

FORMULATION AND EVALUATION OF HERBAL SHAMPOO

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ABSTRACT

Natural products have played an important role throughout the world in treating and preventing human diseases. Natural products medicines have come from various source materials including terrestrial plants, terrestrial microorganisms, marine organisms, and terrestrial vertebrates and invertebrates. *Hibiscus rosa-sinensis* and *Trigonella foenum graecum* are useful medicinal plant. Different parts of the plant were utilized for the treatment of various diseases. *Hibiscus rosa-sinensis* flower were traditionally used in ayurveda. various studies were scientifically reported on the flower. *Trigonella foenum graecum* seeds were also used for various studies. Here both extracts were used as combination for better hair growth, strengthening, smoothening of hair. Therefore, here an attempt is done to screen the formulation and evaluation of herbal shampoo from the extracts. The aim of the present study was to formulate and evaluate herbal shampoo using flower extract of *Hibiscus rosa-sinensis* and seed extract of *Trigonella foenum graecum* for cosmetic purpose. These were procured from local market in powdered form then prepared decoction of these ingredients and mixing with each other using SLS as a surfactant and evaluated for its organoleptic and phytochemical characteristics. The advantage of herbal shampoo is their non-toxic nature, reduce the allergic reactions and time-tested usefulness of many ingredients. Thus, in present work, it is proved that the formulated shampoo has good properties as per the specifications.

KEYWORDS: Herbal shampoo, SLS, Decoction, Extract, *Hibiscus rosa-sinensis*, *Trigonella foenum graecum*.

MATERIALS AND METHODS

Plant profile

Hibiscus rosa-sinensis FlowerFig. 1: *Hibiscus rosa-sinensis* flower.

Vernacular names

English: Hibiscus

Hindi: Gudhal Ka Ful

Tamil: Sembaruthi

Telugu: Red Mudda Mandaram

Kannada: Dasavala

Malayalam: Chembaruthi

Taxonomical classification of *Hibiscus rosa-sinensis*

Table 1: Taxonomical classification of H.R.

Kingdom	Plantae
Sub Kingdom	Tracheobionta
Super Division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Sub Class	Dilleniidae
Order	Malvales
Family	Malvaceae
Genus	<i>Hibiscus</i>
Species	<i>H. rosa-sinensis</i>

Description

Hibiscus rosa-sinensis is a perennial shrub belonging to family malvaceae. The genus hibiscus contains about 275 species.^[1] *Hibiscus rosa sinensis* commonly known as red Hibiscus. It is large shrub and has variable structure. It may be upright or broad and spreading. The tree grows up to 4.7 meter tall.^[2,3] Flowers are actinomorphic, pedicillate, complete and pentamerous corolla contains 5 petals and is 3 inches in diameter.^[1] All verity of Hibiscus flowers has the stalks of the stamens and the style is fused into a long column that is exerted from the centre of the widely spreading petals.

The red variety of Hibiscus flowers is very large and can up to 15cm long. The petals may be smooth or scalloped, single or double depends on the cultivated varieties. The anther which is pollen producing part can be seen part way up the column and five round stigma lobes are visible at the tip of the column.^[4]

Uses

There are many remedies attributed to *Hibiscus* flowers, including anti-hypertensives, anti-atherosclerotics, anti-oxidants, anti-hypercholesterolaemics, anti-nociceptives, antipyretics, anti-mutagenics, anti-fungals, anti-bacterials, and chemo preventives. These properties are attributed mainly to their polyphenolic constituents.^[5] Hibiscus flowers have been used in sachets and perfumes and often are found as component of herbal tea mixture. It has been said to be useful against several diseases, including diabetes, inflammation and hepatic diseases. Flowers were used for regulation of menstrual cycle, for liver disorders, high blood pressure as anti-tussive, in stomach pain, for eye problems, as abortifacient.^[4] Hibiscus flowers are mainly used for promoting hair growth.

Chemical constituents

The flower extract of *Hibiscus rosa-sinensis* (Red) contained amino acids, flavanoids, phenols, alkaloids and tannins.^[5]

Trigonella foenum graecum seed



Fig. 2: *Trigonella foenum graecum* seed.

Vernacular names

English: Fenugreek
Hindi: Methi
Tamil: Meti
Telugu: Menthulu
Kannada: Menthya
Malayalam: Uluva

Taxonomical classification of *Trigonella foenum graecum*

Table 2: Taxonomical classification of T.F.G.

Kingdom	Plantae
Sub kingdom	Tracheobionta
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Sub class	Rosidae
Order	Fabales
Family	Fabaceae
Genus	<i>Trigonella</i>
Species	<i>Trigonella foenum graecum</i>

Description

Fenugreek (*Trigonella foenum graecum*) is a seed belongs to the family of Leguminosae that grows annually and is widely cultivated in Mediterranean countries and Asia.^[6,7,8] Seeds are rhomboidal, pebble like shape, 3-5 cm. long, 2mm thick, plain surface, yellow in colour. Bulk of the fenugreek seed is dietary fiber and protein both of which have no taste or flavour.^[9] Fenugreek is known for its pleasantly bitter, slightly sweet seeds. Its native to southern Europe and Asia, is an annual herb with white flowers and hard, yellowish brown and angular seeds. TFG seed has a central hard and yellow embryo which is surrounded by a corneous and comparatively large layer of white and semi-transparent endosperm.^[7] It may grow well under diverse and a wide range of conditions; it is moderately tolerant to drought and salinity, and can even be grown on marginal lands in profitable way. Owing to these characteristics and heavy metal remediation potential, fenugreek may well fit several cropping systems.^[7,10]

Uses

Fenugreek has been used to relieve colds, bronchial complaints, influenza, asthma, constipation, sinusitis, pleurisy, pneumonia, sore throat, laryngitis, hay fever tuberculosis and emphysema. Drinking water in which seeds of fenugreek have soaked helps in softening and dissolving, accumulating and hardening the masses of cellular debris. It has a beneficial effect on cleansing the blood and as a diaphoretic it is able to bring on a sweat and to help detox the body.^[7] They promoted in daily diet to manage hypercholesterolemia, cancer and diabetes mellitus as they possess hypoglycemic, antilipidemic, anticarcinogenic and cholagogic properties.^[9] Fenugreek containing food supplement results infavourable effects on hair loss that contribute to improvements in hair growth.^[10]

Chemical constituents

The chemical composition of fenugreek showed that endosperm had the highest (4.63 g/100 g) saponin and

(43.8 g/100 g) protein content. fenugreek seed at about 200 µg concentration exhibited antioxidant activity 72%, 64%, and 56% respectively by free-radical scavenging method. Contain the saponin (fenugrin B). Fenugreek seeds have been found to contain several coumarin compounds as well as a number of alkaloids (e.g., trigonelline, gentianine, carpaine). The major bio active compound in fenugreek seeds are believed to be polyphenol compounds, such as rhaponticin and isovitexin.^[7]

METHODOLOGY

Preparation of Extract of *Hibiscus Rosa-sinensis* Flower Extract

The dried flower extract of *Hibiscus rosa-sinensis* were taken and powdered by using a mixer. 10g of powdered plant material were weighed out and extracted by using decoction method with 60ml of distilled water by boiling for 1 hr. The boiled extract was taken and separated by filtration.^[11,12]

$$\text{Percentage yield} = \frac{\text{Actual yield}}{\text{Theoretical yield}} \times 100$$

Preparation of Extract of *Trigonella foenum graecum* Seed Extract

The dried seed extract of *Trigonella foenum graecum* were taken and powdered using a mixer. 10g of powdered plant materials were weighed out and extracted by using decoction method with 100ml of distilled water by boiling for 1 hr. The boiled extract was taken and separated by filtration.^[11,12]

$$\text{Percentage yield} = \frac{\text{Actual yield}}{\text{Theoretical yield}} \times 100$$

Preformulation studies

1. Preliminary phytochemical tests

a. Test for flavanoids

- Alkaline test

To the extract solution added few ml of sodium hydroxide was added, appearance of yellow color which disappears on addition of dilute acid indicates the presence of flavanoids.

b. Test for saponins

- Froth formation test

Place 2 ml of solution of drug in water in a test tube, shake well, stable froth is formed.

c. Test for amino acid

- Ninhydrin test

To test solution, add Ninhydrin solution, boil violet color indicates presence of amino acid.

- Millons test

To test solution, add about 2ml of Millons reagent, white precipitate indicates presence of amino acid.^[13,14]

2. Physical appearance

The formulation evaluated in terms of physical appearance, colour and fluidity.^[15]

3. Solubility study

Solubility is defined as number of gram substance which will dissolve in 100gm of solvent at a stated temperature.

Solubility of the samples was observed in different solvents such as water, ethanol, warm water.

4. Determination of ash value

Take 2g of each of the sample was taken in silicon crucible previously ignited for 3hr and weighed. After complete burning, ash is cooled and weighed. Total ash value of each sample can be calculated using equation.^[13,14]

$$\text{Total ash value} = \frac{\text{weight of ash}}{\text{weight of drug taken}} \times 100$$

Formulation of herbal shampoo

The herbal shampoo containing drugs were prepared by aqueous extracts of HRS and TFG using SLS as surfactant. Saponification was done by using reflux condenser with coconut oil and castor oil with KOH. After completion of saponification allow to cool and add glycerine followed by aqueous extracts. Mix well and add SLS as surfactant, EDTA as foam booster and ethyl alcohol as solvent by constant stirring, to improve aroma in the formulation add sufficient amount of lemon grass oil. At last, add methyl paraben as preservative.^[16,17,18,19] A formulation chart with all ingredients with their quantities is given in the table.

Table 3: Formulation chart of herbal shampoo.

Ingredients	Formulation		
	F1	F2	F3
Extracts (g)	5	5	5
Coconut oil (ml)	10	10	10
Castor oil (ml)	3	3	3
KOH (g)	3	3	3
Glycerin (ml)	4	4	4
SLS (g)	2	3	5
Ethyl alcohol (ml)	4	4	4
EDTA (g)	0.15	0.15	0.15
Methyl paraben (g)	0.01	0.01	0.01
Lemon grass oil (ml)	0.5	0.5	0.5

Evaluation studies

1. Determination of p^H

p^H of 10% shampoo solution is distilled water was determined at room temperature 25°C.^[20]

2. Viscosity evaluation

The viscosity of shampoo was determined by using Brookfield viscometer, set the spindle speed of 10 rpm. The viscosity of shampoo was measured by using spindle.^[21]

3. Dirt dispersion

Two drops of shampoo were added in large test tube contain 10 ml of distilled water. 1 drop of India ink was added. The test tube was stoppered and shake it 10 times. The amount of ink in the foam was estimated as none, light, moderate or heavy.^[22,23]

4. Cleaning action

5gm of wool yarn were placed in oil, after that it was placed in 200ml of water containing 1gm of shampoo ink

flask. The flask was shake for 4 minutes. The solution was removed sample was taken out and observed.^[24,25,26]

5. Surface tension measurement

Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chromic acid and purified water. Calculated using equation.^[21,24,25]

$$r_1 = \frac{\rho_1}{\rho_2} \times \frac{n_2}{n_1} \times r_2$$

6. Foaming Ability and Foaming stability

Cylinder shake method was used for determining foaming ability. A 50 ml of 1% shampoo solution was put in to 100ml graduated cylinder and covered the cylinder with hand and shaken for 10 times. The total volume of foam contents after 1 minute shaken were recorded. The foam volume was calculated only. Immediately after shaking the volume of foam at 1 minute intervals for 4 minutes were recorded.^[26,27]

RESULTS AND DISCUSSION

Percentage yield of the extracts

The percentage yield of hibiscus flower extract was found to be 79.5 %.

The percentage yield of fenugreek seed extract was found to be 80.9 %.

Pre-formulation studies

1. Preliminary phytochemical screening

The preliminary phytochemical studies of extract revealed the presences of flavonoids, saponins and amino acids. The obtained results were shown in Table.

Table 4: Preliminary phytochemical screening.

Test	Observation
Flavonoids	
Alkaline reagent test	+
Saponin	
Froth formation test	+
Amino acid	
Ninhydrin test	+
Millon's test	+

+ = Test is positive

2. Physical appearance

The results of visual inspection of series of formulations are listed in Table.

Table 5: Physical appearance.

Sl No.	Formulation	Physical appearance
1	F ₁	Buff color
2	F ₂	Brown
3	F ₃	Yellowish brown

3. Solubility study

Solubility of samples in various solvents are shown below Table.

Table 6: Solubility study.

Sl no.	Sample	Solubility		
		Water	Warm Water	Ethanol/ methanol
1	Extracts (<i>Hibiscus rosa-sinensis</i> and <i>Trigonella foenum graecum</i>)	Soluble	Soluble	Soluble

4. Determination of ash value

Total ash value for powdered hibiscus flower and fenugreek seed were 8.05 w/w and 5.06 w/w respectively.

Formulation of shampoo

Three formulations (F1-F3) of herbal shampoo were prepared by using SLS as a primary surfactant in various proportions.



Fig. 3: Shampoo formulations.

Evaluation studies

1. Determination of pH

The pH of formulated shampoo was range between 6 - 6.8, falling within the ideal pH range for shampoo which is between 5 and 7.8.

Table 7: Determination of Ph.

Sl no	Formulation	pH
1	F ₁	6.63
2	F ₂	6.70
3	F ₃	6.42

2. Viscosity evaluation

The results of rheological evaluation showed that the viscosity of sample changes gradually with the increase in rpm, therefore the shampoo formulation was time

dependent. The viscosity of formulated herbal shampoo was found to be 108 cP.

3. Dirt dispersion

The dirt dispersion of herbal shampoo was done and it was found to be that the dispersion of the dirt in water is good for the formulated shampoo because the results indicate that no dirt would stay in the foam; so prepared formulations are satisfactory. Results are listed in Table.

Table 8: Dirt dispersion.

Sl no	Formulation	Dirt dispersion
1	F ₁	Moderate
2	F ₂	Moderate
3	F ₃	Good

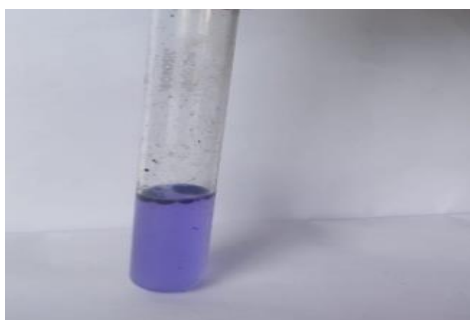


Fig. 4: Dirt dispersion.

4. Cleaning action

Cleaning action was tested on wool yarn in oil. Oil is removed from wool yarn, so the formulated shampoo has good cleaning action.

tension reduction is one of the mechanisms implicated in detergency. Surface tension to shampoo was found to be 34.43 dynes/cm.

5. Surface tension measurement

Surface tension measurement has been mentioning that a proper shampoo should be able to decrease the surface tension of pure water to about 40 dynes / cm. surface

6. Foaming Ability and Foaming stability

This result showed that the shampoo is capable to produce high foaming property, and it is due to the presence of sodium lauryl sulphate is used as foaming agent. The results are listed in Table.

Table 9: Foaming index.

Sl no.	Formulation	Foaming Ability and Foaming Stability (ml)
1	F ₁	30
2	F ₂	35
3	F ₃	39

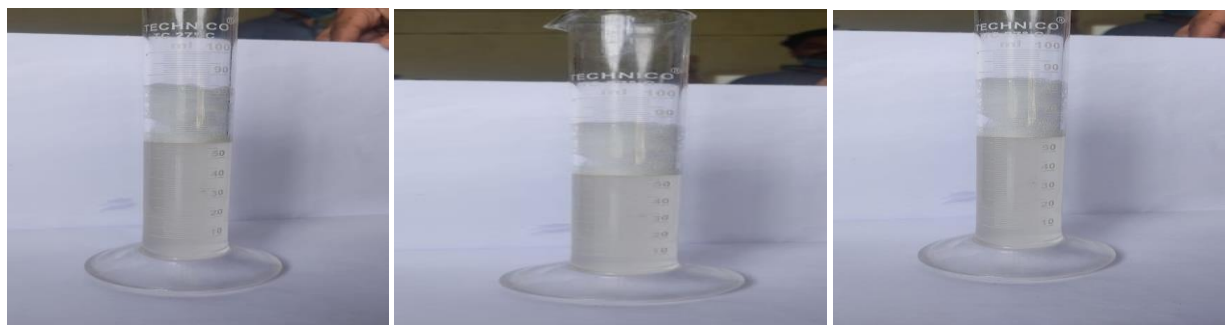


Fig. 5: Foaming action.

CONCLUSION

From the study, it can be concluded that the preparation of herbal shampoo using *Hibiscus rosa-sinensis* and *Trigonella foenum graecum* can meet ideal requirements for herbal shampoo. The formulated shampoo was not only safer than the chemical conditioning agents, but also greatly reduce the hair loss during combining as well as strengthens the hair growth. In the present scenario, it seems improbable that herbal shampoo, although better in performance and safer than the synthetic ones.

Herbal shampoo thus prepared by simple, low cost, non-toxic and eco-friendly method using extracts of *Hibiscus rosa-sinensis* and *Trigonella foenum graecum* proved to be an alternative for other herbal shampoos and for further needs in vivo studies can be done.

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