



FORMULATION AND EVALUATION OF HERBAL HAIR GEL

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ABSTRACT

Herbal cosmetics are the preparations used to enhance the human appearance. Herbal hair gel is formulated from natural ingredients and herbal extracts helps in controlling hair falling, removes dandruff. The aim of this research work was to formulate and evaluate herbal hair gel containing Aloe vera and flax seed for hair growth potential and anti dandruff activity. Flax seed (*Linum usitatissimum*) contains vitamin E which improves hair growth and result in stronger follicles. Flax seed and Aloe vera extracts were prepared by aqueous extraction. Five different types of gel formulations containing varying concentration of Flax seed and Aloe vera extracts were prepared and evaluated. The formulations (F1 to F5) were evaluated for various parameters like colour, odour, gel texture, clarity, pH, viscosity, spreadability, extrudability, gel strength, homogeneity, stability studies and in vitro antifungal activity. Among the five formulations, F4 was stable for long period of time without compromising the antifungal activity. The overall results of this study support that herbal hair gel prepared using Aloe vera and Flax seed could be used for hair growth and reduction of dandruff.

KEYWORDS: Flaxseed, Aloe vera, Hair gel, *Candida albicans*.

INTRODUCTION

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. Types of hair damages are split ends, over processed hair, damage due to hard water, stress, fungal infections. *Malassezia furfur*, *Candida albicans*, ringworms etc can cause various scalp problems like Dandruff, Red or Purple rashes, cracks, patches, white flaky scales etc. Dandruff is a dermatological skin condition which characterized by excessive scaling of scalp tissue.^[1]

Flax seed consist of fatty acids and anti-oxidants, these fatty acids and antioxidants helps in removing toxins and dead cells from the scalp. Flaxseed is enriched with

omega 3 fatty acids. This seals the hair cuticles thus, reduces the hair loss and maximizes the hair volume.^[2] Aloe vera is very effective in fighting dandruff which contains vitamins A, B12, C and E, minerals and amino acids. Bradykinase is an enzyme present in Aloe vera which help in reducing inflammation and itching caused by dandruff.^[3]

Hair styling gel containing flax seed and *Aloe vera* will be used to impart control over hair fall and removal of dandruff. Conventionally available hair gels cannot be directly applied to the scalp as they provide side effects and have high amount of chemicals. Hence the present formulation provides necessary objective to formulate as gel.



Figure 1: Flax seed



Figure 2: Aloe vera

MATERIALS AND METHODS

Collection and authentication of plant materials

The plant specimen for the proposed study flax seed (*Linum usitatissimum*) was commercially obtained from local market in Chengannur Alappuzha district, Kerala. Aloe vera was collected from Kozhencherry, Pathanamthitta District, Kerala, India. The herbariums of these plants were identified and authenticated by a botanist Dr. Jacob Thomas, PG and Research Dept. of Botany, Marthoma College Thiruvalla, Kerala, India.

Preparation of Flaxseed Extract

The flax seed extract was prepared by boiling the seeds in water. A thick mucilage was obtained by constant stirring. Then the mucilage was strained using suitable sieve and collected.

Preparation of Aloe vera Extract

Aloe vera gel was extracted by simple drain procedure where 2-4 leaves of aloe were cut at about half inch from the base so as to drain out all the yellow sap materials. The mucilage was stirred vigorously in a blender to make it uniform. This solution was strained through a muslin cloth and filtered and the filtrate is stored.

Preparation of hair gel

Five herbal hair gel formulations were prepared by using varying amount of herbal extracts. Weighed quantity of methyl paraben, polyethylene glycol and glycerine were dissolved in water and incorporated to carbopol. Using magnetic stirrer, the mixture was stirred at high speed. Finally varying concentrations of aqueous extract of flax seed and *Aloe vera* were incorporated into the above mixture. The preparation was neutralized by dropwise addition of triethanolamine. A transparent gel was obtained by mixing. The prepared herbal hair gel formulation was stored at room temperature.^[4]

Table No.1: Formula for preparation of herbal hair gel.

Formulation	F1	F2	F3	F4	F5
Flaxseed extract	1%	2%	3%	4%	5%
Aloe vera extract	5%	4%	3%	2%	1%
Carbopol(g)	2	2	2	2	2
Methyl paraben Sodium(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)	81.5	81.5	81.5	81.5	81.5

EVALUATION OF HERBAL HAIR GEL

Organoleptic evaluation

Gels were optically evaluated for clearness, colour, and gel texture.^[5]

Homogeneity

All the advanced formulations were proven for uniformity by visual examination. They were proven for their image and occupancy of some lumps, flocculates, or aggregates. Also, qualitative determination of herbal hair gel was performed by sorting the gel between the thumb and forefinger and the sample homogeneity or the appearance of aggregates was checked.

pH measurement

The pH of all hair gel formulations was resolved in an automated pH meter. 1 gram of gel was disintegrated in 100 ml of water purified by distillation and stocked for 2 hours. The electrodes were entirely immersed in a diluted hair gel formulation and the pH was documented. The pH of each output was calculated for 3 periods and the average value was determined.^[6]

Viscosity measurement

A Brookfield viscometer was used to measure the viscosity of the gel created. The Brookfield viscometer

was spun at 100 rpm with spindle number 6. Each study was taken after the sample made equilibrium.^[7]

Extrudability test

A closed tube holding a squeezable gel was given rigidly through the crimped end. When the cap is detached, the gel is pressed just before the pressure is distributed. We calculated the load in grams necessary to expel a 0.5 cm long gel ribbon in 10 seconds. The results for each formulation were written as extrusion pressure in grams.^[8]

Spreadability

The spreadability of gel is calculated on a glass slide, the gel is fixed between the two slides, a 20 g load is planted on the slide, the time to squeeze the sample to a uniform thickness, and the time to separate the two slides (seconds) was calculated so. Measures were taken for spreadability.^[9]

$$S = w / t$$

Where,

S= spreadability (gcm/ sec)

w=weight on upper slide (g)

l = length of slide (cm)

t = time taken in sec

In vitro Antifungal activity

The fungal strains were cultivated on potato dextrose agar and incubated at 35°C for 24 hours and 5 days on potato dextrose agar slant for the mold fungi. Utilizing a sterile loop, uncontaminated colonies of the *Candida albicans* MTCC227 variety were moved into a tube containing sterile normal saline. For the mold, 1 ml of sterile water purified by distillation built up with 0.1% Tween 20 was used to cover and suspend the colonies. Utilizing a haemocytometer, the suspension was conformed to 2–5×10⁶ conidia/ml. The suspension was further diluted at 1:10 to acquire employed inoculums 2–5×10⁵ conidia/ml. The inoculums were gushed over MHA filled out accompanying 2% of glucose. The sterile 6 mm disks that were impregnated with 20 µL test compound (with an aggregation of 10 mg/ml) were established over the plate. The control samples A and B were incubated at 35°C for 48 hours. The zone of inhibition of the culture was calculated in mm.^[10]

Stability studies

The stability studies were performed as per ICH guidelines. A satisfactory portion of improved formulation (F4) was preserved in a glass vial and secured aseptically after sterilization. It was assigned accelerated stability studies for 6 months utilizing a stability chamber at a temperature of 40±2°C and RH 75±5 %. The physical stability of the gel was inspected at the first, third and sixth months by examining appearance, pH, extrudability, spreadability, viscosity and antifungal activity.^[11]

RESULTS AND DISCUSSIONS**Organoleptic Evaluation**

The colour of all the herbal gel formulations F1, F2, F3, F4 and F5 were established to be colourless following a treatment presence that was created to be smooth on treatment.

Table No.2: Evaluation of physical appearance of herbal hair gel.

Sl. No.	Formulation	Physical Appearance
1	F1	Translucent, colourless, smooth
2	F2	Translucent, colourless, smooth
3	F3	Translucent, colourless, smooth
4	F4	Translucent, colourless, smooth
5	F5	Translucent, colourless, smooth

Homogeneity

All the developed gels were resulted for uniformity by visual inspection for the presence and presence of any lumps, flocculates, or aggregates. The consistency was found good for all formulations.

Table No.3: Evaluation of homogeneity of herbal hair gel.

Sl. No	Formulation	Homogeneity
1	F1	Good
2	F2	Good
3	F3	Good
4	F4	Good
5	F5	Good

pH Determination

The pH of all the herbal formulations range from 6.92 to 7.02 which is appropriate for the hair making the compatibility of the herbal gel formulation with the hair.

Table No.4: Evaluation of pH of herbal hair gel.

Sl. No	Formulation	pH
1	F1	6.92 ± 0.003
2	F2	6.93 ± 0.002
3	F3	6.95 ± 0.001
4	F4	6.98 ± 0.001
5	F5	7.02 ± 0.002

Viscosity Determination

Viscosity is an essential requirement for distinguishing the gels as it influences the spreadability, extrudability, and release of the drug. The viscosity of all formulations was in the range of 9361 to 9379 cps.

Table No.5: Evaluation of viscosity of herbal hair gel.

Sl. No	Formulation	Viscosity (cps)
1	F1	9361 ± 0.002
2	F2	9365 ± 0.004
3	F3	9370 ± 0.002
4	F4	9373 ± 0.003
5	F5	9379 ± 0.003

Extrudability Determination

All formulations presented has good extrudability when extruded from the metallic collapsible tube. Comparably, F4 had superior extrudability than F1, F2, F3, and F5.

Table No.6: Evaluation of extrudability of herbal hair gel.

Sl. No.	Formulation	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	89.5±0.001

Spreadability

The spreadability plays the main part in patient compliance and helps in uniform usage of the gel. A good gel takes less duration to spread and will have excellent spreadability.

Table No.7: Evaluation of spreadability of herbal hair gel.

Sl. No.	Formulation	Spreadability(gcm/sec)
1	F1	14.61 ± 0.002
2	F2	13.11 ± 0.002
3	F3	12.65 ± 0.001
4	F4	10.00 ± 0.001
5	F5	8.92 ± 0.002

Antifungal Activity

Control sample: Streptomycin (10ug/well)

Petri dish size: 10 cm

Sample well size: 0.5cm diameter

Clinical fungal sample: Candida albicans MTCC227

Method of determination: Assay disk diffusion method.

Table No.8: Evaluation of anti fungal activity of herbal hair gel.

Sl. No.	Formulation	Zone of Inhibition(mm)
1	F1	25.6
2	F2	26.8
3	F3	28.4
4	F4	31.3
5	F5	30.0
6	Control	30.5

The antifungal action of the processed hair gel was evaluated the using assay disk diffusion method using the organism Candida albicans. The formulation F4

showed an excellent increase in inhibition action compared to F1, F2, and F3 with reference to control.



Stability Studies

The stability studies were directed for the optimized formulation, F4 for 6 months. No considerable changes were settled for the proven limits like appearance, pH,

extrudability, spreadability, gel strength, viscosity, and antifungal action at both temperatures (room temperature and 40°C) for 6 months.

Table No.9: Evaluation of stability studies of herbal hair gel.

Sl.No.	Parameters	Observations		
		Initial Month	Third Month	Sixth Month
1	Appearance	Translucent and smooth	Translucent and smooth	Translucent and smooth
2	pH	6.98	6.87	6.62
3	Extrudability	Excellent	Excellent	Excellent
4	Viscosity	9373	9373	9373
5	Spreadability	10	10	10
6	Antifungal activity	31.3	31.0	31.0

CONCLUSION

Hair gels containing natural ingredients and herbal extracts of flax seed and aloe vera have potential effects in controlling hair fall and removing dandruff. Herbal hair gels help to overcome the various damages caused by chemical agents in various marketed products.

The Prepared product was tested for its antifungal activity using *Candida albicans* as test organism, which causes dandruff and various scalp problems. Herbal hair gel containing flaxseed and aloe vera is a solution for nourishing hair, treating dandruff and other scalp problems. This product can be manufactured in large scale and commercialized as an alternative for chemical hair gels.

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