheese cloth.

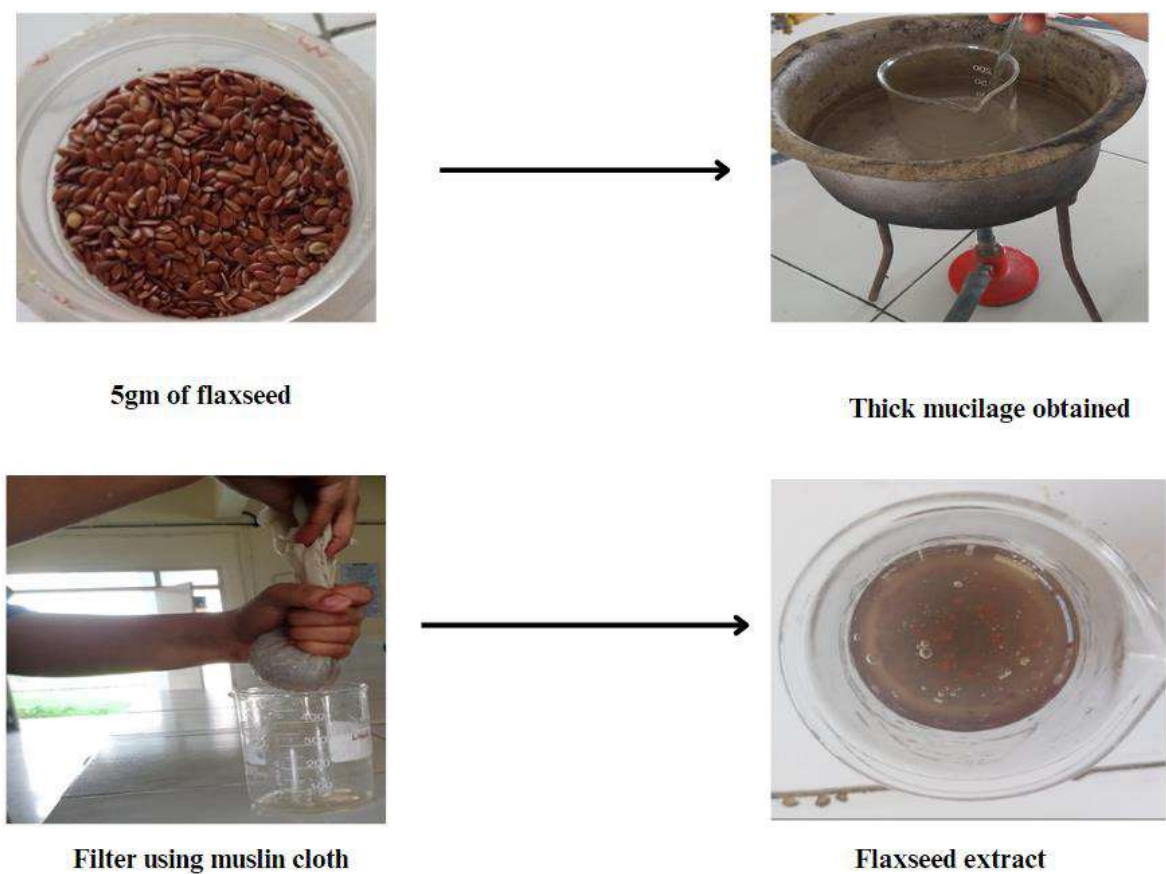


fig 2.1 extraction of flaxseed extract

**2.2 Incorporation of API :** Garlic oil and tulsi oil were obtained from the market. Both herbal oils were added to the flaxseed extract predetermined amounts, as specified by the experimental design.

### 2.3 Formulation of hair Mask:

- 1. Preparation of Gel Base<sup>9</sup>:** Weighed quantities of triethanolamine, PVP, methylparaben, glycerine, polyethylene glycol, and distilled water were gathered. The mixture was stirred at 20 rpm using a mechanical stirrer to ensure uniform blending<sup>3</sup>.
- 2. Preparation of Carbopol 934 Solution:** Carbopol 934 (2% concentration) was soaked in water for 24 hours to hydrate and dissolve. After soaking, the hydrated Carbopol 934 was re-weighed for accurate measurement.
- 3. Incorporation of Active Drug Constituents and Flaxseed Extract:** The measured oils (main drug constituents) and flaxseed extract were added to the stirred gel base mixture. The mixture was continuously stirred at 20 rpm to achieve homogeneity.
- 4. Final Mixing and Homogenization:** Once the gel base was fully incorporated with the active drug constituents and flaxseed extract, Carbopol 934 was added slowly to the mixture. Continuous stirring at 20 rpm ensured thorough dispersion and homogenization of Carbopol 934 within each formulation.

## Formulation table -

Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9
Triethanolamine (gm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PVP (gm)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Methyl Paraben (gm)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Glycerin (gm)	3	3	3	3	3	3	3	3	3
Polyethylene Glycol (gm)	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
Carbopol 934 (19g)	1%	2%	1.5%	1.5%	2%	1%	1%	2%	1.5%
Garlic oil (gm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Tulsi oil (gm)	1.9	7.9	1.9	4.9	1.9	4.9	7.9	4.9	7.9
Flaxseed extract	5	5	5	5	5	5	5	5	5
Water (ml)	15	15	15	15	15	15	15	15	15

Table 2.1: Formulation Table of Hair Mask

## III. Evaluation of Hair Mask–

3.1 Phytochemical analysis of flaxseed<sup>11</sup>:

- 1) **Detection for Tannins Braymer's test-** 2 ml of extract was allowed to react with 10% alcoholic ferric chloride solution.
- 2) **Detection for Quinones Alcoholic KOH test-** 1mL plant extract + few mL alcoholic potassium hydroxide.
- 3) **Detection for Phenols Iodine test-** 1mL extract + few drops of dil. Iodine solution.

## Phytochemical analysis of flaxseed extract:

Table 2.2: phytochemical analysis of flaxseed extract.

Sr no.	Plant constituents	Test performed
1	Test for Tannins	Braymer's test
2	Test for Saponins	Foam test
3	Test for Alkaloids	Dragendroffs test
4	Test for Quinones	Alcoholic KOH test
5	Test for Phenols	Iodine test

## Phytochemical studies of Tulsi oil:

### Test for carbohydrates:

**Fehling's test<sup>10</sup>:** Equal amount of Fehling A and Fehling B reagents were mixed and 2ml of it was added to the plant extract and then gently heated the sample.

**Test for proteins:** Million's test: Crude extract was mixed with 2ml of Millon's reagent, if precipitate appeared which turned red on gentle heating confirmed the presence of protein.

**Test for alkaloids<sup>19</sup>:** 2ml of 1% HCl was mixed with crude extract and heated gently. After heating, Mayer's and Wagner's reagents were added to the mixture. If precipitate was observed in the reaction mixture which indicated the presence of alkaloids.

**Test for tannin<sup>12</sup>:** 1 ml of distilled water and 2-3 drops of ferric chloride solution was added to 0.5 ml of crude extract. A black coloration indicated the presence of tannin.

## IV. Result:

### 4.1 Formulation Table

*Table 3: Formulation Table of Hair MasK*

Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9
Triethanolamine (gm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PVP (gm)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Methyl Paraben (gm)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Glycerin (gm)	3	3	3	3	3	3	3	3	3
Polyethylene Glycol (gm)	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
Carbopol 934 (19g)	1%	2%	1.5%	1.5%	2%	1%	1%	2%	1.5%
Garlic oil (gm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Tulsi oil (gm)	1.9	7.9	1.9	4.9	1.9	4.9	7.9	4.9	7.9
Flaxseed extract	5	5	5	5	5	5	5	5	5
Water (ml)	15	15	15	15	15	15	15	15	15



Fig 4.1 formulations for trial

Formulatio F8 was found to be the best formulation

#### 4.2 Evaluation of Flaxseed:

##### Phytochemical analysis of flaxseed extract:

Table 4.1: Phytochemical test of Flaxseed

Sr no.	Plant constituents	Test performed	Result
1	Test for Tannins	Braymer's test	Positive
2	Test for Saponins	Foam test	Positive
3	Test for Alkaloids	Dragendroffs test	Positive

#### 4.3 Phytochemical test for Tulsi oil:

Table 4.2: Phytochemical test for Tulsi

Sr.no	Test performed	Result
1	Test for carbohydrates	Positive
2	Test for protein	Positive
3	Test for alkaloid	Positive
4	Test for Tannins	Negative

**Tannin test:** Tannin penetrates the hair shaft, creating a protective layer that strengthens the structure and reduces breakage. This fortifying effect not only strengthens the hair, but also promotes healthy growth and vitality. Tannin-treated hair becomes stronger, shinier, and more resistant to damage over time

**Saponin:** They are mild and natural; they serve natural conditioner and cleaners and do not deplete natural oils from the skin and hair. Also, most plant saponins exhibit hair follicle strengthening, hair growth promotion, and hair dyeing activities.

**Alkaloids:** Alkaloids can positively impact hair by stimulating hair growth and enhancing scalp health. Compounds like caffeine, present in certain alkaloids, promote blood circulation to the scalp, encouraging

follicle activity and reducing hair loss. Additionally, alkaloids with antioxidant properties can protect hair follicles from oxidative stress, contributing to overall hair health and resilience.

**Protein:** Proteins play a crucial role in maintaining hair health by strengthening the hair shaft and preventing damage. They help repair and rebuild damaged hair strands, improving elasticity and resilience. Proteins also contribute to moisture retention, enhancing hair hydration and reducing frizz. However, excessive protein exposure can lead to stiffness and brittleness, so it's essential to strike a balance in hair care products.

**Carbohydrates:** Carbohydrates serve as essential energy sources for hair follicle metabolism, supporting healthy hair growth. They provide nourishment to the scalp and hair follicles, aiding in the production of keratin, the primary structural protein of hair. Additionally, carbohydrates help maintain scalp moisture balance, promoting overall hair health and vitality.

**Phenols:** Phenols exhibit antioxidant properties that protect hair follicles from oxidative stress, reducing damage and promoting hair strength. Additionally, phenols can soothe and calm the scalp, alleviating inflammation and irritation, thus contributing to overall scalp health and improving hair condition.



Fig4.2: phytochemical test for Oils

#### 4.4 Particle size:

Table4.3: particle size of hair mask

	F1	F2	F3	F4	F5	F6	F7	F8	F9
<b>Particle size (d.nm)</b>	758.1	2343	3926	816.3	1.778e	6517	877	731.6	7382

#### 4.5 Zeta Potential –

Table4.4: Zeta Potential of molecules of hair mask

	F1	F2	F3	F4	F5	F6	F7	F8	F9
<b>Zeta Potential</b>	-23	-3.73	-24.6	-6.64	-12.7	-22.7	-7.17	-26.7	-18.6

#### 4.6 Spreadability:

**Table 4.5: Spreadability of Hair Mask**

	F1	F2	F3	F4	F5	F6	F7	F8	F9
HARDNESS	37.2	31.4	41.2	33.9	39.4	40.1	45.2	31.1	33.1

**Lesser the hardness greater the spreadability.**

**4.7 Freeze Thraw:** During this studies the prepare formulation of hair mask was kept alternatively at temperature of 4 and room temp for 24 hrs each.



**Fig4.3 : Stability of hair mask**

**4.8 Stability Studies:** The prepared hair mask was kept for stability studies for one month and was found to be stable.

**4.9 pH :** After the preparations of different hair gel formulations its pH was determined. 1gm of hair gel was dissolved in 100ml of distilled water and kept for 2 hrs. after 2hrs pH was noted. The pH was determined 2 times for each herbal hair gel formulation and its average value was found to be 6.11.





**Fig4.5 : pH determination**

## V DISCUSSION

The study is performed with an aim to develop Flaxseed hair mask enriched with tulsi oil and garlic oil. Nine different hair gel formulations were prepared. Out of Nine different formulation the F8 formulation gave appropriate colour, homogeneity, pH, spreadability, skin irritation and stability study to minimised side effects of Herbal hair mask all formulation are formulated & evaluated for every formulation. According to the evaluation parameters performed F8 formulation was best formulation from the rest 9 formulation with the desired properties.

## VI CONCLUSION

The formulation of Flaxseed Hair Mask enriched with tulsi oil and garlic oil provides a good base for treating the dandruff, scalp infection and strengthens the hair by increasing the blood supply thereby preventing the hair fall and increasing hair quality. There is a further scope for pharmacological studies in lower animals.

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