

## Formulation and Evaluation of Herbal Hair Gel

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DOI: [10.36348/sijtcm.2022.v05i02.002](https://doi.org/10.36348/sijtcm.2022.v05i02.002)

Received: 03.01.2022 | Accepted: 05.02.2022 | Published: 13.02.2022

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### Abstract

Hair is an imperative part of human body. Due to 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. The present work is done by formulating hair gel using Guar gum and Jatamansi. Guar gum hydrates the hair by sealing in the moisture, Jatamansi shown to have the hair growth promoting activity. The gel was formulated in two steps, firstly extraction of the powdered rhizome of *Nardostachys jatamansi* was carried out by using alcohol by reflux condensation. Secondly Guar gum powder is triturated with water until gel consistency is obtained. Then the jatamansi extract was incorporated to this obtained gel. The jatamansi extract contains carbohydrates, flavonoids, alkaloids, saponins. The formulation was evaluated for various physical parameters like pH, viscosity, spreadability, homogeneity, stability studies, skin irritation and washability.

**Keywords:** Guar gum, Jatamansi, Eco friendly, Gel formulation, Anti-fungal Activity.

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### INTRODUCTION

Recently the number of men and women who is suffering from hair loss or hair thinning is increasing worldwide. Hair loss or alopecia is a common patient compliant and source of significant psychological and physical distress [1]. Androgenetic alopecia occurs in both men and women and is characterized by the progressive loss of hair from the scalp in a defined pattern. Alopecia is the most common problem of modern societies, which create much economical and psychological effect, affecting about 70% males and 30% females [2].

Dandruff is one of the main causes of hair loss. However, dandruff is a very common non-contagious hair problem affecting person irrespective of age. Medically it is defined as pityriasis simplex capitis-shedding of dead skin from the scalp. It may be dry or greasy [3].

Indian traditional medicine system acclaims a number of herbal formulations for hair growth promotion. Herbs are invaluable gifts from nature, and recently the world market is flooded with herbal cosmetics [4].

Gels are semisolid system in which a liquid phase is constrained within a three dimensional polymeric matrix (consisting of natural or synthetic gum) in which a high degree of physical or chemical cross linking has been introduced. Gels are relatively newer class of dosage form created by entrapment of larger amount of aqueous hydro alcoholic liquids in a network of colloidal solid particles which may consist of inorganic substance such as aluminum salts or organic polymers of natural or synthetic origins [5].

Guar gum has a high molecular weight polysaccharide obtained from *Cyamopsis tetragonoloba* seed endosperm. The biopolymer has structure of  $\beta$ -1,4 linked chain of mannose with  $\alpha$ -1,6 linked galactose substituent at every second points. The ratio of galactose to mannose in guar gum varies from 1.8:1.0 to 2.0:1.0. Guar gum forms a good gel [6].

As from the years usage of synthetic chemical (Carbopol) for gel preparation was considered as the only source, Hence in the present study the focus has been laid down on the natural gum for preparation of Gel.

**HERBAL INGREDIENTS USED;****GUAR GUM****Botanical name:** - *Cyamopsis tetragonoloba***Family:** - *Fabaceae***Genus:** - *cyamopsis***Active constituents**

The leaves and pods contain carbohydrates, protein, fibers, galactomannans, ascorbic acid and condensed tannins together with caffeic acid, gallic acid, genetic acid. Its flavonoidal content include quercetin, diaizinin, kaemferol.

**Uses**

- Guar gum hydrates the hair by sealing in the moisture.
- It acts as a conditioner and makes hair smooth and shiny.
- It prevents breakage.
- It reduces frizz in the hair, protects the hair strands from pollution and prevents static.
- It reduces product buildup in the hair.
- It makes hair more manageable as it performs the role of a detangling agent.

**JATAMANSI****Botanical name:** - *Nardostachys jatamansi***Family:** - *caprifoliaceae***Genus:** - *Nardostachys***Active Constituents**

Ursolic acid, octacosanol, nardosinone, oleanolic acid, beta-sitosterol, sesquiterpenes coumarines, volatile essential oils, resins, jatamol A, jatamol B, spirojatamol, jatamansinone, oroseolol, oroseolone, valeranal, jatamansone and valerone.

**Uses**

- The extract of jatamansi is helpful to strengthen hair.
- Stimulate hair follicle and make the hair healthy
- Helps to impart black color to hair and prevent greying of hair.
- Jatamansi roots are used to reduce hair fall.
- Jatamansi acts on hair fall by balancing Tridosha [vata, pitta, kapha Dosh], which also removes excessive dryness and cure dandruff.

**MATERIALS AND METHODS****Step-1: Preparation of Jatamansi extract**

Weighed 20g of Jatamansi powder is taken in round bottom flask to that added 80ml of ethanol. Reflux for 3 hours by maintaining the temperature of 40-50°. Filter the filtrate and keep it aside. To the remaining residue again add 60ml of ethanol then Reflux for 2 hours by maintaining the temperature of 40-50°. The obtained 1<sup>st</sup> and 2<sup>nd</sup> filtrates were combined, then it was concentrated in rotary

evaporator. The obtained crude jatamansi extract was stored in airtight container (2.14g).

**Step-2: Preparation of gel and incorporation of extract**

INGREDIENTS	QUANTITY
Guar gum	2g
Distilled water	85ml
KOH	1ml
Methyl paraben	200mg
Jatamansi	100mg

**Procedure****Preparation of KOH Solution**

1g of pellet dissolved in 5ml water

Take 2g of guar gum in a mortar and pestle, to this add 85ml of distilled water with continuous stirring until forms a gel like consistency, to this add 100mg of Jatamansi extract and mix it properly. Then add 1 drop of KOH solution and 200mg of methyl paraben [6].

**Qualitative phytochemical investigation of JATAMANSI extracts**

The extract of *Nardostachys jatamansi* rhizomes obtained were subsequently subjected to qualitative tests for detection of diverse plant constituents.

**Detection for carbohydrates**

**Fehling's test:** Take 1ml of extract in a clean test tube.

To that add 2ml of hydrochloric acid and heat. To the above solution add 1ml of sodium hydroxide. Mix it and add equal volume of Fehling's A and B solution. Red color precipitate indicates the presence of reducing sugar.

**Detection of alkaloids**

**Mayer's test:** Take 1ml of extract in a clean test tube.

Add Mayer's reagent. Cream foam formation indicates the presence of alkaloids.

**Dragendorff's test:** Take 1ml of extract in a clean test tube.

Add Dragendorff's reagent to it. Reddish-brown precipitate indicates the presence of alkaloids.

**Wagner's test:** Take 1ml of extract in a clean test tube.

Add Wagner's reagent to it. Red color precipitate indicates the presence of alkaloids.

**Hager's test:** Take 1ml of extract in a clean test tube.

Add Hager's reagent. Yellow color precipitate indicates the presence of alkaloids

**Detection of saponins**

**Foam test:** Take 1ml of extract in a clean test tube.

Add 1 to 2 ml of distilled water and shake well. Foam formation indicates the presence of saponins.

**Detection of flavonoids**

**Lead acetate test:** Take 1ml of extract in a clean test tube. Add 1 to 2ml lead acetate solution to it. Formation of intense yellow color indicates the presence of flavonoids.

**EVALUATION OF HERBAL HAIR GEL FORMULATION****1. Physical appearance**

The gel formulation was evaluated in terms of physical character like phase separation and change in color, odour and rheological parameters.

**2. Homogeneity**

Developed gel was tested for homogeneity by visual inspection after the gel was set in the container. It was tested for appearance, presence of any aggregates and flocculates.

**3. pH**

The pH of the gel formulation was determined by using digital pH meter. One gram of gel was taken and dissolved in 100 ml distilled water and measurement of pH was done in triplicate and average value was calculated.

**4. Washability**

The prepared hair gel formulation is applied on the skin and then ease and extent of washing with water is checked normally.

**5. Extrudability**

The prepared hair gel formulation is filled into collapsible tubes. The tube is pressed to extrude the material and the Extrudability of the formulation was checked.

**6. Spreadability**

The weighed quantity of gel (2g) was sandwiched between two glass slides. 500g of weight was placed on the slides. The weight was placed for specific period of time for 5 minutes. Then weight was removed and diameter of the spread circle was measured at different points. Spreadability was calculated by using formula.

$$S=M.L/T$$

Where,

S= Spreadability,

M= Weight placed on the slide,

L=diameter of circle in cm,

T=time in seconds.

**7. Skin irritation test**

Applied the herbal hair gel formulation on the skin and observe for irritation, redness or rashes.

**8. Anti-fungal activity**

The inhibition of fungal growth under standardized conditions may be utilized for

demonstrating the therapeutic efficacy of antifungal drugs. The microbiological evaluation of gels was done using cup-plate method, which depends upon diffusion of the drug from the gel contained in the cup through a solidified agar layer in the petridish to an extent such growth of the added microorganism is prevented entirely in a zone around the cup. Wider zone of inhibition is an indicative of better release of the drug from the base.

**Medium Used:** Sabouraud dextrose broth

**Test Organism:** *Candida albicans species*

**Table 1: Composition of Sabouraud Dextrose Broth Medium**

Sl. No	Content	Quality
1	Glucose	2g
2	Peptone	2g
3	Agar	2g
4	Water	100ml

Dissolve the ingredients with heat and autoclave at 121<sup>0</sup> for 1hr.

**Test Procedure**

The antifungal activity was carried out to ascertain the biological activity of hair gel formulation prepared against fungi. This was determined by sabouraud dextrose diffusion test employing "cup plate technique" using previously sterilized petri-dish. Solution of gel prepared formulation and Fluconazole (50mg) as a standard 1mg/ml was poured into cups bored of size 8 mm in to wells of sabouraud dextrose plate previously seeded with test organism (*Candida albicans*). After allowing diffusion of solution for 1h, the plates were incubated at 27<sup>0</sup> for 24h. The zone of inhibition measured around each cup was compared with that of the standard.

**9. Stability study**

Stability of a drug has been defined as the ability of a particular formulation, In a specific container, to remain within its physical, chemical, therapeutic and toxicological specifications. The purpose of stability testing is to provide evidence on how the quality of a drug substance or drug product varies with time under the influence of a variety of environmental factors such as humidity and light, and enables recommended storage conditions, re-test periods and shelf lives to be established. In the present work the formulation was stored at room temperature (25–30°C) for 30 days and observed for any changes in their physical characteristics and evaluation parameters.

**RESULTS AND DISCUSSION****Qualitative phytochemical investigation of Jatamansi extract;**

The results of the preliminary phytochemical investigation of ethanolic extract of *Nardostachys jataman* are shown below,

**Table 2: Qualitative Phytochemical investigation of Jatamansi extract**

Sl. No	Plant constituents	Test performed	Result
1	Test for carbohydrates	Fehling's test	+
2	Test for alkaloids	Mayer's test Dragendorff's test Wagner's test Hager's test	- + + +
3	Test for saponins	Foam test	+
4	Test for flavanoids	Lead acetate test	+

Extract - Ethanolic extract of *Nardostachys jatamansi*.

“+” Sign shows the presence of phytochemical constituents.

“-“ sign shows the absence of phytochemical constituents.

**Physicochemical evaluation of formulated herbal hair gel;**

**Table 3: Physicochemical evaluation of formulated herbal hair gel**

Sl.no	Parameters	Observation
1	Color	Light black
2	Odour	Characteristic
3	Consistency	Semisolid
4	PH	6.06
6	Spreadability	13.3cm/sec
7	Homogeneity	Homogeneous, smooth and consistent
8	Skin irritation test	Non-irritant
9	Washability	Shows good washability

**Physical appearance**

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 light black in color. It has a good odour. 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 6.06, The pH mean value of female hair 6.784±0.16, and that of male hair 5.604±0.93.

**Homogeneity**

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

**Skin Irritation**

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

**Stability study**

The stability study was carried out for the prepared hair gel at standard room temperature of 25 – 30 oC for 30 days. Several parameters such as physical appearance, odour, and color of the prepared gel were noticed. Significant changes in color and pH of hair gel was not observed in 30 days.

**Washability**

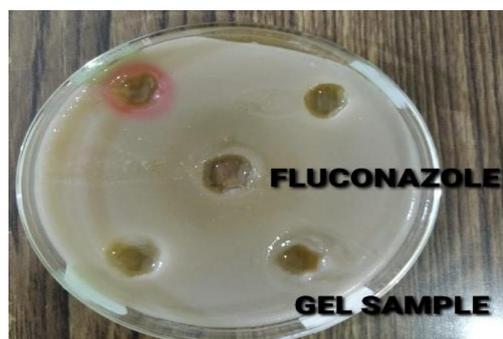
The prepared herbal hair gel was applied then washed in water. After washing there is no trace of gel.

**Spreadability**

Spreadability plays an important role in consumer acceptability and help in uniform application. The spreadability of prepared gel was found to be 13.33cm/sec.

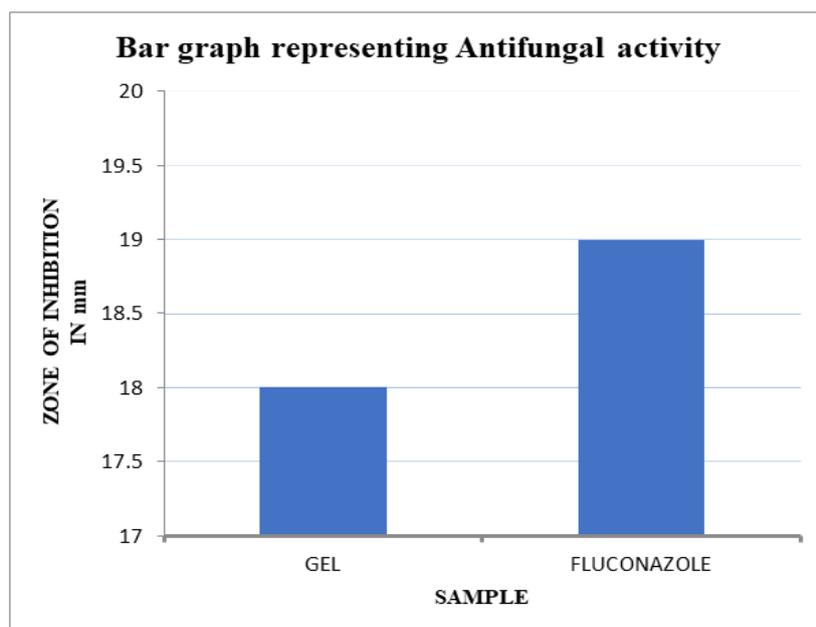
**Anti-fungal activity**

The prepared herbal hair gel showed nearly a zone of inhibition as standard Fluconazole.



**Table 4: Anti-fungal activity of Herbal Hair Gel**

	ZONE OF INHIBITION (mm)
Formulated Hair Gel	18
Standard fluconazole	19



## CONCLUSION

The use of natural gums for pharmaceutical applications is attractive because they are economical & readily available nontoxic capable of chemical modifications, potentially biodegradable, & with few exceptions, also biocompatible.

Natural gums can also be modified to have tailor made products for drug delivery systems & thus can compete with synthetic excipients available in the market. Hence with the huge scope of research in the present study Guar gum is used as a natural gelling agent & it is incorporated with jatamansi extract for the preparation of Herbal hair gel. The work justifies all the Evaluation parameters & the resultant value lies within the standard limits.

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