# FORMULATION AND EVALUATION OF POLYHERBAL HAIR GEL FOR HAIR GROWTH PROMOTION

**Sachin Niwas Pawar**
Student, Shri Sai Institute Of Pharmacy & Research, Chh. Sambhajinagar.

**Dr. Kulkarni Kavita ( Principle),** Shri Sai Institute Of Pharmacy & Research, Chh. Sambhajinagar

## Abstract

*This study focuses on the formulation and evaluation of a polyherbal hair gel intended for promoting hair growth and reducing hair-related problems such as hair fall and dandruff. The formulation incorporates natural ingredients including neem leaves, curry leaves, and lemon juice, which are known for their antimicrobial, nourishing, and hair growth–enhancing properties. The gel was prepared using Carbopol 940 as a gelling agent along with excipients such as glycerin, EDTA, triethanolamine, and methyl paraben. Various formulations (F1–F4) were developed and evaluated for physicochemical parameters including pH, viscosity, homogeneity, spreadability, skin irritation, and stability. The results indicated that formulation F3 showed optimal characteristics with suitable pH, good viscosity, and excellent stability without causing skin irritation. The study concludes that the developed polyherbal hair gel is a safe, effective, and economical alternative to synthetic hair care products, offering potential benefits in hair growth promotion and scalp health.*

***Keywords-****Polyherbal hair gel, Hair growth, Neem leaves, Curry leaves, Herbal formulation, Carbopol 940, Hair care, Natural products, Alopecia, Cosmetic formulation*

## INTRODUTION

Recently, the number of men and women who suffered from hair loss and/or hair thinning is increasing in worldwide. Hair loss is a dermatological disorder, and the surge for discovering natural products with hair growth promoting potential is continuous. Hair loss or alopecia is a common patient complaint and a source of significant psychological and physical distress. Many factors such as metabolism, hormones, heredity and side effects of antineoplastic and immunosuppressant drugs, have been negatively affecting the healthy growth of hair. According to one survey, androgenic alopecia on its own eventually affects approximately 50% of the world's adult population. In androgenic alopecia it is assumed that the genetically predisposed hair follicles are the target for androgen-stimulated hair follicle miniaturization, leading to gradual replacement of large, pigmented hairs (terminal hairs) by barely visible, depigmented hairs (vellus hairs) in affected areas. It is dihydrotestosterone medicated process, characterized by continuous miniaturization of androgen reactive hair follicles and accompanied by per follicular fibrosis of follicular units in histological examination. Androgenic alopecia results in a decrease in hair follicle size accompanied by a decrease in the duration of anagen; anagen is the active phase of the hair in which hair is living and growing and an increase in the percentage hair follicles in telogen; telogen is the resting phase and accounts for 10-15% of all hairs.

Androgens are considered to be one of the most important causes for alopecia apart from a variety of other factors. Thus, it is very important to develop new therapeutic materials to stop hair loss and to enhance hair

growth. Alternative medicine is one interesting area, which is getting more popular. Although it has not yet been incorporated into the mainstream of medical care because of limited scientific evidences and lack of mechanistic understanding, alternative medicine is becoming an increasingly attractive approach all over the world. Natural products in the form of herbal formulations are available on the market and are used as hair tonic, hair growth promoter, hair conditioner, hair-cleansing agent, antidandruff agents, as well as for the treatment of alopecia and lice infection.

A number of herbal products have been acclaimed with hair growth promoting activity. The traditional system of medicine in India acclaims a number of herbal drugs for hair growth promotion but lack of sound scientific backing and knowledge limits their usage. Neem and Curry are the traditional herbaceous plant, commonly used for nourishment and growth promotion of hairs. [1]

### 1.1 Hair Gel:

Herbal gels are a type of gel that is made from natural ingredients such as herbs and plants. They are used for various purposes such as skin care, hair care, and pain relief. Hair gel is a hairstyling product that is used to harden hair into a particular hair style. Hair gel has evolved into one of the most commonly used hair styling products. Hair gels initially gained popularity as they helped the hair to be kept in an undisturbed, uniform state throughout the day. Hair gels are compatible with all types of hairs includes curls, wavy, colored and relaxed hair. Excessive usage of hair gel might cause impaired hair growth.

**Figure 1. Hair Gel**

It is a matter of choosing right hair gel product. Pore on the scalp need a minimal degree of time when they are unblocked, excessive usage of ensures that these pores remain blocked. Cheap hair gels can damage your hair. Hair gel works best when applied to slightly damp hair. [2]

Polyherbal hair gel is a hair gel that is made from a combination of herbs. It is found to be effective in promotion of hair growth and nourishes the hair while preventing premature graying. However, it is important to note that the effectiveness of polyherbal hair gel may vary depending on the individual's hair type and scalp condition.

### 1.2 Types of Hair Gel:

Water based pomade

Oil based pomade Hybrid pomade

Water based pomade :

Water based pomades are water soluble, they wash out easily with water. With a firm hold, natural shin, a clean and crisp cedar scent our gel.

Oil based pomade :

These are traditional hair greases that have been in natural oils in these pomades promote high levels of shine. These products do not dry completely after application

Hybrid pomade :

This hybrid pomade is a water-soluble cream that feels like a firm version of their oil-based pomade. Goes into the hair with ease and washes out After one shampoo.

Hair gels are actually categorized by "HOLD" which refers to the strength-holding capacity of the gel :-

Light hold :

Light-hold hair gel is indicated for hairstyles that do not require the hair to be secured tightly in place. It is only type of hair gel recommend for long hair.

Firm hold :

Firm hold hair gel provides a tighter grip on the hair than the one from light- hold hair gel. This gel is especially useful for straight and wavy hair of short and medium length.

Strong hold :

Strong hold hair gel offers the strongest grip on the hair and is ideal for gravity defying hair styles and that need very precise shaping and molding. This hair gel is recommended for straight and wavy hair of short to medium length.

### 1.3 Ways to Use Hair Gel :

For a shinier look, apply hair gel do damp hair or for a more matte finish, use it on dry. Start with a dime to nickel amount of gel. Rub it in between the hands and then thorough hair, making sure gel is well distributed. Then styled into your desired style. There are different varieties of gels that provide a variety of results range from wet look, dry look and vertical holds. One way to use gel is to help in smoothening the hair.


Figure 2.

### 1.4 Advantages of Hair Gel :

- Some gels make your hair healthierby providing it with essential nutrients
- These nutrients will soak into your scalp and hair follicles, makes your hair strengthen.
- Gel gives shinier look to your hair.
- Hair gels are used to hold the hair long lasting.
- Gels are not time-consuming application.

### 1.5 Disadvantages of Hair Gel :

- Hair gels contain alcohol and corrosive chemicals that strip off

moisture from hair and scalp and make them dry and dehydrated.
- Hair loss
- Dandruff
- Discoloration and damage

**1.6 Applications of Hair Gel :-**

- Hair gel is a very popular styling tool used by both men and women. People use this product in order to keep every hair place, prevent flying and help to maintain hair stiff.
- Hair gel gives necessary nutrients to your hair.
- Hair gel is used makes your look attractive.
- The main benefit of using hair gel in the first place gives control over your hair and hair style.
- There are some hair gels that also offers temporary color.
- For best results, wash your hair before applying gel, this will remove any excess oil.
- Hair gel provides better application property and stability compare to creams and lotions.
- Gels have good spreadin property Compare to shampoo and other products.
- Gels are used for styling hairs so it has multiple uses.
- They are also known to provide nourishment to your hair and scalp. Some of the benefits of using herbal hair gel include:
- They are free from harmful chemicals like parabens, sulfates, and alcohol
- They provide nourishment to your hair and scalp.
- They help in reducing hair fall and promote hair growth.

## 2. AIM, OBJECTIVE & NEED OF STUDY

**AIM: PREPARATION AND EVLAUATION OF POLYHERBAL HAIR GEL**

**OBJECTIVE**:

a) The objectives of herbal hair gel are to provide a natural alternative to chemical-based hair gels and to nourish the hair while providing hold and shine. Below are some of the key objectives of the current project work:
b) To establish the Standard Operating Procedure of Polyherbal Hair gel.
c) To assess quality control parameters of Polyherbal Hair gel.
d) To evaluate efficacy of Polyherbal Hair gel and compare with marketed sample of gel containing synthetic chemicals for hair growth.
e) To compare efficacy of hair gel and standard market preparation
f) To formulate a polyherbal hair gel for a safety of general population.
g) Give natural black color to hair.
h) To provide scientific evidence for the potential use of the polyherbal hair gel as a safe and effective treatment for hair loss and promotion of hair growth.
i) To compare the efficacy of the polyherbal hair gel with that of a commercial hair growth product.
j) To determine the optimal pH and viscosity of the polyherbal hair gel.

## 3. NEED OF STUDY:

There is a need for studies on herbal hair gel for several reasons:

Demand for natural products: In recent years, there has been an increasing demand for natural and organic products, including hair care products. Consumers are becoming more conscious of the potential health and environmental risks associated with synthetic chemicals in conventional hair care products. Herbal hair gel is a natural alternative to synthetic hair gels and is therefore in demand.

Potential benefits of herbal ingredients: Many herbal ingredients have been traditionally used to promote hair growth and treat hair loss. For example, Aloe vera, Hibiscus rosa-sinensis, and Embolic officinalis are known to have hair growth-promoting activity. By studying the efficacy of these ingredients in a hair gel formulation, researchers can provide scientific

evidence for their potential use in hair care.

Safety concerns of synthetic chemicals: Synthetic hair care products may contain chemicals that can cause adverse health effects such as skin irritation, allergies, and hormone disruption. Herbal hair gel formulations have the potential to be safer and gentler on the scalp and hair.

Need for effective hair loss treatments: Hair loss is a common problem that can have a significant impact on self-esteem and quality of life. While there are conventional treatments for hair loss, they may not be effective for everyone and can have adverse side effects. Herbal hair gel formulations have the potential to be effective and safe alternatives for hair loss treatment. The study of herbal hair is important because research has shown that some herbs may slow hair loss or help promote new growth. However, it's important to note that much of the research has been done on animals and additional studies are needed to prove their effectiveness on humans.

## 4. PLAN OF WORK

1) Literature review
2) Procurement of materials
3) Extraction of herbal ingredients
   - preformulating study of obtained extracts
4) Formulation of herbal hair gel
   - Formulation of hair gel with API
5) Evaluation studies of prepared hair gel
   - Appearance and texture test
   - pH value test
   - Viscosity test
   - Spread ability test
   - Water resistance test
   - Tensile strength test
   - Microbial assay

## 5. LITERATURE REVIEW:

1) R.Abiyarasu et al (2022) has studied Formulation and evaluation of polyherabal hair gel formulation. Dandruff is a skin condition caused by bacteria and fungus, which can lead to further hair problems or skin issues. Herbal extracts of gauva leaves, amla and aloe have been found to be effective in treating candidiasis. Guava leaves are rich in Vitamin B & C, which helps in nourishing hair and aids hair growth. Amla is 20 times more vitamin C than orange, which prevents premature graying of hairs and provides luster to hairs. Gauva leaves extract was evaluated by Cup and plate method against the fungus C. albicans and bacteria S. aureus. Herbal gel was formulated and evaluated by using Carbopol 934, triethanolamine. A polyherbal hair gel was found to be effective against candidiasis and nourished the hair and prevented premature graying.
2) Poonam Madan et al (2021) has studied pharmaceutical development, standardization and clinical evaluation of efficacy of a polyherabal hair pack and hair gel in dendruff control. Dandruff is a common hair problem caused by vitiation of vaat and kapha and is considered a social stigma. Treatment is expensive and unsatisfactory, with recurrence common.
3) Mr.Maharu shamrao bhil et al (2020) has studied formulation and evaluation of hair setting gel by using onion oil baheda. The follicle is an important organ in humans, providing protection, sebum production, thermoregulation, and social and sexual interaction. It is a reservoir for epithelial and melanocyte stem cells. [6]

4) Megha jain et al (2020) has studied formulation and evaluation of polyherbal gel containing hydro-alcoholic extract of some herbs used for hair growth potential . Currently, herbal extracts are utilized to make gel, and polyherbal extracts are very interested in boosting its effectiveness. Mentha piperita leaves, Triticum aestivum Linn. wheat grass leaves, and Moringa oleifera leaves were hydro-alcoholic extracts used in the current study. Eclipta alba Linn. (Leaves), Murraya koenigii (L.) Spr. (Leaves), Lam. (Leaves), Punica granatum Linn. (Fruits), and Lam. (Leaves) were used to create polyherbal hair gel, this was then tested for effectiveness. These plants' extracts were used to create a polyherbal hair gel with Carbopol 934. After evaluating the created formulation, the findings were given. Comparing the PHHG-3 to other formed PHHG, the results show that it performs satisfactorily. [7]

5) Mashuri yusuf et al (2017) has studied herbal gel containing corm extract of pisang kepok promote hair growth of rabbit. People who experience hair loss are not yet satisfied with the technologies and treatments currently available, so efforts to find effective medications to encourage hair growth are still being made. This investigation and confirmation of the effects of topically applied pisang kepok (Musa balbisiana) crude corm extract on rabbit hair growth was the goal of this study. For the study, four healthy male rabbits weighing 1.5 kg to 2 kg, aged 4-5 months, were used. Six regions (2 cm × 2 cm each) on the dorsal sides of animals were shaved. The first shaved area treated topically with nothing (normal control). The second and third sections treated successively with gel without banana corms extract (as negative control) and reference formulations (as positive control).reference formulations (as a positive control) and extract (as a negative control). The final three areas received treatment with gel containing pisang kepok corm extract at concentrations of 2%, 4%, and 8%, respectively. For 21 days, each therapy was administered once daily. On days 7, 14, and 21, hair length was measured, while day 22 saw the measurement of hair mass. The results demonstrated herbal topical gel containing crude corms extract of pisang kepok significantly enhance the animal hairs length and bulk in comparison to the normal and negative control. Therefore it may be proposed that herbal gel containing corms extract of
M. balbisiana is potent to be utilized as the topical formulations for hair growth. [8]

6) Goswami anindya et al (2019) has studied fabrication and evaluation of herbal hair gel containing zizipus juiuba hibiscus and piper nigrum. An essential component of the human body is hair. Numerous artificial substances, chemicals, and their derivatives have been shown to have harmful effects. Numerous herbal principles have been recognized for their ability to promote hair development, and when they are formulated into suitable cosmeceuticals, patient compliance is not a problem. The goal of this research project was to create a hair gel mixture using black pepper (Piper nigrum), which is frequently found in Ayurvedic medicines and encourages the formation of new hair follicles, and hibiscus leaf extract, which is both known to encourage hair growth and to condition hair. Additionally, Ziziphus jujuba leaf extract, which has been proven to have

antibacterial properties and is advantageous. The formulations also include an extract from Ziziphus jujuba leaves, which has been suggested to have antibacterial properties that make it helpful for treating scalp and dandruff. Additionally, there are 3% w/w extracts of black pepper seeds, hibiscus leaves, and ziziphus jujuba seeds. Although the physicochemical analysis of the chemicals used to make the hair gel revealed optimal findings, further study is needed to fully understand its ability to promote hair growth. [9]

7) Sharma and Singh et al (2014) This review article provides an overview of herbal hair cosmetics, including herbal hair gels, and discusses the advantages of using herbal ingredients in hair cosmetics. It explain that herbal hair gels offer several advantages over conventional hair gels, such as being free from synthetic chemicals that can cause damage to hair and scalp. The use of herbal ingredients in hair gels can provide various benefits, including hair growth promotion, hair strengthening, and dandruff control. The article also reviews the herbal ingredients commonly used in hair gels, such as aloe vera, hibiscus, and neem. Aloe vera is known for its moisturizing and soothing properties and is commonly used in hair gels to treat dry and damaged hair. Hibiscus is known for its hair growth-promoting activity and is used in hair gels to stimulate hair growth. Neem is known for its antibacterial and antifungal properties and is used in hair gels to treat dandruff and other scalp infections. They also discuss the formulation of herbal hair gels and explain that natural ingredients such as gums, resins, and plant extracts are used as gelling agents in place of synthetic polymers. Overall, the article suggests that the use of herbal ingredients in hair gels can provide numerous benefits and may be a better option for people who are concerned about the potential harmful effects of synthetic chemicals on their hair and scalp. [10]

## 6. MATERIALS AND METHOD:-

MATERIAL:

The raw materials like drugs, polymers, excipients and chemicals for the present work were procured from different sources. Following were used for the formulation and evaluation of polyherbal hair gel.

| Sr No. | MATERIALS | SUPPLIED BY |
|---|---|---|
| 1 | n leaves (*Azadirachta Indica)* powder | Local market of Chh. Sambhajinagar |
| 2 | *Curry leaves (Murraya koenigii)* leaves powder | Local market of Chh. Sambhajinagar |
| 3 | Lemon juice | Local market of Chh. Sambhajinagar |
| 4 | Carbopol 940 | ute of Pharmacy & Research, Chh. Sambhajinagar |
| 5 | EDTA | ute of Pharmacy & Research, Chh. Sambhajinagar |
| 6 | Triethioamine (TEA) | ute of Pharmacy & Research, Chh. Sambhajinagar |
| 7 | Methyl Paraben | ute of Pharmacy & Research, |

| | | |
|---|---|---|
| | | Chh. Sambhajinagar |
| 8 | Glycerin | ıte of Pharmacy & Research, Chh. Sambhajinagar |
| 9 | Rose water | ıte of Pharmacy & Research, Chh. Sambhajinagar |
| 10 | Water | ıte of Pharmacy & Research, Chh. Sambhajinagar |

Table 1. Lists of Materials Used

| SR. NO. | EQUIPMENTS | SUPPLIED BY |
|---|---|---|
| 1 | Glasswares | ıte of Pharmacy & Research, Chh. Sambhajinagar |
| 2 | Electronic weighing balance | ıte of Pharmacy & Research, Chh. Sambhajinagar |
| 3 | Hot plate | ıte of Pharmacy & Research, Chh. Sambhajinagar |
| 4 | Electric stirrer | ıte of Pharmacy & Research, Chh. Sambhajinagar |
| 5 | Whatmann filter paper | ıte of Pharmacy & Research, Chh. Sambhajinagar |
| 6 | Viscometer | ıte of Pharmacy & Research, Chh. Sambhajinagar |
| 7 | Digital pH meter | ıte of Pharmacy & Research, Chh. Sambhajinagar |

Table 2. Lists of Equipments Used

### 6.1 Drug & Exipient Profile

Table 3. Classification of NEEM

A. HERBAL DRUG PROFILE

1) NEEM [11]

Botanical Name:- *Azadirachta Indica*

Classification:-

| Kingdom | *Plantae* |
|---|---|
| division | *Magnoliophyte* |
| Class | *Magnoliopsida* |
| Order | *Sapindales* |
| Genus | *Azadirachta* |
| Species | *A. indica* |
| Family | *Meliaceae* |

Figure 3. NEEM

2) Curry leave [12]

Scientific Name:- *MURRAYA KOENIGII*

Classification:-

| Kingdom | *Plantae* |
|---|---|
| division | *Magnoliophyte* |
| Class | *Magnoliopsida* |
| Order | *Sapindales* |
| Genus | *Rutaceae* |
| Species | *Murraya* |
| Family | *Koenigii* |

Figure 4.Curry Leave

Table 4. Classification of Curry Leave

3) Lemon juice [13]

Botanical name:- *Citrus limen (L.)*

Classification:-

| | |
|---|---|
| Kingdom | *Plantae* |
| Order | *Sapindales* |
| Genus | *Citrus* |
| Species | *C. limon* |
| Family | *Rutaceae* |

Table 5.


Figure 5. Citrus

Medicinal uses:- natural preservative, pH balancing, clarifying, shine enhancing, anti-dandruff.

**6.2 EXCIPIENT PROFILE:-**

a) GEL FORMING POLYMER
- CARBAPOL 940
- Chemical formula:- (C3H4O2)n
- M.W.:- 72.06

b) CHELATING AGENT
- EDTA (Edetic acid)
- Chemical formula:- C10H16N2O8
- M.W. :- 292.244

c) SURFECTANT & STABILIZER
- TEA
- Chemical formula:- C6H15N
- M.W. :- 101.19

d) PRESERVATIVE
- METHY PARABEN
- Chemical formula:- CH3[C6H4(OH)COO]
- M.W. :- 152.149

e) HUMECTANT
- GLYCERIN
- Chemical formula:- C3H8O3
- M.W. :- 92.09

f) FREGENANCE:-
- ROSE WATER

- **METHODOLOGY:-**

**Preparation of Plant Extracts :**

Curry leaves and Neem leaves were washed under the running water to remove contaminants; it was dried under shade, coarsely powdered and extracted discretely by cold maceration in absolute ethanol for 48 hours. The extract were first filtered with a white muslin cloth after which the filtrates were refiltered with whatmann no. 1 filter paper. The resulting ethanol leafs extracts were concentrated using rotary evaporator to obtain a semi-solid mass. The weights of the semi-solid extracts were determined. [14]

**Preformulational study of obtained extract:-**

***a) Characterizations of obtained extracts:***

Identification and confirmation of Neem and curry leaves was carried out by evaluating organoleptic properties and Phytochemical test.

**b) Organoleptic properties:**

Neem and Curry leaves extract was evaluated for its organoleptic properties such as color, odor, appearance, and taste. [15]

**c) Determination of pH:**

The crude powder of Neem and curry leave was dissolved in distilled water and was kept in water bath for 20 min, filtered and then pH of the filtrate was noted down with the help of pH meter. [15]

**d) Determination of total ash:**

The total ash value of crude powder of Neem and curry leave was determined by incinerating 2g of accurately weighed crude powder in silica crucible. It was incinerated in a muffle furnace at a temperature not

exceeding 450$^0$C until free from carbon, then cooled and weighed. [15]

**e) Determination of water soluble ash:**

The total ash obtained was boiled with 25ml of distilled water for 5 min. The insoluble matter was collected on a ash less filter paper, washed with hot water and ignited to constant weight at allowed temperature. The weight of insoluble matter was subtracted from the weight of total ash. The percentage of water soluble ash with reference to the air dried drug was calculated. [15]

**f) Determination of acid insoluble ash**:

The ash obtained in the above method was boiled with 25ml of dilute hydrochloric acid for 5 min. The residue was collected on ash less filter paper and washed with hot water, ignited, cooled. The percent of acid insoluble ash with reference to air dried drug was calculated. [15]

**g) Preparation of hair gel :**

Hair Gel formulation was prepared by uncomplicated gel formulation preparation technique with Carbopol gel as a base.

The gel formula comprises of Methyl Paraben Sodium, Glycerin, (TEA), and Carbopol 940 grams of Carbopol 940 and precise amount of extracts was dispersed in 100 ml of distilled water and assorted by agitating incessantly in a magnetic stirrer at 800 rpm for 1 hour. Glycerin was further added to the mixture under continuous moving. The assimilation was continuous until a clear gel was formed. [9]

Dissolve 2 gm Carbopol in 100 ml of distilled water.
Add 0.5 gm of EDTA and 0.2 gm of glycerin.
Boil till 1/2 remains.
Cool the above admixture for further processing.
Add 0.2 gm Triethanolamine (TEA) and 0.1 gm methyl paraben
Add 1gm of extracted neem leave & 1 gm of extracted curry leaves

Add 2 ml lemon juice & 2ml rose water
Mix well till leaves sets into gel consistency.
Store in cool & air tight container.

**Process of formula of hair gel**

| Ingredient | Activity |
|---|---|
| Neem leaves extract | Antimicrobial agent |
| Curry leaves extract | Hair growth promoter |
| Lemon juice | Hair nourishment |
| Carbopol 940 | Gelling agent |
| EDTA | Appearance enhancer |
| Triethan olamine (TEA) | Plasticizer & neutralizer |

| | |
|---|---|
| Methyl paraben sodium | Preserv ative |
| Glycerin | Humect ant |
| Rose water | Fragra nce |
| Distilled water | Solvent |

Table 6. Ingredients and their roles in polyherbal hair gel

| INGREDENT | FI | F2 | F3 | F4 |
|---|---|---|---|---|
| Neem | 1ml | 2ml | 1ml | 1ml |
| Curry leave | 1ml | 2ml | 1ml | 2ml ml |
| Lemon juice | 1ml | 1ml | 2ml | 2ml |
| Carbopol | 2 gm | 2 gm | 2 gm | 2 gm |
| EDTA | 0.5 gm | 0.5 gm | 0.5 gm | 0.5 gm |
| Triethanolamine (TEA) | 0.2 gm | 0.2 gm | 0.2 gm | 0.2 gm |
| Glycerin | 0.2 gm | 0.2 gm | 0.2 gm | 0.2 gm |
| Methyl paraben sodium | 0.1 gm | 0.1 gm | 0.1 gm | 0.1 gm |
| Rose water | 2 ml | 2 ml | 2 ml | 2 ml |
| Distilled water | 100 ml | 100 ml | 100 ml | 100 ml |

Table 7. Compositions of different batches of prepared hair gels for optimization

From the above Table no. 7, all the prepared formulation (F1 to F4) are evaluated for various physicochemical parameters and results obtained from it are mentioned in table no. 9

**Evaluation of formulated hair gel :**

*Physical appearance / Visual inspection*

The formulated hair gel was evaluated for the color, transparency, odor, visual appearance and presence of foreign particles. [10,16,17]

**Determination of pH**

The pH of herbal hair gel was determined using pH meter at room temperature. [9,16,17]

**Viscosity profile**

For the extent of viscosity of the herbal gel, Brookfield viscometer was used. The Brookfield viscometer was rotated at 100 rpm with spindle no.6. Every impression was taken after equilibrium was attained by the sample at the conclusion of two minutes. The study was repeated three times and average value was noted. [9,16,17]

**Homogeneity**

The prepared gel was assessed for homogeneity by visual scrutiny after the gel was positioned in the container. It was experienced for manifestation and incidence of any lumps or

aggregates. [9]

**Spreadability**

It was evaluated by wooden block and glass slide apparatus. Weights of about 20 g were placed in to the pan and time was recorded for upper slide (impermanent) to disconnect entirely from the preset slides. Spreadability was consequently calculated by using the formula,

**S=M.L/T**

Where, S= Spreadability,
M=Weight tide to upper slide,
L=Length of glass slide,
T=Time taken to separate the slide completely from each other.
[9,16,17]

Skin irritation test

Test for skin annoyance was performed on individual volunteers (human) with their consent. Five volunteers were preferred; furthermore 1.0 g of formulated gel was applied on a region of about 2 square inch to the reverse of hand. The volunteers were scrutinized for lesions or irritation. [9]

Stability study of prepared formulations

The stability study was approved out for the prepared hair gel at standard room temperature of 25 – 30 $^0$C and at 4 $^0$C for 2 weeks. Quite a few parameters such as physical appearance, odor, and color of the prepared formulations were noticed after 14 days. [9]

## 7. RESULT & DISCUSSION

***Preformulation study of obtained extract:-***

*Characterization of obtained extract:- Organoleptic properties:-*

The extract sample of Neem and Curry leaves was observed for colour, odour, appearance and taste which are as shown in table

| Sr. No. | TEST SAMPLE | TEST | RESULT | SPECIFICATION |
|---|---|---|---|---|
| 1. | em leaves extract | our Odour Taste | Greenish brown Characteristic aroma Bitter | Greenish brown Characteristic aroma Bitter |
| 2. | rry leaves extract | our Odour Taste | Greenish brown Characteristic aroma Bitter | Greenish brown Characteristic aroma Bitter |

*Table 8. Organoleptic properties*

***Determination of pH:-***

pH of the Neem and Curry leaves extract was found to be 6.5 and 6.1 respectively.

**Determination of total ash:-**

The total ash value of Neem and Curry leaves was found to be 12.23% and 14,07% respectively.

**Determination of water soluble**

**ash:-**

The water soluble ash value of Neem and Curry leaves was found to be 2.11% and 1.96% respectively.

**Determination of acid insolube ash:-**

Th e acid insoluble ash value of Neem and Curry leaves was found to be
3.94 and 4.72% respectively

**Determination of loss on drying:-**

The loss on drying of Neem and Curry leaves was found to be 11.78 gm and
10.11 gm respectivey.

Determination of extractive values:-

***Alcohol soluble extractive value:-***

The alcohol soluble extractive was found to be 7.34% and 7.45% respectively. Water soluble extractive value:-

The water soluble extractive was found to be 10.23% and 9.21% respectively.

**Evaluation of prepared polyherbal hair gel**

| Parameters | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| *Colour* | Light green | Light green | Light green | Light green |
| *Transparency* | Transparent | Transparent | Transparent | Transparent |
| *Odour* | Characteristic | Characteristic | Characteristic | Characteristic |
| *Visual appearance* | Smooth and consistent | Smooth and consistent | Smooth and consistent | Smooth and consistent |
| *pH test* | 5.28 | 5.78 | 6.34 | 5.98 |
| *Viscosity (cps.)* | 6500 | 5600 | 4740 | 7200 |
| *Homogeneity* | Smooth, non-homogeneous, & few aggregates were found | Smooth, homogeneous, & no aggregates were found | Smooth, homogeneous, & no aggregates were found | Smooth, non-homoge |
| *Skin irritation* | Compatible, non irritant to skin | Compatible, non irritant to skin | Compatible, non irritant | Compatible, non irritant to skin |
| *Visual stability* | No significant changes | No significant changes | No significant changes | No significant changes |

**Table 9. Results obtained form above mentioned evaluation parameters**

From table no. 9, It can be concluded that from all the prepared formulation F3 formulation is optimum and meets the all the required specifications of hair gel.

Physical appearance / Visual inspection

As any other cosmetic products, hair gels are also to be judged visually, thus having good physical appearance is important. The formulated gel was clear and light greenish in color. It has a good odor given by the fragrance in the ingredients. The gel was free from foreign particles and was smooth.

**pH**

The pH balance of products is important as it affects the skins and surfaces as they are being used. The pH of our formulated gel was 5.28, which is slightly alkaline falling in the ideal pH range for skin which is between 4.5 and 5.5. It is noted that the formulated gel is slightly alkaline in nature.

**Viscosity profile**

Product rheology plays an imperative part in defining and controlling many attributes such as shelf life stability and product aesthetics such as effortlessness of flow on removal from packaging and distribution on use to

hair and product evenness in the package. The viscosity profile of the gel was measured using Brookfield's viscometer. It was found out to be 4740 cp.

**Homogeneity**

The prepared hair gel was Smooth, Homogeneous and no agglomerates were found.

**Skin Irritation**

The prepared herbal hair gel was applied on 1 cm skin of hand and exposed to sunlight for 4-5 min. It was found skin compatible and non-irritant.

**Visual stability**

The stability study was carried out for the prepared hair gel at standard room temperature of 25 – 30 $^0$C and at 4 $^0$C for 2 weeks. Several parameters such as physical appearance, odor, and color of the prepared gel were noticed as significant.

**CONCLUSION**:-

In the present work, it can be concluded that the formulated polyherbal hair gel is a safer option as compared to other synthetic products available in market. The formulated hair gel has less side effects as it contains herbal ingredient. The polyherbal hair gel containing curry leaves and neem leaves extract offers better hair growth potency and protective action to the hair. The formulated poly herbal hair gel was evaluated for several parameters and meets the ideal characteristics as of marketed hair gels. Finally, as the formulation and evaluation of polyherbal hair gel was an ultimate success and have been thoroughly characterized, some of the analytical approaches developed during the study might attract scientific community and may be further develop.

## 8. REFERENCES :

1) *T Regupathi1, K Chitra, K Ruckmani, KG Lalitha and Mohan Kumar. Formulation and Evaluation of Herbal Hair Gel for Hair Growth Potential. Journal of Pharmacology & Clinical Research. Volume 2 Issue 2, 2017 DOI: 10.19080/JPCR.2017.02.555581*

2) *Abbaraju K Sailaja and K.Madhuri. "Comparitive Study of Various Brands of Synthetic Hair Gels and Herbal Hair Gels". Clinical Case Reports and Clinical Study, 4(5); DOI:http;//doi.org/07.2021/1.1094*

3) *Sanju, N., Arun, N., Roop, K.K. 2006. Cosmetic Technology. 2nd Edition, 379-382*

4) *R. Abiyarasu, B. Premchand, K. Pravallika, V. Yuvaraj, D. Kalyani, Dr. K. Swathi Krishna. Review on formulation and evaluation of polyherbal hair gel formulation. The Jour Multi Rese, 2(3), 2022, 31-36. DOI: https://doi.org/10.37022/tjmdr.v2i3.400*

5) *Poonam Madan, Bharat Rathi, Renu Rathi, Sonali Wairagade4, Dhiraj Zade. Pharmaceutical Development, Standardization and Clinical Evaluation of Efficacy of a Polyherbal Hair-Pack and Hair Gel in Dandruff Control. Journal of Pharmaceutical Research International 33(31B): 69-78, 2021; Article no.JPRI.68592, ISSN: 2456-9119.*

6) *DOI: 10.9734/JPRI/2021/v33i31B31692*

7) *Mr. Maharu Shamrao Bhil, Mr. Mayur Bharat Bhamare, Mr. Vishal Ashok Chaudhari, Mr. Jayeshkumar Chatur Borse, Mr. Pravin Tanaji Jadhav. Formulation and evaluation of hair setting gel by using onion oil, baheda. © IJCIRAS | ISSN (O) - 2581-5334 June 2020 | Vol. 3 Issue. 1*

8) *Megha Jain and Anup Chakraborty. Formulation and Evaluation of Polyherbal Gel Containing Hydro-Alcoholic Extract of Some Herbs used for Hair Growth Potentia. Annals of R.S.C.B., ISSN:1583-6258, Vol. 24, Issue 2, 2020, Pages. 1753 – 1759*

9) *Mashuri Yusuf, Qurota Aini, Isbiyantoro, Rr Prita Permatasari, Yulianty, Mohammad Kanedi. herbal gel containing corm extract of pisang kepok (musa balbisiana) promote*

*hair growth of rabbit. ejbps, 2017, Volume 4, Issue 04, 27-32.*

10) *Goswami A , Mathur K, Yadav P, Jain R, Malviya N, Fabrication and Evaluation of Herbal Hair Gel containing Zizipus jujuba, Hibiscus and Piper nigrum, Journal of Drug Delivery and Therapeutics. 2019; 9(2-A):68-71*

11) *Sharma, G., & Singh, V. (2014). Herbal hair cosmetics: An overview. Journal of Cosmetic Science, 65(3), 201-218.*