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FORMULATION AND EVALUATION OF HERBAL SHAMPOO USING *PIPER BETLE, MUSSAENDA FRONDOSA* AND *HIBISCUS ROSA SINENSIS*

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ABSTRACT

Dandruff is a common disorder caused by Candida albicans and Malassezia globosa, which affects the scalp condition. Shampoos are cosmetic products used in daily life for the removal of dirt, oil, and dandruff. The aim of the study is to formulate and evaluate herbal anti-dandruff shampoo using Piper betel, Mussaenda frondosa, and Hibiscus rosa sinensis. Synthetic shampoos contain harsh chemicals, detergents, and preservatives,which may cause adverse effects on hair, like dryness, itching, scalp irritation, and long-term hair fall. Herbal shampoos are the natural alternatives to synthetic cleansers, formulated using plant extracts, essential oils, and botanical minerals. The main objective of the study is to eradicate harmful synthetic ingredients from herbal shampoo and replace them with safe natural ingredients. We have used maceration and decoction methods for extraction and performed the phytochemical screening for individual extracts. Further, the formulation of viscous liquid shampoo was done at laboratory scale and evaluated for a number of parameters to ensure its safety and efficacy. The formulated herbal shampoo shows good froth stability, detergency, and good dirt dispersion, with optimal PH. It also has an anti-dandruff property. This study successfully demonstrated the formulation and evaluation of a herbal shampoo using naturally derived ingredients.

KEYWORDS: Herbal anti-dandruff shampoo, Formulation, Evaluation, *Piper betle, Musseanda frondosa, Hibiscus rosa sinensis.*

INTRODUCTION

Shampoos are the most widely used cosmetic product for cleansing hairs and scalp in your daily life.[1] The primary function of shampoo is to remove accumulated sebum, debris from the scalp, and residue from hair care products. Herbal shampoo is a kind of cosmetic product that substitutes plant-based herbs for the synthetic shampoo that is sold in stores. Shampoos are most likely utilized as beautifying agents and are a viscous solution of detergents containing suitable additives, preservatives, and active ingredients.[2] Shampoos can also be used as medications, conditioners, lubricants, and for other purposes. Shampoos come in a wide variety of forms, such as lotions, powders, medicated shampoos, liquid herbal shampoos, clear liquids, and solid gels.[3]

Types of shampoos are

a) By Function And Hair Concern

- Clarifying shampoo
- Volumizing shampoo
- Moisturizing shampoo
- Strengthening or repairing shampoo
- Colour treated shampoo
- Anti dandruff shampoo
- Smoothing or anti frizz shampoo
- 2-in-1 shampoo or conditioner

b) By form

- Liquid shampoo
- Cream shampoo
- Dry shampoo
- Lotion shampoo
- Powder shampoo
- Solid gel shampoo

Synthetic anti-dandruff shampoo shows various side effects such as hair loss, increased scaling, scratching, and discomfort. Therefore, an attempt was made to formulate herbal anti-

dandruff shampoo that is safer in terms of health and treating the dandruff condition than the synthetic anti-dandruff shampoo. Herbal anti-dandruff shampoo has been formulated using herbal ingredients such as *Piper betle*, *Mussaenda frondosa*, and *Hibiscus rosa sinensis.*

MATERIALS AND METHODS

SAMPLE COLLECTION

Dried leaves of Piper betle, Mussaenda frondosa, and Hibiscus rosa sinensis flowers were gathered from betle plant, Mussaenda plant, and Hibiscus plant respectievely from Cherukunnam.

Table No. 1: plant profile.

Sl. no	Common name	Picture	Botanical name	Chemical constituents	Category
1.	Vettila (leaf)		*Piper betle*	Phenolic compounds	Anti-dandruff
2.	Vellila (leaf)		*Mussaenda frondosa*	Flavanoids	Anti-oxidant
3.	Hibiscus (flower)		*Hibiscus rosa sinensis*	Saponin	Detergent

CHEMICALS USED

The chemicals like gelatin, Tea tree oil and Rose oil were gathered from Indira Gandhi Institute of Pharmaceutical Sciences, Perumbavoor.

Fig. No. 1: Gelatin.

Fig. No. 2: Rose oil.

Fig. No. 3: Tea tree oil.

PREPARATION OF PLANT EXTRACT

Extraction of *Piper betle* leaves: Dried fine powdered betle leaves were extracted using water as solvent. Extraction was carried out using heating mantle and round bottom flask of 1000ml. 30g of powdered leaves were boiled with 900ml of water at 50ºC for 4hrs to avoid degradation of phytochemicals. Extract was filtered.[4]

Fig. No. 4: Decoction.

Fig. No. 5: Extract of *Piper betle.*

Extraction of *Mussaenda frondosa* leaves: 10g dried powder was dissolved in 200ml of water in a 500ml beaker and covered with aluminium foil. Flask was kept aside for 24hrs. Solvent was filtered using Whatmann filter paper.[5]

Fig. No. 6: Maceration of *Mussaenda.*

Fig. No. 7: Extract of *Mussaenda.*

Extraction of *Hibiscus rosa sinensis:* The flowers were shade-dried and crushed into fine powder. 250g of powder was macerated using 100 mL of demineralised water for 24 hours. Filtered and collected the extract.[6,7,8]

Fig. No. 8: Maceration of Hibiscus.

Fig. No. 9: Extract of Hibiscus.

FORMULATION OF HERBAL SHAMPOO

Formulation of herbal shampoo was prepared according to the formula given in Table 2.

10% gelatin solution was prepared, and the herbal extracts were added to it. It was continuously stirred for a time interval of 20 minutes. To this solution, the preservative (tea tree oil), essential oil (rose oil) and pH stabiliser (lemon juice) were added.

The ingredients were added according to the formula given below,

Table No. 2: Formulation for preparation of herbal shampoo.

Ingredients	Quantity	Use
Piper betel	2ml	Anti dandruff agent
Mussaenda frondosa	3ml	Anti-oxidant
Hibiscus rosa sinensis	5ml	Detergent
Gelatin solution(10%)	(q.s to 100ml)	Thickening agent
Tea tree oil	0.2ml	Preservative
Rose oil	2ml	Fragnance
Lemon juice	1ml	pH adjuster

Fig. No. 10: Herbal shampoo.

EVALUATION OF HERBAL SHAMPOO

The subsequent criteria were employed to assess the developed herbal shampoo:

Physical Evaluation

It was assessed through observation of the colour, clarity, odour and froth content.

pH Determination

Using a pH analyzer, the pH of the prepared herbal shampoo diluted in distilled water (10% v/v) was measured at room temperature.[10,11]

Surface Tension Measurement

The prepared shampoo in distilled water (10% w/v) was estimated for surface tension by a stalagmometer at room temperature.[12]

Foaming Ability Test

The cylinder shake method was used to determine foaming ability. 50ml of the 10% of the solution was taken in a 100ml measuring cylinder and covered with a hand and shaken 10 times. The total volume of the foam content after immediate shaking was recorded.[13]

Foam Stability Test

The stability of the froth was determined using cylinder shake method. Froth stability was measured by recording the foam volume at 1 min interval for 4 min.[13]

Dirt Dispersion Test

To 10ml of distilled water 2 drops of shampoo was added and taken in a wide mouth test tube. To the formulated shampoo added 1 drop of Indian ink and shaken for 10 min.

After closing the test tube with a stopper. Volume of ink in the froth was measured.[14]

Anti-Fungal Activity

Prepared SDA and sterilised by autoclaving at 121ºC for 15min, poured into petri plates and allowed them to solidify. Prepared a fungal spore suspension and adjusted to a specific concentration, such as 10^6 spores/ml, using sterile saline. Spread the fungal inoculum evenly over the entire the agar surface to create a lawn culture. Using a sterile 6-8 mm cork borer, punch holes into the solidified agar. Added 50-100µL of the anti-fungal agent, extract or control into the well. Allow the plate to stand for 1-2hours to let the agent diffuse. Incubate

the plates usually inverted, at 25-30ºC for 48-72 hrs. Measure the diameter of the zone of inhibition around the wells.[15,16,17,18,19]

RESULT AND DISCUSSION

1. Physical Appearance

The prepared shampoo showed good characteristics in terms of foaming effect and appearance on visual inspection. These findings are summarized in Table 3.

2. pH

The pH of the prepared shampoo solution, made with using distilled water (10%), was evaluated at room temperature. For improving the hair quality, the pH of the shampoo is very important and also for stabilising the scalp and minimising irritation to the eye. The pH of the prepared shampoo was found to be 4.11 Results are shown in table:3

Fig No. 11: pH meter.

3. Surface tension

The surface tension reduction in the prepared shampoo was found to be of about 33dynes/cm.

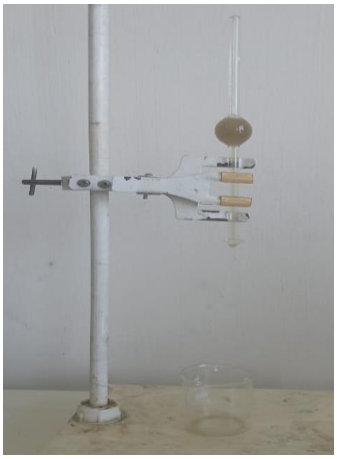

Fig. No. 12: Stalagmometer.

4. Foaming ability and foaming stability

From the consumer point of view, Foam stability is one of the important needs of a shampoo. Foam volume produced by the formulated shampoo is above 10ml. Prepared shampoo shows uniform, small sized, denser, compact and stable foam. The foam volume remains same throughout the period of about 5 minutes showing that the foam formed by the shampoo has good stability.

Fig. No. 13: Foam ability and retension test.

5. Dirt dispersion

In the dirt dispersion test using Indian Ink, the volume of the ink in the froth was measured and result was graded as none, light, moderate or heavy. The results indicate that no dirt would stays in the foam; so prepared formulation is satisfactory.

Fig No. 14: Dirt dispersion test.

Table No. 3: Evaluation results.

Evaluation test	Formulated shampoo
Colour	Greyish green
Transparency	Good
Odour	Pleasant
pH of 10%solution	4.11
Foam volume	10ml
Foam type	Dense, small
Foam retention time	More than 5 minutes
Surface tension	33

Table No. 4: antifungal activity study report.

Antifungal Activity against *Candida albicans*	
Sample (100 µl)	**Zone of Inhibition in Diameter (mm)**
Solvent	11 mm
F2	16 mm

Fig. No. 15: Anti-fungal activity.

CONCLUSION

This study successfully demonstrated the formulation and evaluation of a herbal shampoo using naturally derived ingredients. The formulated herbal shampoo showed acceptable physicochemical properties such as pH, surface tension and foaming ability, which were comparable to those of conventional commercial shampoos. Evaluation results indicated good cleansing action, adequate foam formation with minimal skin irritation The incorporation of herbal extracts contributed beneficial effects such as improved hair texture, conditioning, and scalp nourishment, while avoiding the adverse effects commonly associated with synthetic surfactants and additives. Stability studies further confirmed that the formulation remained physically and chemically stable. Overall, the study concludes that herbal shampoo can serve as a safe, effective, and eco-friendly alternative to synthetic shampoos.

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