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Available online at: [www.jpardonline.com](http://www.jpardonline.com)**Formulation and evaluation of Herbal Hairgel containing Curry leaf extract for scalp treatment**

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**ABSTRACT: Background:** Hair is an imperative part of the human body. Due to the use of various chemicals and synthetic compounds, it usually causes destructive effects. A variety of herbal plants are used to promote hair growth as well as prevent hair loss. **Aim:** The present study was aimed to formulate and evaluate the herbal hair gel containing *Murraya koenigii* extract for scalp treatment. **Method:** The curry leaves were collected from the local garden and then they were dried and powdered. The powdered course was soaked in aqueous ethanol at a ratio of 1:3 for 48 h and then it underwent a maceration process and  $\beta$ -carotene was extracted and analysed by UV-Visible Spectrophotometer. From the above extract, hair gel was formulated using Carbopol 934 by dispersion method. The prepared hair gel was evaluated for pH, extrudability, viscosity, and spreadability. **Results:** The absorption maximum of the extract was found to be 466 nm which confirms the presence of  $\beta$ -carotene. The pH of the prepared formulations was found in the range of 6.8 to 7.1. Extrudability of the prepared formulations was found in the range of 94.10 to 96.32 %, and F3 showed the highest extrudability. The viscosity of prepared formulations was found in the range of 6573 to 11953 cps, F5 has shown a better result for viscosity. All prepared formulations showed good spreadability in the range of 13.89 to 24.83 g.cm/s. **Conclusion:** It is concluded that beta-carotene-containing hair gel formulations exhibit more potency on scalp treatment. By comparing all the formulations, F3 had shown good results for all the parameters.

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**INTRODUCTION:**

Hair not only possesses aesthetic significance in our culture, but it also offers protection. This Fiber-reinforced nano-composite plays a key role as an outer covering in many vertebrates [1], Hair can grow individually, in groups of 2 to 3, or even at times in groups of 4 to 5. These groups are known as follicular units. Each individual hair shaft in the growth phase is composed of 3 main concentric regions: the Medulla, Cortex, and Cuticle. The medulla comprises the innermost layer and is formed from transparent cells and

air spaces that vary among different hair types. The cells comprising the medulla contain glycogen-rich vacuoles and medullary granules, which contain citrulline. The middle layer is called the cortex and is the business center of the hair shaft. The cortex is composed of a highly structured protein, keratin, which is an organized filament made up of long, helical strands. The cells keratinize without forming granules through a process called trichilemmal [2].

The scalp is the skin under the hair on your head, In the healthy scalp there are evenly spaced groups of few hair shafts coming out of the same follicular ostium. Some of the scalp problems are Androgenetic alopecia, Seborrheic dermatitis, and psoriasis, Tinea capitis [3].

A gel consists of a natural or synthetic polymer forming a three-dimensional matrix throughout a dispersion medium or hydrophilic liquid. The USP defines gels as semisolid systems containing either suspension made up of small inorganic particles, or large organic molecules interpenetrated by a liquid. Most topical gels are prepared with organic polymers, which impart an aesthetically pleasing, clear sparkling appearance to the products and are usually washed off skin with water. The bulk of these semisolid preparations are applied to the skin, where they usually serve as vehicles for topically applied drugs, as emollients, or as protective or occlusive dressings [4,5].

In Ayurvedic medicine, curry leaves infused oil is very popular for hair regrowth (new hair growth) as well as promotes strong, shiny, thick, and fast hair growth. It also reduces hair fall which makes it a wonder herb for thick and luscious hair, Curry leaves condition the hair, reduce scalp infections, stop premature greying, and have an antibacterial effect. High in antioxidants such as vitamins A, C, and E, folic acid, and minerals such as iron, curry leaves are truly nourishing for hair [6].

The green leaves are stated to be eaten raw for curing dysentery, and the infusion of the washed leaves stops vomiting. Curry leaves are also used for calcium deficiency. It has Vitamin A, Vitamin B, Vitamin C, Vitamin B2, Calcium, and iron in plenty. Its nutritional value benefits both the young and the old alike. Women who suffer from calcium deficiency, osteoporosis, etc can find an ideal natural calcium supplement in curry leaves. Fresh juice of curry leaves, with lime juice and sugar, is an effective medicine in the treatment of morning sickness, nausea, and vomiting due to indigestion and excessive use of fats [7].

The objective of the present work is to formulate and evaluate the herbal hair gel containing *Murraya koenigii* extract for scalp treatment.

#### MATERIALS AND METHODS:

Propylene glycol and Propyl paraben were obtained from Genuine Chemical Co., Mumbai. Methyl paraben obtained from NR Chem, Mumbai. Carbopol934 was purchased from Hi-Media, Mumbai. Triethanolamine was procured from Pioneer Chemical Co., Delhi. All other chemicals and reagents used in this study were of analytical grade and procured from an authorized dealer.

#### Extraction of $\beta$ -carotene from *Murraya koenigii* [8]:

The *Murraya koenigii* was freshly collected from the local garden then it was cleanly washed and air-dried for 3 days. After drying the curry leaves were finely powdered and soaked in aqueous ethanol at a ratio of 1:3 for 48 h then it was under the maceration process and the essential oils were collected. Then obtained extract was filtered and beta-carotene was extracted.

#### Formulation of hair moisturizer gel:

Carbopol 934 was previously soaked in 50 % of solvent for 24 h and the gel was prepared. Blank Carbopol with water is mixed with a lab stirrer. In another beaker propylene glycol, methyl paraben, and propyl paraben were taken and slightly heated. Furthermore, this mixture is added to previously prepared Carbopol gel base under constant stirring with a lab stirrer. Further in another beaker 1 ml of extract and the remaining amount of water were mixed thoroughly and this mixture was added to the gel base containing propylene glycol mixture with constant stirring. Finally the translucent mass of hair gel was formed and this gel is being used for further evaluation.

#### Evaluations of Curry Leaves Hair Gel:

##### Confirmatory test by UV-visible spectrophotometer:

About 1 ml of *Murraya koenigii* extract was dissolved in 10 ml of ethanol and their absorbance was taken in the UV spectrophotometer at the range of 200 to 800 nm. The obtained results were depicted in the results.

##### Visual appearance and homogeneity:

The prepared gels were visually analyzed for clarity, color, and transparency. The prepared

gels were also evaluated for the presence of any aggregation. Gels were prepared and transferred into transparent containers and then observed under the microscope for the presence of any particle or grittiness [18].

#### Determination of pH:

By using the digital pH meter (Hanna Instruments, Romania) pH of the gel was measured. The pH meter was calibrated with standard buffer solution before measurement and every time the measuring was repeated 3 times and the mean was calculated [12].

#### Extrudability test:

About 5 g of the gel formulation was filled in a clean, lacquered aluminium collapsible tube on the crimped end of the tube then a clamp was applied to avoid any roll back and sealed with the sealing machine. And the cap was removed and the gel was extruded. The extrudability was then determined by measuring the amount of gel extruded through the tip. The extruded gel was collected and weighed, the percentage of gel extruded was calculated and grades were allotted [13].

#### VISCOSITY [14-15]:

The viscosity of the formulated gel was determined by using a Brookfield viscometer. The gels were rotated at 20 rpm using spindle no.64. At each speed, the reading was recorded. The viscosity determination of samples was repeated three times.

#### Spreadability [16-17]:

Spreadability was determined by the apparatus which consists of a glass plate block, which was provided by a pulley at one end. By this method, spreadability was measured on the basis of the slip and drag characteristics of gels. An excess of gel (about 2 g) under study was placed on this ground slide. The gel was then sandwiched between both the glass slides having the dimension of fixed ground slide the two slides for 5 minutes to expel air and to provide a uniform film of the gel between the slides. Excess of the gel was scraped off from the edges. The top plate was then subjected to a pull of 20 g. With the help of string attached to the hook and the time (in seconds) required by the top slide to cover a distance of 6.5 cm be noted. A shorter interval indicates better spreadability. Spreadability was calculated using the following formula.

$$S = (M \times L) / T \dots (1)$$

Where, S = Spreadability, M = Weight in the pan (tied to the upper slide), L = Length moved by the glass slide (6.5 cm), and T = Time (in seconds) taken to separate the slide completely from each other.

#### Washability:

All herbal formulations are checked for washability with water.

#### Stability studies [18]:

Stability studies were performed according to ICH guidelines. All formulations were kept at different temperatures  $30 \pm 2^\circ\text{C}$  and  $4 \pm 2^\circ\text{C}$  for 45 days. As per the study protocol, at specific intervals of time, the gel was evaluated for its physicochemical properties.

## RESULTS AND DISCUSSION:

The present investigation is attempted to formulate hair gel using  $\beta$ -carotene extract of *Murraya koenigii* by maceration method. Further gel was formulated using dispersion method and subjected for various evaluation parameters

#### Confirmation test for $\beta$ -carotene:

The  $\beta$ -carotene extract was analyzed using UV-Visible spectrophotometer and the absorbance between 460 to 490 nm indicates the presence of  $\beta$ -carotene. The  $\lambda_{\text{max}}$  for  $\beta$ -carotene was found to be 466 nm.



Fig 1. Maceration process.

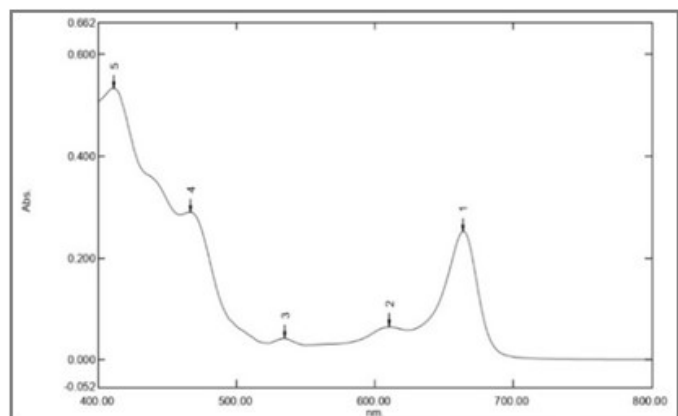


Fig 2. Absorption maxima of  $\beta$ -carotene.

**Table1: Formulation chart for preparation of hair gel.**

Contents	Formulation code				
	F1	F2	F3	F4	F5
<i>Murryakoeningii</i> Extract(1 %, ml)	1	1	1	1	1
Carbopol-934 (g)	0.5	1	1.5	2	2.5
Propyleneglycol (ml)	5	5	5	5	5
Propylparaben (g)	0.001	0.001	0.001	0.001	0.001
Methylparaben (g)	0.005	0.005	0.005	0.005	0.005
Triethanolamine (ml)	0.1	0.1	0.1	0.1	0.1
Roseessence (ml)	0.1	0.1	0.1	0.1	0.1
Distilled water (ml)	Upto100	Upto100	Upto100	Upto100	Up to100

**Table 3. The pH, extrudability, viscosity, and spreadability studies of hair gel.**

Formulation code	pH determination	Extrudability (%)	Viscosity (cps)	Spreadability (g.cm/s)
F1	7.0	95.20	6573	24.83
F2	6.9	94.10	8246	21.01
F3	6.9	96.32	9466	18.93
F4	6.9	94.49	10686	16.14
F5	6.9	95.36	11953	13.8963

**Conformation test for  $\beta$ -carotene:**

Beta carotene extract was analyzed using UV-Visible spectrophotometer and the absorbance between 460 to 490 nm indicates the presence of Beta carotene. The  $\lambda_{max}$  for the  $\beta$ -carotene was found to be 466 nm.

**Visual appearance and Homogeneity:**

Formulated gel was investigated for presence of particles, improper mixing aggregation and other residue. So the prepared gel was filled in a transparent container and visually inspected and all the formulations were found to be homogeneous and there was no aggregate formation of particles.

**pH determination:**

The pH of all the gel formulations were evaluated using a digital pH meter whereas all the formulations shown near to neutral pH values, they were ranging from 6.8 to 7.1. So the extent of pH difference will not cause any harm on the scalp. The results were depicted in Table 3.

**Extrudability:**

Extrudability is important to determine the ease of removal and application of products. All the gel formulations were subjected to extrudability and the values indicate that all the gel formulations showed good extrudability. Among these F3 showed excellent extrudability as compared to remaining formulations. The results were depicted in Table 3.

**Viscosity:**

Viscosity of the formulations affects the drug release from the gel. All the gel formulations were subjected to viscosity determination using Brookfield viscometer. All the formulations showed good viscosity and they were capable of remaining in the site of application for prolonged time. Among these formulations F5 was more viscous compared to remaining formulations. The results were depicted in Table 3.

**Spreadability:**

To determine the spreading ability of gel the test was performed. The gel having low viscosity shows better spreadability. The values of spreadability indicate that the gel was easily spreadable by applying a small amount of shear. The results were depicted in Table 3.

**Washability:**

All the prepared formulations are easily washable under the running water.

**Stability Studies:**

All the formulations were kept at varying conditions of temperature. The system was stable at 25 °C. There were no significant changes in the formulation when kept at room temperature (30±2°C) and also at refrigerated temperature (4±2°C). No much change of pH, Viscosity, Homogeneity, Spreadability, and Extrudability.

**CONCLUSION:**

Herbal hair gel containing  $\beta$ -carotene was extracted from *Murraya koenigii*. The obtained extract was subjected to a UV-visible spectrophotometer which confirms the presence of  $\beta$ -carotene. The pH of the gel formulations were in the range of 6.8 to 7.1 which lies in the normal range of the skin. All the gel formulations were found to be homogeneous and there was no aggregate formation, there was no observable sediment in the centrifuge test. All the gel formulations showed good extrudability. Among all formulations, F3 showed excellent extrudability. All the gel formulations showed good viscosity and they were capable of remaining in the site of application for prolonged time. The values of spreadability indicated that the gel was easily spread by applying a small amount of shear. By comparing all the formulations, the hair gel formulation F3 had shown good results for all the parameters.

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