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FORMULATION AND EVALUATION OF JACKFRUIT SEED SHAMPOO FOR ANTIDANDRUFF ACTIVITY

S PARVEEN*[1], D JOTHIESWARI[2], ANAMALAMUDI DHARMATEJA[1], G MAIDHILI[1], GUGGULLA AKSHAYA[1], PARSA INDHU[1], RAKESH KUMAR PANDIT[1]

[1]Department of Pharmacy Practice, Sri Venkateswara College of Pharmacy, Chittoor, Andhra Pradesh, India.
[2]Department of Pharmaceutical Analysis, Sri Venkateswara College of Pharmacy, Chittoor, Andhra Pradesh, India.

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ABSTRACT

Dandruff is a common scalp condition mainly by the excessive growth of the fungi such as Malassezia, leading to itching, irritation, and flaking of the scalp. Synthetic anti-dandruff shampoos may cause side effects such as dryness and irritation; therefore, herbal formulations are gaining importance due to their safety and natural origin also minimizes the side effects and ecofriendly nature. The present study aimed to formulate and evaluate an herbal anti-dandruff shampoo containing jackfruit (*Artocarpus heterophyllus*) seed extract. The shampoo was prepared using jackfruit seed extract as the active ingredients along with herbal excipients such as reetha, shikakai, aloe vera, henna, glycerin, and xanthan gum and suitable preservatives such as sodium benzoate and potassium sorbate. Jackfruit seeds are rich in bioactive compounds such as phenolics, flavonoids, antioxidants and antimicrobial constituents that help in controlling fungal growth, reducing scalp inflammation and promoting healthy hair. In this preparation reetha and shikakai acted as a natural foaming and cleansing agents. While glycerin served as a humectant and xanthan gum and gelatin improves viscosity and stability of the shampoo. Different formulations were prepared and evaluated for parameters including pH, viscosity, foam height, foam stability, surface tension, dirt dispersion and stability. The formulation showed acceptable physiochemical properties with pH suitable for scalp application, good foam formation and effective cleansing ability. Antifungal activity was tested against *Malassezia furfur*, showing noticeable zones of inhibition indicating its effectiveness in controlling dandruff causing organism. Among the formulations 4th one showed better antifungal activity and stability. The results indicate that the formulated herbal antidandruff shampoo showed acceptable physical properties. Thus the study concludes that jackfruit seed extract can be successfully utilized in the formulation of safe, effective, and natural herbal antidandruff shampoo, providing a potential alternative to synthetic chemical based hair care products.

Keywords: *Dandruff, Artocarpus heterophyllus, Malassezia furfur, herbal, antidandruff shampoo.*

***CORRESPONDING AUTHOR**
S Parveen

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INTRODUCTION

Dandruff is the biggest problem in the world today. It is apparently caused by fungi called *Malassezia stricta* and *M. globose*. This is a common disease caused by the pittosporum yeast that affects the condition of the scalp. Dandruff cannot be completely removed; it can only be effectively controlled. The scalp sheds dead cells almost invisible, but in some cases, they slough off as visible flakes called dandruff [1]. Anti-dandruff agents are intended to reduce dandruff. Although the causes of dandruff are not completely understood, treatment involves the use of several active ingredients that act as antibacterial agents or antimitotic agents [2]. Jackfruit seeds are used in the preparation of herbal anti-dandruff shampoo because they contain several natural bioactive compounds that help control dandruff in a safe and effective way [3]. Seeds are rich in nutrients like vitamin-A, C and zinc, that nourish hair, antioxidants protecting it and properties that reduce inflammation, remove oily layers, promotes growth, add shine and prevent premature graying, acting as a natural conditioner and scalp healer. They provide hydration strengthen follicles and offer antiaging benefits, making hair softer, and manageable. The present study was aimed to formulate an effective, safe

and natural anti-dandruff shampoo by using plant-based ingredients such as jackfruit, floor, reetha powder, shikakai powder, Aloe Vera gel, henna, Jasmine oil that are free from chemicals.

MATERIALS AND METHODS

Jack fruit seeds extract was purchased from Mangrove health care Pvt Ltd, India. All other ingredients were purchased from local market.

Formulation of herbal shampoo

20g of jackfruit seed powder is added to 40g of reetha powder, 32g of shikakai powder, 8g of henna powder into a clean beaker and soaked for few minutes in distilled water and this mixture is heated in boiling water for 30-40 min and filtered the filtrate into another beaker after cooling. Gelatin powder of 8g is mixed with warm water in a beaker. Glycerine of 20 ml is mixed with 4g xanthan powder in another beaker. Sodium benzoate and potassium sorbate each 1g is dissolved in few ml of distilled water. Filtrate of shampoo extract and mixture of excipients are mixed together along preservatives (sodium benzoate and potassium sorbate) are added to the shampoo sample. Stirring is done until homogenous product is formed [4].

Table 1. Formulation of anti-dandruff shampoo

S.No	Ingredients	F1 (50ml)	F2 (100ml)	F3 (200ml)	F4 (400ml)
1	Jack fruit seeds extract (g)	2.5	5	10	20
2	Reetha powder (g)	5	10	20	40
3	Shikakai powder (g)	4	8	16	32
4	Xanthan gum (g)	1	2	2	4
5	Gelatin solution (g)	2	2	4	8
6	Glycerine (ml)	5	10	10	20
7	Potassium sorbate (g)	0.25	0.25	0.5	1
8	Sodium benzoate (g)	0.25	0.25	0.5	1
9	Jasmine oil (drops)	1	1	2	3
10	Henna (g)	1	2	4	8
11	Purified water (ml)	q.s	q.s	q.s	q.s

Evaluation Tests

i. Organoleptic properties

The color should be uniform and acceptable, pleasant herbal smell, clear or slightly opaque. smooth, free from particles [5].

ii. pH determination

The pH of the shampoo is measured using a digital pH meter, by dipping the glass electrode completely into the shampoo [5].

iii. Viscosity test

The viscosity of the herbal shampoo is measured using Ostwald viscometer. It ensures proper thickness and pourability of the sample. Approximately 1ml of shampoo sample is taken and dissolved in 10ml distilled water for10% sample solution. First the viscosity of distilled water is checked and then tested with sample solution with help of Ostwald viscometer and calculated the viscosity of the shampoo [6].

iv. Foam height and foam stability test

The foam height and stability test are performed using cylinder shake method. Good shampoo should produce stable foam. Foam height is tested by taking 1ml of shampoo sample into a test tube and shaked it well. This method is called cylinder shake method. Foam stability is tested by observing the height of foam occurred in the test tube for certain time. This foam should be stable at least for 10 min [6].

v. Surface tension test

The surface tension of the herbal shampoo is measured using stalagmometer. Here lower surface tension indicates better cleansing action. 1% of shampoo solution (1ml shampoo in 100ml water) is prepared. First the surface tension of the distilled water is tested by counting the number of drops fallen from the orifice and then the surface tension of shampoo solution is tested using stalagmometer [7].

vi. Dirt dispersion test

Ink or soil added to the shampoo solution in a test tube, dirt should remain in water layer but should not disperse in foam [8].

vii. Skin irritation test

Patch test on skin is done to check the skin irritation, it is performed by applying the shampoo sample on skin for atleast 2 hours and observing the reactions on skin. It should show no redness or irritation on skin [9].

viii. Eye Irritation test

In Eye irritation test shampoo sample is diluted and few drops are poured on eye, eye should not irritate [10].

ix. Stability test

The shampoo sample is stored at different temperature for one week, and observes the in change in color, pH, odor, appearance, viscosity, phase separation etc [11].

x. Antimicrobial/Antifungal test

Sabourand Dextrose Agar prepared and this medium is sterilized in autoclave at 1210Cfor15 minutes. This medium is poured into sterile petriplates and allowed the medium to solidify. *Malassezia furfur* fungus is obtained and a fungal suspension is prepared using sterile saline. This suspension is spread on the agar plates. Shampoo sample is diluted with distilled water in 1:10 ratio and spread on petriplates. These plates are incubated at 30-32°C for 48-72 hours. After

incubation, the zone of inhibition (mm) is measured in each petriplate. Large clear zone indicates stronger antifungal activity of herbal shampoo [12].

xi. Zone of inhibition

The antimicrobial activity was performed by agar well diffusion method. The plates were evaluated after incubation at 32C for 48-72 hours after which the zone of inhibition around each well was measured by using scale in millimeter (mm). The ratio of diameter zone of inhibition produced by standard product and inhibition zones of the sample formulations was used to express the antifungal activity of the shampoo [12].

RESULTS & DISCUSSION

i. Organoleptic properties

The color of shampoo is brown, pleasant herbal smell, appearance was clear, smooth, free from particles.

Table 2. Organoleptic properties of the formulations

Formulations	Color	Odor	Appearance	Texture
F1	Brown	Pleasant herbal	Clear	Smooth
F2	Brown	Pleasant herbal	Clear	Smooth
F3	Brown	Pleasant herbal	Clear	Smooth
F4	Brown	Pleasant herbal	Clear	Smooth

ii. pH determination

pH of both the standard shampoo and shampoo formulations are in the range of 5 – 7 which is suitable for scalp cleaning.

iii. Viscosity test

Viscosity of the shampoo formulations are in the range of 0.5 – 6 poise.

iv. Foam height and foam stability test

Height of the foam formed was 2 cm and it was stable for 20 min.

v. Surface tension test

The surface tension of the shampoo solutions were found to be in the range of 30 – 40 dynes/cm.

vi. Dirt dispersion test

The dirt poured in the sample did not dispersed with foam and remained in sample.

vii. Skin irritation test

No irritation on skin was observes

viii. Eye Irritation test

No irritation in eyes was observed.

ix. Stability test

Shampoo sample was stable for one week in different temperatures with no changes in incolor, pH, odor, appearance, viscosity etc.

Table 3. Evaluation tests of jackfruit seed shampoo

Tests	F1	F2	F3	F4
pH	6.1	6.3	6.5	6.8
Viscosity	5	5.3	5.5	5.6
Foam height	2cm	2cm	2.5cm	3cm
Foam stability	10min	10min	13min	20min
Surface tension	35	32.5	31.5	31
Dirt dispersion	No dispersion	No dispersion	No dispersion	No dispersion
Skin irritation	No irritation	No irritation	No irritation	No irritation
Eye Irritation	No irritation	No irritation	No irritation	No irritation

x. Antimicrobial/Antifungal activity

Antifungal efficacy study was performed on formulations using *Malassezia furfur*. Clear zones showing inhibited zone of growth were observed. The zones of inhibition of the formulations were shown in the table no. 4. The study indicated jackfruit seed extract remained its antimicrobial activity when formulated as shampoo against *Malassezia furfur*.

Table 4. Zone of inhibition of prepared shampoos

Microorganism	Zone of inhibition (mm)				
	Standard (pure) drug	F1	F2	F3	F4
Malassezia furfur.	19	11	14	15	17

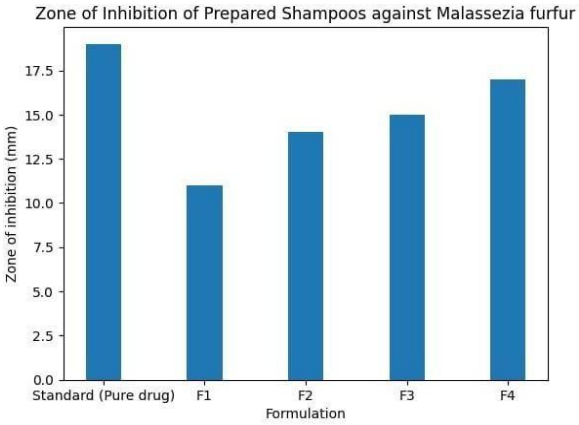

Fig 1. Antifungal activity of the shampoo formulations

CONCLUSION

The study demonstrated that the procured jackfruit seed shampoo closely matches the standard jackfruit seed shampoo in terms of physicochemical properties, including it is of comparable quality and suitable for formulation purpose. Four formulations of shampoo were prepared. The jack fruit seed based shampoos prepared were clear, homogenous, and acceptable pH levels for scalp cleaning. They showed good physical stability over one week at different temperatures and retained the characteristics of jackfruit seed powder. Importantly, all formulations maintained their antimicrobial efficiency against *Malassezia furfur,*

confirming that jackfruit seed extract retains its therapeutic potential when formulated into a shampoo. These findings support the potential use of jackfruit seed shampoo as an effective and stable formulation for anti-dandruff, scalp cleaning and hair care applications.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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