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# Fabrication and Evaluation of Herbal Hair Gel containing *Zizipus jujuba, Hibiscus* and *Piper nigrum*

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## ABSTRACT

Hair is an imperative part of human body. Various synthetic compounds, chemicals, and their derivatives have been proved to cause destructive effects. A number of herbal principles have been commended with hair growth promoting action and formulating them into appropriate cosmeceuticals can be well acknowledged as far as the patient compliance is concerned. The objective of the present research work was to develop a hair gel formulation with Black pepper (Piper *nigrum*) which is often used in Ayurvedic medicines and it stimulates hair follicles causing growth, and with Hibiscus leaves extract which is known as a hair growth promoter and a hair conditioner as well. The formulations also contain Ziziphus *jujuba* leaves extract, which has been reported possessing antibacterial activity which makes it beneficial against dandruff and scalp infections. Along with extracts of Ziziphus *jujuba* and Hibiscus leaves and Black Pepper seeds (3% w/w each). All the ingredients used to prepare the hair gel was found harmless and the physicochemical assessment showed ideal results, but advance research is required to perceive its hair growth promotion property.

**Keywords:** *Ziziphus jujuba, Piper nigrum , Hibiscus*, Hair Gel

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## INTRODUCTION

Hair is one of the external barometers of internal body conditions. There is something like 5 million entire body hair follicles, of which 100,000 to 150,000 are scalp follicles. [1] Hair is the receiver of an invariable series of environmental assaults such as rain, ultraviolet radiations exposed from sun light, air pollutants, wind and water chemicals contribute to the ecological process known to cause structural and chemical squalor to hairs.

### Objectives

The objective of the current research work was to develop polyherbal hair hair gel with Black pepper (Piper nigrum) which is often used in ayurvedic medicines and it stimulates hair follicles causing growth, and with Hibiscus leaves extract which is known as a hair growth supporter and a hair conditioner as well. The formulation also contains *Ziziphus jujuba* leaves extract, which has been reported possessing antibacterial activity which makes it beneficial against dandruff and scalp infections. [2]Along with extracts of *Ziziphus jujuba* and Hibiscus leaves and Black Pepper seeds (3% w/w each).The herbal hair oil the formulation was enriched with the nutrition of Coconut oil, Castor oil and Olive oil which has been traditionally used for maintaining the strength and health of hair.

## EXPERIMENTAL

### *Plant materials*

Fresh leaves of Hibiscus and Ziziphus were collected in the month of August from the Herbal Garden premises of Smriti College of Pharmaceutical Education, India. The collected leaves were dehydrated in the shade, pulverized to a crude consistency and preserved in airtight bottles at room temperature (34°C). Black Pepper seeds were procured from local market of Indore.

**Figure 1: Drying of Plant Materials**

***Preparation of Plant Extracts***

Hibiscus and Ziziphus leaves were washed under the running water to remove contaminants; it was dried under shade, coarsely powdered and extracted discretely to exhaustion in a Soxhlet apparatus for 72 hours with ethanol (95%) as solvent (Merk & Spectrum Chemicals, India) system. 10gms of Black Pepper seeds were extracted with 150ml 95% Ethanol in Soxhlet Extractor for 2 hours. [3]The solution was filtered and concentrated on the water bath at 60˚C. 10ml of 10% alcoholic Potassium Hydroxide was further added to the filtrate with incessant stirring. The inexplicable remains were filtered and alcoholic solution was left all night and filtered through a membrane filter. The extracts were subsequently concentrated by means of a rotary evaporator at low down temperature (40-50˚C) and reduced pressure. The extracts were preserved in airtight bottles and kept at 4˚C until further use.

**Figure 2: Soxhlet Extraction Process**

***Qualitative phytochemical investigation of Plant Extracts*** [4, 5]

The extracts of Hibiscus and Ziziphus leaves and black Pepper seeds obtained were subsequently subjected to qualitative tests for detection of diverse plant constituents like alkaloids, carbohydrates, glycosides, proteins, amino acids, steroids etc. The Reagents prepared for these tests were based on the research of Kokate et al. (2007); and Evans (2002).

**Detection of carbohydrates**

1 gm of extract was dissolved with mother solvent and filtered. The residue was used to carry out the subsequent tests to detect the incidence of carbohydrates.

**Benedict's test**

Equal volume of Benedict's reagent and extract were assorted in a test tube and it was heated in a steaming water bath for 5 min. Presence of reducing sugar was indicated by red precipitate.

**Detection of alkaloids**

The small residue of extract was added with small volume of dilute HCl. It was then shaken properly and clarified. The filtrate was utilized to carry out following tests.

**Mayer's test**

(1.36 gms of $HgCl_2$ in 60 ml of distilled water + 5 gms of KI in 20 ml of distilled water, structured to the quantity to 100 ml). Small number of drops of Mayer's reagent was added to 2 – 3 ml of the filtrate. Attendance of alkaloids was indicated by creation of cream colour precipitate.

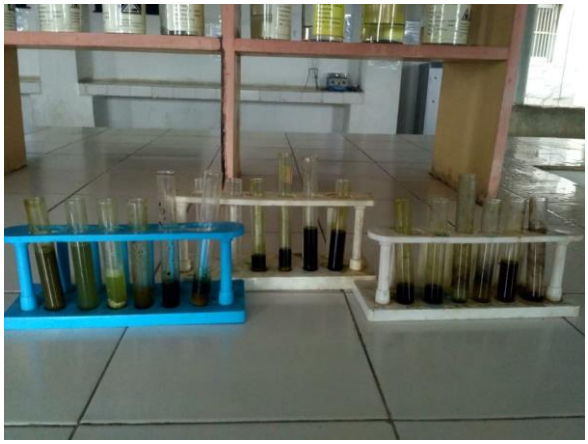

**Figure 3: Phytochemical investigation of plant extracts**

**Detection of glycosides**

**Detection of cardiac glycosides**

**Legal's test**

Extracts were reacted with Sodium Nitroprusside in pyridine and Methanolic alkali. Development of pink to blood red colour hints at the occurrence of cardiac glycosides.

**Detection of saponins**

**Foam or frothing test**

Few grams of extracts were thinned with 20 ml of distilled water and shaken in a graduated cylinder for 15 min. Configuration of 1 dm layer of foam indicated the occurrence of saponins.

**Detection of amino acids**

**Ninhydrin test**

In the extract, 0.25 % Ninhydrin reagent was added and boiled for some minutes. Progression of blue colour indicated the existence of amino acids.

**Detection of proteins**

**Biuret test**

The extracts were treated with 1 ml of 10 % NaOH and heated. To this a drop of 0.7 % Copper Sulphate solution was added. Formation of purplish violet colour indicated the presence of proteins.

**Detection of flavonoids**

**Lead acetate test**

The plant extracts were made to react with few drops of lead acetate solution. Development of yellow precipitate hints at the existence of flavonoids.

**Test for gums and mucilages**

Around 10 ml of the extracts were added to 25 ml of absolute alcohol with rousing and clarified. The precipitate was dehydrated in air and checked for its bulging properties and in support of the presence of carbohydrates.

**Test for fixed oils and fats**

**Spot Test**

Place small quantities of extracts between two filter papers. Oil stain formed by either extracts confirms the occurrence of fixed oils and fats.

***Preparation of hair gel*** [6]

Hair Gel formulation was prepared by uncomplicated gel formulation preparation technique with carbopol gel base. The gel formula comprises of Methyl Paraben Sodium, Glycerine, Poly ethylene glycol (PEG), and Carbopol 934. 2 grams of Carbopol 934 and precise amount of extracts was dispersed in 80 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.

**Figure 4: Prepared Herbal Hair Gel**

***Formula for Hair Gel***

**Table 1: Formulation Composition of herbal hair gel**

| Name of Ingredients | Formulation compositions |
|---|---|
| Carbopol 934 | 2gm |
| Methyl Paraben Sodium | 75mg |
| Hibiscus leaves extract | 3 % |
| Black Pepper Extract | 3% |
| Ziziphus Leaves Extract | 3% |
| Glycerine | 03ml |
| PEG | 6.25ml |
| Distilled Water q.s. | 1.5ml |

***Evaluation of formulated hair gel***

**Physical appearance / Visual inspection**

The formulated hair gel was evaluated for the colour, transparency, odour, visual appearance and presence of foreign particles

**Determination of pH**

The pH of herbal hair gel was determined using pH meter at room temperature.

**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.

**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.

**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.

**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.

**Stability study of prepared formulations**

The stability study was approved out for the prepared hair gel at standard room temperature of 25 – 30 $^{o}$C and at 4$^{o}$C for 2 weeks. Quite a few parameters such as physical appearance, odour, and colour of the prepared formulations were noticed.

## RESULT AND DISCUSSIONS

### *A) Qualitative Phytochemical Evaluation of Plant Extracts*

The results of preliminary phytochemical investigation of ethanolic extracts of *Ziziphus jujuba* , *Piper nigrum* and *Hibiscus rosea* are shown in Table 2.

**Table 2: Qualitative Phytochemical screening of *Z. jujuba*, *P. nigrum* and *H. rosea* extracts**

| S. No. | Plant constituents | Ethanolic Extract of *Ziziphus jujuba* | Ethanolic Extract of *Piper nigrum* | Ethanolic Extract of *Hibiscus rosea* |
|---|---|---|---|---|
| 1. | Carbohydrates | - | - | - |
| 2. | Alkaloids | - | + | - |
| 3. | Glycosides | - | + | - |
| 4. | Saponins | + | - | + |
| 5. | Amino Acids | - | - | - |
| 6. | Proteins | - | - | - |
| 7. | Flavonoids | - | - | + |
| 8. | Gums and Mucilages | + | - | + |
| 9. | Fixed Oils and Fats | + | - | + |

+ = showed colour reaction - = did not showed colour reaction

***B) Physicochemical evaluation of formulated hair gel containing Hibiscus and Ziziphus leaves extract with Black Pepper***

**Table 3: Evaluation of prepared herbal hair gel**

| Parameters | Results |
|---|---|
| Colour | Light green |
| Transparency | Transparent |
| Odour | Characteristic |
| Visual Appearance | Smooth and consistent |
| Viscosity (Cps) | 4731 cp |
| Homogeneity | Smooth, Homogeneous and no aggregates were found. |
| Irritation | Compatible, Not irritation |

The Physicochemical evaluation of formulated hair gel containing Hibiscus and Ziziphus leaves extract with Black Pepper has been summarized in **Table No. 02**

***Physical appearance / Visual inspection***

As any other cosmetic products, the beauty of hair gels for consumers tends to be judged visually, thus having good physical appearance is important. The formulated gel was clear and light greenish in colour. It has a good odour 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 6.68, which is slightly acidic falling beyond the ideal pH range for skin which is between 4.5 and 5.5. It is noted that the formulated gel is slightly acidic.

**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 4731 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 $^{o}$C and at 4$^{o}$C for 2 weeks. Several parameters such as physical appearance, odour, and colour of the prepared gel were noticed. Significant changes in color and pH of hair gel was not observed in 14 days.

## CONCLUSION

Herbal cosmetics are organized by the connection of bioactive ingredients and pharmaceutical products. The present study was aimed to formulate an herbal hair gel containing Hibiscus, Ziziphus and Black pepper. A number of tests were performed on the way to resolve the physicochemical properties of the formulated gel. Ingredients used to prepare the hair gel were found harmless and the physicochemical assessment showed ideal results, but advance research is required to perceive its hair growth promotion characteristics.

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