

## FORMULATION AND EVALUATION OF FLAXSEED

### HAIR GEL: A NATURAL HAIR TAMER

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#### ABSTRACT

India is known for traditional medicine. Herbs are the traditional form of Indian medicine which was developed by ancient sages whose astute observations led to the development of constitutional medicine. Herbal cosmetics are the preparations used to enhance the human appearance. The aim of the present research was to formulate and evaluate the herbal gel of flaxseed for the purpose of moisturizing and nourishing the hair. Flaxseed (also known as linseed) is full of fatty-acids and anti-oxidants which help to remove toxins and dead cells from the scalp. Four different types of gel formulations containing carbopol 934 in varying concentrations ranging from 0.5 to 2% were prepared and evaluated. 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. Among the four formulation, F4 showed good spreadibility, consistency, homogeneity, appearance, optimum viscosity, pH and was stable for long period of time. There is further scope to carryout animal studies also.

**Keywords:** Aqueous extract, Carbopol, Flaxseed, Hair Gel and Herbal.

#### INTRODUCTION

Flaxseed (also known as linseed) is emerging as an important functional food ingredient because of its rich contents of  $\alpha$ -linolenic acid (ALA, omega-3 fatty acid), lignans, and fiber<sup>1</sup>. Flaxseed oil, fibers and flax lignans have potential health benefits such as in reduction of cardiovascular disease, atherosclerosis, diabetes, cancer, arthritis, osteoporosis, autoimmune and neurological disorders<sup>2</sup>. Apart from this, flaxseed is full of fatty-acids and anti-oxidants which help to remove toxins and dead cells from the scalp. Flax seed gel can be applied to scalp and hair as a

moisturizer that can help to stimulate growth and improve the strength of existing hair.

Topical formulations include oils, creams, ointments, pastes and gels out of which gels are getting more popular now a days because they are more stable and also can provide controlled release than other semisolid preparations. The gel formulations can provide better absorption characteristics and hence the bioavailability of drug<sup>4</sup>. Gels are semisolid systems in which a liquid phase is constrained within a three dimensional polymeric matrix (consisting of natural or synthetic gums) in which a high degree of physical or chemical

cross-linking has been introduced<sup>5</sup>. Gels are relatively newer class of dosage forms created by entrapment of larger amount of aqueous hydro alcoholic liquids in a network of colloidal solid particles which may consist of inorganic substance such as aluminium salts or organic polymers of natural or synthetic origins<sup>6</sup>. Most topical gels are prepared with organic polymers, such as carbopol 934, which impart an aesthetically pleasing, clear sparkling appearance to the products and are usually washed off skin with water.

In the present study, flaxseed gel was prepared by incorporating aqueous extract of flaxseed into carbopol 934 gel which makes the application of flaxseed extract easy.

## MATERIALS AND METHODS

### MATERIALS USED

Flaxseeds were procured from the local organic farm, Bengaluru, India. Carbopol 934, PEG 200, methyl paraben and glycerin were procured from SD fine chemicals, Mumbai, India, and all other chemicals and reagents used were of either analytical or laboratory grade.

### METHODOLOGY

#### Formulation of hair gel base

Weighed quantity of polyethylene glycol and measured quantity of glycerin, methyl paraben, were dissolved in 35 ml of water in a 250 ml beaker. Then the mixture was stirred using mechanical stirrer at high speed. Suitable quantity of carbopol 934 and PVP were added slowly to the beaker containing above mixture of liquid with continuous stirring. Then triethanolamine (gelling agent) was added slowly with continuous stirring until gel structure was obtained. In order to optimize the concentration of carbopol, five various gels containing varying concentrations of carbopol such as 0.5g, 1g, 1.5g, 2g and 2.5g (F1 to F5 respectively) were prepared<sup>7</sup>. The gels formed using 0.5g and 1g carbopol 934 were found to be very thin that liquefied within 4 to 5 hours of preparation. With 1.5g carbopol 934 the gel formation was better to some extent but the problem of liquefaction after 24 hours was observed. The gel formulation containing 2g of carbopol 934 formed uniform and smooth gel that did not liquefy even after 24 hrs. Whereas gel containing 2.5g carbopol was too thick to be handled. Among the Five formulations, gel containing 2g carbopol 934 (F4) was optimized (table 1).

#### Preparation of herbal hair gel

The aqueous extract of flaxseed was prepared by adding 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<sup>8</sup>.

Five different herbal hair gel formulations were prepared by simple gel preparation method with carbopol gel base. Measured quantity of methyl paraben, glycerin and weighed quantity of polyethylene glycol were dissolved in about 35 ml water in a beaker. Then the mixture was stirred at high speed using mechanical stirrer. 2g carbopol 934 (optimized) and PVP were added slowly to the beaker containing above liquid while stirring. Then triethanolamine was added slowly with continuous stirring to obtain gel structure. Finally varying concentrations of aqueous extract of flaxseed (5%, 10%, 15%, 20% and 25%) was incorporated into carbopol gel and stirred for about 1 hour so as to obtain H1F4, H2F4, H3F4, H4F4 and H5F4 containing 5%, 10%, 15%, 20% and 25% flaxseed extract in F4 carbopol gel formulation (table 2). The prepared herbal gel formulations were stored at room temperature until further evaluation.

### Evaluation of herbal hair gel formulations

#### Physical appearance

The physical appearance was visually checked for the appearance, colour and the feel on application of prepared hair gel formulations<sup>9</sup>. Results are as shown in table 3.

#### 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<sup>10</sup>.

#### pH determination

The pH of all hair gel formulations were determined by using the digital pH meter<sup>11</sup>. 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. The results are presented in table 3

#### Extrudability determination

The hair gel formulations were filled into collapsible metal tubes. The tubes were pressed into extrude the material and extrudability of the formulations was checked<sup>12</sup>. The extrudability of the formulations was determined in terms of weight in grams required to extrude a 0.5 cm ribbon of gel in 10 seconds. The comparative

extrudability of the hair gel formulations is as shown in table 3.

#### 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. The results are as shown in table 3.

#### Stability studies

All the formulations were equally good with respect to appearance, homogeneity, pH, viscosity and extrudability. So H5F4 was selected for stability studies. The stability studies was carried out for all the prepared gel formulations at room temperature and 40 °C at 75% RH<sup>13</sup>. The stability study was conducted for the period of 3 months. The parameters like appearance, pH, extrudability, colour were tested every month. The results are tabulated in table 4.

## RESULTS AND DISCUSSION

### Physical appearance

The colour of all the herbal gel formulations H1F4, H2F4, H3F4, H4F4 and H5F4 were found to be pale brown with translucent appearance which was found to be smooth on application.

### 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.

### Extrudability determination

All formulations showed good extrudability when extruded from metallic collapsible tube. Comparatively H4F4 and H5F4 had excellent extrudability than H1F4, H2F4, H3F4.

### 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 was conducted for all the formulations for a period of 3 months. No appreciable changes were found for the tested parameters like appearance, pH, extrudability, at both the temperatures (room temperature and 40 °C ). The results are tabulated in table 4.

## CONCLUSIONS

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

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**Table 1: Formulation of Hair gel base**

Formulation Code	F1	F2	F3	F4	F5
Carbopol 934(g)	0.5	1	1.5	2	2.5
PVP (mg)	5	5	5	5	5
Methyl paraben (mg)	75	75	75	75	75
Glycerine (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 2: Formulation of herbal hair gel**

Formulation Code	H1F4	H2F4	H3F4	H4F4	H5F4
Aqueous extract of flaxseed %	5	10	15	20	25
Carbopol 934(g)	2	2	2	2	2
PVP (mg)	5	5	5	5	5
Methyl paraben (mg)	75	75	75	75	75
Glycerine (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 3: Evaluation of herbal hair gel**

Formulation Code	Physical appearance	Homogeneity	*pH	Extrudability	Viscosity (cps)
H1F4	Translucent, pale brown, smooth on application	Good	6.7	++	1,50,232
H2F4	Translucent, pale brown, smooth on application	Good	6.7	++	1,50,798
H3F4	Translucent, pale brown, smooth on application	Good	6.9	++	1,51, 354
H4F4	Translucent, pale brown, smooth on application	Good	7.1	+++	1,51,785
H5F4	Translucent, pale brown, smooth on application	Good	7.3	+++	1,52,876

\*Each reading is an average of three readings  
Excellent = +++, Good = ++

**Table 4: Stability studies of herbal hair gel formulations for H5F4**

S.No.	Parameters	Observations						
		Initial	First month		Second month		Third month	
			RT	40 °C	RT	40 °C	RT	40 °C
1	Appearance	Translucent & smooth						
2	pH	7.3	7.3	7.2	7.2	7.2	7.1	7.1
3	Extrudability	Excellent						

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