

Developing Anti-dandruff Shampoo Formulations using different Indian plant Herbs- An Eco-friendly Hair care Cosmetic

Sandeep DS^{1*}, Prashant Nayak¹, Nayana K¹, Nashiha¹, Nafishath Alfisha¹, Nanda Kumar AR¹

Abhishek Kumar ²

¹Nitte (Deemed to be University), Department of Pharmaceutics, NGSM Institute of Pharmaceutical Sciences, Mangaluru-575018, Karnataka, India

² Nitte (Deemed to be University), Department of Pharmaceutical Chemistry, NGSM Institute of Pharmaceutical Sciences, Mangaluru-575018, Karnataka, India

Abstract

The aim of the present work was to develop the polyherbal antidandruff shampoo and evaluate the formulated shampoos for physical parameters. The polyherbal antidandruff shampoos were prepared using plant leaves extract namely *Mimosa pudica*, *Hibiscus labeo*, *Azadirachta indica*, *Lacosoni alnervis* and *Murraya koenigi* in varying concentrations. The plant extracts were prepared by boiling in distilled water followed by concentration. The polyherbal shampoo formulations included ingredients, oleic acid, EDTA, Sodium Lauryl Sulphate, Tween 80, Span 80, methyl paraben, propyl paraben, rosemary oil, and triethonalmine. A total of six formulations were made by gradually increasing the concentration of polyherbal extract. All the prepared formulations were evaluated for visual appearance, pH, formability, dirt dispersion, viscosity, and antimicrobial activity. All the formulations showed satisfactory results and the antimicrobial activity revealed that formulation, F6 having highest concentration of leaves extract showed significant results in comparison to other formulations and standard drug used for study. The present outcome of the studies revealed that polyherbal shampoos can be prepared easily from the natural plant sources having antimicrobial properties and herbal antidandruff shampoos are better alternatives than synthetic shampoos.

Key words: Poly herbal shampoo, pH, Sodium lauryl sulphate, Viscosity, Foamability.

Introduction

Hair is one of the defining characteristics of mammals. Hair is a protein filament that grows from follicles found in the dermis, which is derived from Ectoderm of the skin ¹. Natural shampoo by having a combination of both organic and natural ingredients stimulates the growth of new hair by stimulating the hair follicles while keeping the environment around the follicles clear.

“Shampoo is a preparation of a surfactant (Surface active agents) in a suitable form – liquids, solid or powder – which when used under specified conditions will remove surface, grease, dirt and skin debris from the hair and scalp without adversely affecting the user.

The herbal shampoo is a cosmetic preparation in which herbs are collected from plants and it is likely a regular shampoo that is usually meant for washing the hair and scalp. Now a day's herbals help people in building their good health with the help of natural sources². This is because people found the benefits of herbs in the cosmetic products which they used daily.

The realization and essential for cosmetics using herbs are raised because it is believed that these preparations are safe, pure, effective and cheap in cost. It is proved that product with herbs enhances the health of the consumer³.

Advantages of herbal shampoos:

- It is pure and it involves organic ingredients.
- Free from side effects.
- There is no use of synthetic additives.
- No use of petroleum based ingredients.
- It is skin friendly.

Demerits of synthetic shampoos:

- The artificial additives used in synthetic shampoos can cause significant irritation to sensitive people.
- It leads to toxicity in the nervous system and even cancer.
- The active ingredients used in synthetic shampoos can cause headache, nausea, dizziness, and sometimes it causes vomiting.
- It causes more harmful effects.

Dandruff is one of the most common dermatological skin conditions and chronic non-inflammatory conditions of the scalp, which is characterized by excessive scaling of scalp tissue. Dandruff is caused by a fungus called *Malassezia restricta* and *Malassezia globosa*, commonly called pityrosporum, which causes infection to the skin and scalp. The growth of *Malassezia* mainly occurs during the warm and humid atmosphere, overcrowding and poor personal hygiene. Dandruff also causes itching. Dandruff affects mostly after puberty; females are less effective during the age 20-30 years. It mostly affects 5% of

the population. Dandruff occurs on the skin where high levels of sebum's are present. The symptoms of dandruff include- redness of the scalp, itching, and flakes⁴.

Herbal shampoos are cosmetic preparations with the use of traditional Ayurvedic knowledge that helps for cleansing the hair and scalp just like regular shampoo. They are mainly used for the removal of oils, dandruff, dirt, environmental pollutions, etc⁵.

Materials and methods

Collection of plant materials

For the present study, five different Indian plants selected, Neem, Mimosa pudica, Hibiscus, Henna and Curry leaves. These plant leaves were collected from the NGSMIPS college campus and packed in polybag for further use. The selected plant leaves were depicted in Fig. 1.



Fig. 1: Different plant leaves used for shampoo preparation

Preparation of plant leaves extract

All the plant leaves collected were dried for a period of three days. All the dried leaves were coarsely powdered for preparing dried extract. In 500ml beaker add take 350ml of water and add 10g of dried extract powdered leaves and boil for 30 minutes. After 30 minutes of heating followed by concentration, cool the extract for few minutes, filter using filter paper and collect the filtrate in a conical flask and cover it with cotton plug. The name of different plant used, part of the plant and quantity used for preparing extract is shown in Table 1.

Table1: Details of herbal plant, part of plant and quantity used for polyherbal shampoo

Name of the plant	Part of the plant	Quantity of dried leaves used
Azadirachta indica	Leaves	10g
Lawsonia inermis	Leaves	10g
Hibiscus labeis	Leaves	10g
Murraya koenigii	Leaves	10g
Mimosa pudica	Leaves	10g

Method of preparation of herbal shampoo formulations

In 250 ml beaker take 40 ml of water and add 4 ml of oleic acid. Dissolve it completely by mechanical stirrer. Add 6g of sodium lauryl sulphate and stir. Heat gently at 60°C. When both get dissolved reduce stirring speed and add 3 ml of triethanolamine and continue stirring for 5 minutes. After that, EDTA and methyl paraben together were added and stirring continued till it becomes clear liquid. In another beaker take 30 ml of water and add tween 80 and stir it for 10 minutes and required quantity of plant extracts were added. This liquid was added to above one and stir for 20 minutes. Filter the liquid and the filtered liquid was used for evaluating parameters.⁶ The ingredients used for formulating herbal shampoos were listed in Table 2 and the prepared formulations were depicted in Fig 2.

Table 2: Formulation design of polyherbal antidandruff shampoo

Ingredients	F1	F2	F3	F4	F5	F6
Henna leaves extract	1ml	2ml	2.5ml	3ml	3.5ml	4ml
Neem leaves extract	1ml	2ml	2.5ml	3ml	3.5ml	4ml
Hibiscus leaves extract	1ml	2ml	2.5ml	3ml	3.5ml	4ml
Curry leaves extract	1ml	2ml	2.5ml	3ml	3.5ml	4ml
Mimosa leaves extract	1ml	2ml	2.5ml	3ml	3.5ml	4ml
Oleic acid	4ml	4ml	4ml	4ml	4ml	4ml
Sodium lauryl sulphate	6g	6g	6g	6g	6g	6g
Triethanolamine	3ml	3ml	3ml	3ml	3ml	3ml
EDTA	0.15g	0.15g	0.15g	0.15g	0.15g	0.15g
Methyl paraben	0.2g	0.2g	0.2g	0.2g	0.2g	0.2g
Tween80	1ml	1ml	1ml	1ml	1ml	1ml
Water	qs	qs	qs	qs	qs	qs
Perfume	qs	qs	qs	qs	qs	qs



Fig. 2: Polyherbal shampoo formulations

Methodology

Evaluation parameters

The prepared formulations were evaluated for product performance which includes visual appearance, clarity, pH determination, foamability test, dirt dispersion test, viscosity measurement and antidandruff activity.

1. Visual appearance

The formulations were visually inspected and the color of each formulation was noted and recorded.⁷

2. Clarity

The formulations were visually checked whether it is clear or not and recorded.

3. pH

The pH of prepared formulations was determined by digital pH meter at room temperature.⁸

4. Dirt dispersion test

In a test, tube take 10 ml of distilled water and add 2 drops of shampoo and one drop of Indian ink dye. The test tube is closed with thumb and shaken for 10 minutes. The level of appearance of ink dye test tube was observed and based on that, level was graded as none, slight, moderate and heavy.

5. Foamability test

It was determined by the cylindrical shake method. In 100ml graduated cylinder take 50 ml of shampoo and shake vigorously for 10 times. The volume of foam was measured after 1min of shaking and recorded.⁸

6. Determination of viscosity

Viscosity is one of the important testing parameter for liquids and semisolid preparations to predict the flow nature. It also has a vital role in the packaging system suitability for the preparations. The viscous

nature of the preparations can give an idea of flow pattern for their usage. Brookfield Viscometer DV2 (LV DV- II + PRO MODEL) was used for the determination of viscosity of the formulations. The sample was taken for analysis by using spindle no.61 at 10 and 5 rpm. The viscosity was measured in cps.⁹

7. Antidandruff activity

Cup plate method was used for determining the antidandruff activity of shampoo. It was carried out by employing culture of fungi *Candida albicans* in sabourad dextrose agar medium. The medium was poured into petri plate which was sterilized in autoclave. At room temperature, Petri plate is allowed to solidify. The organism was inoculated using loop and was spreaded using glass spreader. In each petri plate 3 wells were made using sterile cork borer, one was treated with standard (fluconazole) and other 2 wells with formulations F1 and F2. In the same way other 2 plates were prepared. The plates were incubated at 20-25 °C. After incubation, plates were observed for zone of inhibition. The diameter of zone of inhibition was measured using ruler and compared with standard and recorded in mm.¹⁰

Results and Discussion

All the formulations were subjected to evaluation parameters such as visual appearance, clarity, pH determination, dirt dispersion, foamability test, viscosity and microbial test for antidandruff activity. The formulations F1 and F2 were observed as light yellow colour and remaining 3 formulations were found to be dark yellow in appearance. All the prepared shampoos were found to be clear. The pH of all the prepared shampoos was in the range of 6.3-6.5 which was within range of hair pH. The results of visual appearance, clarity, and pH are shown in Table 3.

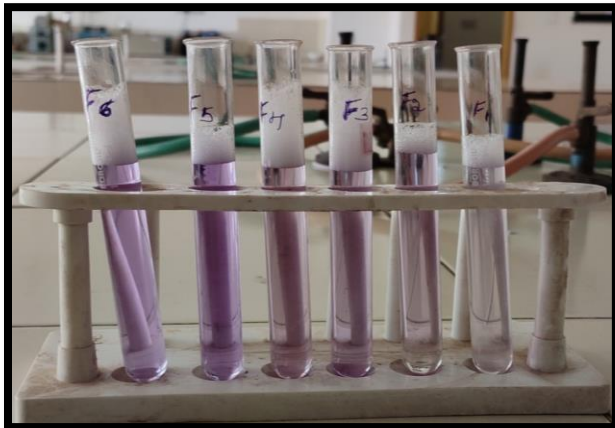
Table 3: Visual appearance, clarity and pH of polyherbal shampoo

Formulation code	Evaluation Parameters		
	Visual appearance	Clarity	pH
F1	Light yellow	Clear	6.6
F2	Light yellow	Clear	6.4
F3	Dark yellow	Clear	6.3
F4	Dark yellow	Clear	6.4
F5	Dark yellow	Clear	6.3
F6	Dark yellow	Clear	6.3

The foamability of all prepared shampoo was found to be 23 to 40 ml and dirt dispersion test showed the preparation was found have light to moderate dirt levels. The data of foambility test and dirt dispersion test results were shown in Table 4. The fomability test and dirt dispersion test were shown in Fig 3. and Fig 4.

Table 4: Dirt dispersion and formability test results

Formulation code	Foamability	Dirt dispersion
F1	23ml	None
F2	25ml	Light
F3	26ml	Light
F4	28ml	Moderate
F5	35ml	Moderate
F6	40ml	Moderate

**Fig. 3: Dirt Dispersion test****Fig. 4: Foamability test**

The viscosity of all prepared formulations was found to be 57.6 to 91.6 cps at 5 rpm and 43 to 65 cps at 10 rpm. There was gradual increase in the viscosity of the formulations with increase in the concentration of plant leaves extract and as there was increase in rpm of spindle, viscosity was reduced indicating Pseudoplastic flow nature of non Newtonian liquids. The result of viscosity of all prepared shampoos is shown in Table 5.

Table 5: Results of Viscosity of polyherbal shampoos

Formulation code	Viscosity in cps	
	At 5 rpm	At 10 rpm
F1	57.6	43
F2	91.6	55.4
F3	82.2	65
F4	64	46.4
F5	57.6	40
F6	87.6	60.6

The anti-dandruff activity of shampoo was determined by dandruff resistance which was carried out by the cup plate method. The zone of inhibition in first plates for F1 & F2 was 24 and 25 mm and for standard was 26 mm. In second plate the zone of inhibition for F3 & F4 was 30 and 32 mm and standard was 28 mm. In third plate, the zone of inhibition for F5 & F6 was found to be 36 and 39 mm and standard was 30 mm. The test results for zone of inhibition for all the polyherbal shampoos and standard was shown in Table 6 and the zone of inhibition was depicted in Fig 5.

Table 6: Antidandruff test for poly herbal shampoo formulations

Formulation code	Zone of inhibition (mm)	
F1	24	Std-26
F2	25	
F3	30	Std -28
F4	32	
F5	36	Std -30
F6	39	

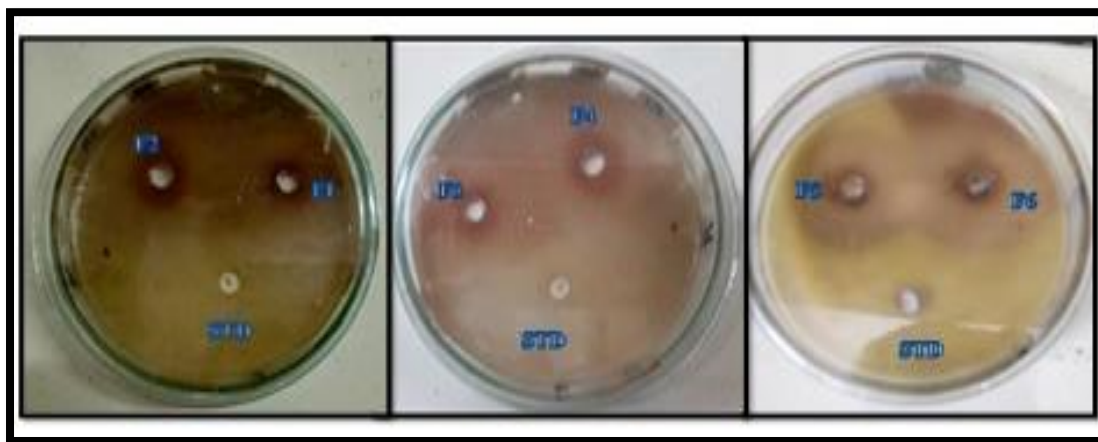


Fig. 5: Antidandruff activity test by cup plate method

Conclusion

Polyherbal shampoos were formulated using different plant extracts with purpose of providing antidandruff activity. All the ingredients used for the preparation of polyherbal shampoo were found to be safe and all the formulated shampoos showed acceptable results. The formulations showed gradual increase in zone of inhibition which may be due to increased concentration of plant extracts. Formulation F6 having higher concentration of plant extracts showed effective zone of inhibition in comparison with remaining formulations and standard drug used for reference. From the results obtained of current study,

it can be concluded that herbal shampoos will be better eco-friendly alternatives with cost effective manner over synthetic shampoos. Finally, we hope that the present investigation can be a better reference for people and researchers working on hair care cosmetic products.

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Conflicts of Interest

The authors of this manuscript declare there were no conflicts of interest.

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