

Formulation and Evaluation of Herbal Hair Color Emulgel

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Abstract—Hair dyeing has been used for hundreds of years to offer hair a lovely look and protection, in addition to coloring grey hairs and causing them to seem younger. The need to look well and style yourself, as well as the impact of social media, has led to the widespread use of hair dyes. Because these hair colorants are synthetic, they have a history of causing numerous side effects. Natural elements in cosmetics are in high demand as a replacement for synthetic compounds. Emulgel is the dosage form that is created when gels and emulsions are mixed. The hydrophobic therapeutic moiety is inserted into the gels to create Emulgels. In this study, beetroot extract (BETA VULGARIS) and henna extract (LAWSONIA INERMIS) were used as natural coloring agents, with aloe-vera (ALOE BARBADENSIS) and linseed (LINUM USITATISSIUM) gel as a base medication. These medications are combined with Carbopol, a gelling agent. Vitamin-E oil is used as the emulsion's oil phase. Vitamin E adds luster to hair and ensures healthy steps, while Aloe-Vera helps to reduce hair thinning. Linseed also helps to reduce greying. The emulgel was discovered to be an oil-in-water emulsion. A prepared formulation is applied to specific areas of hair to be highlighted, which subsequently takes on an orange hue. After washing the hair, the discoloration is eliminated. The formulation's pH was discovered to be 6.5-6.9, which is hair-friendly. It was also discovered that the viscosity was in the region of 500-1000 cps, indicating that even a slight smear will spread easily. Based on the results, it can be concluded that the hair emulgel formulation contains all of the desirable characteristics of an ideal emulgel, is safe and effective, and may be used whenever hair coloring is necessary, replacing the usage of synthetic dyes.

Indexed terms— Hair dyeing, o/w emulsion, Soxhlet extraction, Linseed, Aloe-vera, Maceration

I. INTRODUCTION

Emulgels are described as unconventional topical drug transport structures that may be shaped with the aid of using the incorporation of gel into the water part of an emulsion and own the benefits each as gels and emulsions. Therefore, those are the aggregate of each gel and emulsions. [1] The advantage of emulgel topical delivery is to avoid first-pass metabolism and avoids the risk of intravenous therapy. Topical delivery systems are meant for cosmetic and skin diseases. Emulgel is the water in oil or oil in water emulsion with an active ingredient that is incorporated in gelling agents, the system gives the formulation more stability with the desirable release of drugs. [2-3] They have better stability, better loading capacity, production feasibility, low preparation cost and have controlled release. [4-5]

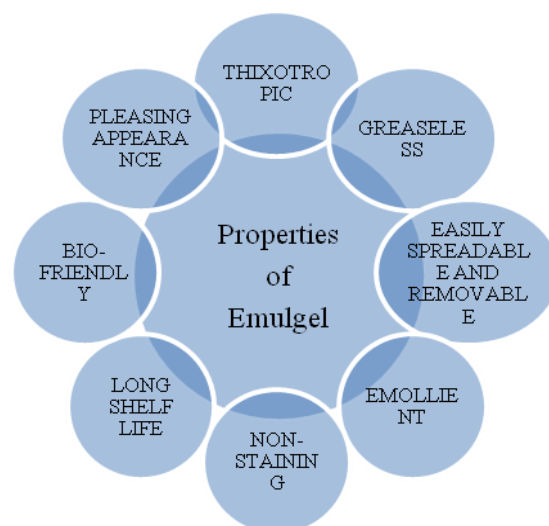


Fig. 1: Properties of Emulgel[6]

Hair coloring/dyeing is a hair-coloring technique. Women's preoccupation with hair is limitless since hair serves as a crown for attracting attention. Because of these, one's appearance is enhanced by

healthy, well-kept, and well-styled hair. Hair color loss can be caused by a variety of factors, including genetics, environmental conditions, and the use of alcoholic preparations. [7-8] Hair color is required as a result of these factors. Change the natural color of hair; color gray/white hair; change the color of hair temporarily for a special occasion, due to discoloration from hairdressing operations or sun bleaching; and change the color of hair to one that is more trending, fashionable, and desirable.[9] Transparent gels have become more popular in cosmetics and pharmaceutical treatments. As a result, an emulsion-based technique is being employed to successfully absorb and bring even a hydrophobic medicinal moiety into gels. Emulgels have become a prominent drug delivery technique because of their superior spreadability, adhesion, viscosity, and extrusion. FenilVanpariya, Milan Shiroya, Mitesh Malaviya, et al. [9] M Ravi Kumar, MangilalTeelavath, and Shiva Kumar Yellanki et al. stated that the hair care polyherbal preparation was formulated as emulgel by mixing the hydroalcoholic extract of four medicinal plants which are earlier reported to possess acclaimed hair growth-promoting action. [10] In this formulation Carbopol, 934 is used as a gelling agent with herbal extracts. It was found that the formulation of hair emulgel contains all the good characteristics of an ideal emulgel and it was found to be harmless, more effective, and economical. Mahuli Manna and Anandamoy Rudra et al. [11] The study was designed for crude Aloe vera extract, development of oil in water (o/w) emulsion, preparation of gel base using Aloe vera extract, and formulation of the emulgel for topical application. Aloe vera extract was incorporated into emulgel with compatibility, no chemical interactions were reported. Viscosity and pH of formulated Aloe vera emulgel were useful for skin application. Rashmi Saxena Pal, Yogendra Pal, A.K Rai, Pranay Wal, and Ankita Wal et al. [12] herbal-based hair dyes are being preferred on large scale, due to the vast number of advantages it exerts to overcome the ill-effects of a chemical-based hair dye. The need for herbal-based natural medicines is increasing rapidly due to their natural goodness and lack of side effects. Z. Shahi, M. KhajehMehrizi, M. Hadizadeh, et al. [13] Natural hair dyes solve the problem of the destruction of the scalp and hair cuticle, which are safe for use. Henna balances the pH of the scalp for preventing premature hair fall and greying of hair. Lawsonia is used as a

non-oxidizing hair coloring agent at a maximum concentration of 1.5% in the hair beauty product. Aloe vera gel is effective for the scalp and can be used not only to treat hair loss but to promote hair growth as well. Aloe vera contains aloemodin which promotes hair growth by stimulating the hair follicle. Saloni Agarwal, Khushbu Shrivastava, and Sangeeta Sahasrabuddhe et al. [14] Beetroot powder is the natural coloring material that gives a natural glow to the skin. Beetroot nourishes the skin. Beta cyanine, the pigment that gives beetroot its color, is an antioxidant. Beetroot juice when mixed with regular henna powder can be used to add a light chestnut color to your hair. An attempt was made in this work to prepare hair coloring emulgel by using beetroot extract and henna extract as a natural coloring agent. As our formulation is gel-based, ingredients cannot penetrate the hairs and thus solving the major drawbacks of synthetic dyes. The novelty of this formulation is that it gives a temporary coloring effect and an herbal base has been used. Prepared emulgel is applied to the selected part of hair for highlighting purposes. The Colouring agent which has been added to the emulgel will give stain to the applied part. The drugs used are Aloe Vera and linseed in their gel form. The applied formulation gives a brownish coloring effect to hairs and is removed immediately after washing of hair. This formulation is used whenever urgent and temporary hair coloring is required. No frequent use is needed, thus offering occasional use and causing no damage to hair unlike synthetic permanent and semi-permanent hair dyes. [15]

II. MATERIALS AND METHODS

Material:

Dried juice was collected by incision, from the bases of the leaves of ALOE BARBENDIS, and then it was kept for refrigeration. Preformed linseed gel was bought from Atys7 naturals Pvt Ltd. Beetroot powder and henna powder were obtained from the local ayurvedic store. Vitamin E capsules were bought from a local medical store. Carbopol 942, tween 80, methylparaben, propylene glycol, and Triethanolamine were purchased from Rankem.

Identification test:

Aloe-vera– Anthraquinone Glycoside [16]

Table 1: Confirmatory Test for Aloe

Test	Color	Inference
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Borax test: Heat 5 ml test solution with 0.2 g borax, add a few drops of this in a test tube	Green fluorescence is produced	Aloe Confirmed
Modified Borntrager's test: Solution + Ferric chloride, heat, and filter. Filtrate + benzene. Separate benzene layer + strong ammonia solution.	Lower ammonical layer shows pink to red color	Aloe Confirmed
Nitrous acid test: Test solution + nano ²⁺ acetic acid, heat	Reddish brown color	Aloe Confirmed

Linseed - Fixed oil

Guignard's test for cyanogenetic glycoside [17]: The drug was powdered, moistened with water, and was kept in a conical flask after that it was a trap on the sodium picrate paper on the neck of the flask with cork. Because of volatile hydrocyanic acid, the paper becomes brick red or maroon-colored.

Extraction Of Henna:

It was done by Maceration Process. One hundred grams of dried powdered leaves were soaked in 1,000 ml of water and left for 24 hours. After that, the solution was filtered via Whatman filter paper. After that, the filtrate was concentrated using an evaporator, yielding 18.6 percent. [18]

Extraction of Beet Root:

It was done by the Soxhlet apparatus. 50 grams of beetroot powder was kept for defatting for 24 hours

Table 2: Composition of Herbal Emulgel

Ingredient	Uses
Aloe-vera extract	Helps to reduce hair thinning. Has vitamin b12 i.e. Cobalamin, promotes healthy hair growth by assisting in the production of oxygen-rich RBCs which feed hair follicles.
Linseed extract	Increases elasticity of hair fibre. Prevents split ends. Stops greying hair.
Carbopol 942	Gelling agent.
Vitamin E	Adds lustre to hair. It ensures hair growth. It the oil phase of a formulation.
Beetroot extract	Colouring agent. Prevents dandruff.
Henna extract	Colouring agent.
Tween 80	for o/w emulsifier
Methyl paraben	Preservative
Propylene glycol	Solvent
Triethanolamine	For pH adjustment
Distilled water	Making up of volume

Based on the above methodology, a total of 6 batches of Herbal Emulgel were prepared to have varying concentrations of coloring agents.

Table 3: Formulation of Herbal Emulgel

Sr. no.	Name of ingredients	F1	F2	F3	F4	F5	F6
1	Aloe-vera gel (g)	10	10	10	10	10	10
2	Linseed gel (g)	10	10	10	10	10	10
3	Carbopol 940 (g)	1.8	1.8	1.8	1.8	1.8	1.8
4	Beetroot extract (ml)	15	5	10	11	9	12
5	Henna extract (ml)	5	15	10	9	11	8

with petroleum ether. The powder was dried and then it was extracted in a Soxhlet apparatus with methanol for about 72 hours. The extract was then concentrated in an evaporator with a yield of 16.5%. [19]

III.DEVELOPMENT OF FORMULATION

Emulgel was prepared in 4 steps:

- Preparation of emulsion
- Preparation of gel
- Addition of emulsion into the gel in a 1:1 ratio
- Addition of coloring agent to emulgel

Emulgel was prepared by incorporating gel into an emulsion. The emulsion and gel were prepared separately and mixed. For preparing emulsion, the aqueous phase and oil phase were taken separately and mixed. Then the gel was prepared by using a gelling agent. After preparing gel and emulsion, they were mixed with gentle stirring. [20] The chemicals used in the oil phase were vitamin E, span 80, propylene glycol, and methylparaben. Water, and propylparaben, were used in the aqueous phase. Aloe-vera and linseed extract were added in Carbopol to prepare gel. Triethanolamine was added to adjust the pH. After preparing emulsion and gel separately, they were mixed in a ratio of 1:1 to get emulgel. Beetroot and henna extract were added as a coloring agent for preparing emulgel.

6	Vitamin E (mg)	2.4	2.4	2.4	2.4	2.4	2.4
7	Tween 80 (ml)	5	5	5	5	5	5
8	Methyl paraben (ml)	1	1	1	1	1	1
9	Propylene glycol (ml)	10	10	10	10	10	10
10	Triethanolamine (ml)	qs	qs	qs	qs	qs	qs
11	Distilled water (ml)	qs	qs	qs	qs	qs	qs

Evaluation parameters of herbal hair colour emulgel: [21-27]

Organoleptic evaluation: The emulgel was evaluated for its color, odour, and state.

Measurement of pH: The pH was determined by using a pH meter.

Determination of Viscosity: Brookfield viscometer was used for the measurement of the viscosity of the prepared gel.

Spreadability test: The important criteria of the semisolid formulation are that it possesses good spreadability. It is a term used to denote the extent of the area to which emulgel was spread on application to the skin; therapeutic efficacy also depends on spreading value. We chose two glass slides with conventional dimensions. The emulgel was placed on one of the slides and the other slide was placed on it and pressed by placing 100 g weight to press uniformly to form a thin layer; excess adhering to the slide is removed. One of the slides was fixed on which the formulation was placed and a movable slide is placed over it with one end tied to a string to which load was applied with the help of a simple pulley and a pan. A 30 g weight was placed on the pan, and the time it took for the upper slide to travel 5 cm and separate from the lower slide under the weight's direction was recorded. Spreadability was calculated using the formula:

Spreadability = $\frac{m}{L \cdot t}$, where m = weight tied to upper side; L = length of glass slide; and t = time taken in seconds.

Physical appearance: Physical characteristics such as phase separation and color change, as well as smell and rheological parameters, were assessed.

Globule size and its distribution in emulgel: Optical microscope was used to determine globule size and distribution. To achieve homogeneous dispersion, a 1 g sample was dissolved in filtered water and stirred. The sample was examined under an optical microscope to determine the mean globule diameter and distribution.

Homogeneity: After the developed gel was placed in the container, it was visually inspected for homogeneity. It was examined for the appearance of aggregates and the presence of any.

Dye solubility test: The scarlet red dye (Amaranth water-soluble dye) was mixed with the emulgel and examined under a microscope. If the dispersed globules appear red and the continuous phase colorless then the emulgel is w/o type. The reverse condition occurs in o/w type emulgel i.e., the dispersed globules appear colorless in the red background.

Test for microbial growth: The formulated emulgel were inoculated on the plates of Muller Hinton agar media by streak plate method and control was prepared by omitting the emulgel. The plates were kept in the incubator and were incubated at 37°C for 24 hours. After the incubation period, plates were taken out, and check the microbial growth by comparing with the control.

Dyeing effect: Dyeing effect of gel was tested on artificial hair. 1.0 g of the formulation was applied to the hair and shows a dyeing effect.

Washability: 1.0 g of the formulation was applied to the hair and washed with water. It was easily washed from hair

IV. RESULT AND DISCUSSION

The color of the formulation was checked against the white and black background. The consistency of the emulgel was tested on the skin. The odor of emulgel was checked by mixing it in water and by smelling it. 1% solution of emulgel was prepared and subjected to measure pH by the digital pH meter. It was found to be in the range of 6.1-6.9 which is suitable for hairs. The viscosities of all formulations ranged from 500 to 600 cps at 1 rpm, showing that they were easily spreadable with minimal shear. The mean size of globule in emulgel was found to be 2 μ . About 75-85% of globules were having a size range of 1 to 2 μ . Hence, it can be said that the emulsion was uniformly distributed throughout the gel base and formed a homogenous emulgel. The dyeing effect was observed to be acceptable in batches 5 and 6. The dye was easily removed on washing. The spreadability of all the batches was calculated and it was found that the formulation had a good spread. After testing phase separation, it was found

that Batch-6 had better stability. And out of all the tested batches, Batch 6 was optimized. The emulgel was found to be oil in water type of emulsion. The prepared formulation was checked for two months to examine its stability. It showed better stability at

cold temperatures i.e., not more than 20°C. At room temperature, emulgel tends to get liquefy. The phase was not separated; color and odor were not changed and all other parameters also remained unchanged.

Table 4: Evaluation Parameters of Herbal Emulgel

Parameters	F1	F2	F3	F4	F5	F6
Color	Reddish brown	Brown	Brown	Brownish orange	Brownish orange	Orange
pH	6.2±0.1	6.1±0.4	6.8±0.1	6.2±0.3	6.4±0.1	6.5±0.3
Viscosity	554	578.5	593	573	549.2	567
Phase separation	Separation of phases	Separation of phases	Slight separation	No separation	Slight separation	No separation
Spreadability	Not good	Not good	Average	Average	Average	Good
Dyeing effect	less	less	Nearly less	Moderate	Acceptable	Acceptable
Washability	Not easily washable	Not easily washable	Not easily washable	Not easily washable	Easily washable	Very easily washable

V.CONCLUSION

Herbal formulations are in great demand to fulfil the needs of the growing world market. Natural remedies are widely accepted with open hands nowadays as they are safer with minimal side effects as compared to chemical-based products. Due to their non-toxic properties, fewer side effects, and more medicinal values, natural dyes are used in the pharmaceutical industry. Natural dyes have a wide range of therapeutic effects in addition to their dyeing properties. Emulgels are developing and challenging novel systems that can provide better topical activities. Herbal hair care products are beneficial and thus herbal hair color emulgel is formulated and evaluated in this project. Evaluation parameters showed that this formulation has better stability results and is not harmful to human hair. Thus, it can be concluded from this study that old traditions of hair coloring if applied to recent technologies, a stable, least destructive formulation for hair coloring can be prepared which is patient compliant, economical, and hence, beneficial to human society.

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