

**DEVELOPMENT AND EVALUATION OF HERBAL SHAMPOO FOR
ANTI-DANDRUFF ACTIVITY**

Umadevi. A*, Jubairiya.C, Rabiya, Sajida.P, Sivaprasad. K.V

Department of Pharmacognosy, Malik Deenar College of Pharmacy, Kasaragod, Kerala, India.

ABSTRACT

An attempt was made to know the activity of *Thespesia populnea* leaves against the dandruff causing organism *Malassezia furfur*. *Thespesia populnea* leaves were collected and their powered extracts were used for the activity studies. The antidandruff activity of *Thespesia populnea* leaf extract using agar well diffusion method was carried out. Sensitivity of the organism to herbal shampoo containing leaf extract was also studied. Herbal shampoo formulation was prepared using Sodium lauryl sulphate as foaming agent of concentrations 1 to 20%. Test parameters for shampoo like appearance, pH, and foaming ability, solid content, viscosity, surface tension and stability test was evaluated. The formulation, F3 with 5% Sodium lauryl sulphate was selected, based on its evaluation parameters. The results of this study showed that *Thespesia populnea* extracts and its shampoo had antidandruff activity. The concentration chosen was 30% extract because in that concentration the value of the resistor area is still categorized well. The stability test results stated that all the formulas were stable even after 30 days of stability studies.

Key words: *Thespesia populnea*, *Malassezia furfur*, herbal shampoo, Anti-dandruff activity

Author for correspondence**Umadevi. A,**Department of Pharmacognosy,
Malik Deenar College of Pharmacy, Kasaragod,
Kerala, India. Email id: umanair40@gmail.com**INTRODUCTION**

Dandruff is one of the most common dermatological skin conditions and is a chronic, non-inflammatory condition of the scalp that is characterized by excessive scaling, itching and redness of the scalp. Dandruff is apparently caused by a fungus called *Malassezia restricta*, *M. furfur* and *M. globosa*. *Malassezia* formerly called *Pityrosporum* is a yeast causing infection of skin and scalp. It often causes

itching. Warm and humid atmosphere, overcrowding and poor personal hygiene are ideally suited for the growth of *Malassezia*. Dandruff affects 5% of the population and mostly occurs after puberty, between 20-30 years and dandruff affects males more than females. Hair is one of the external barometers of internal body conditions. Shampooing is the most common form of hair treatment. Dandruff can be treated in two ways, by using herbal based anti-dandruff shampoo and by using chemical based anti-dandruff shampoo (1). A shampoo may be defined as a preparation of a surfactant (i.e. surface active material) in a suitable form-liquid, solid, or powder which when used under the conditions specified will remove surface grease, dirt and skin debris from the

hair, shaft and scalp without affecting adversely the hair, scalp or the health of the user. Various natural plant extracts are known for their antidandruff properties. Evaluation of antifungal properties of such plant extracts can be done and they can be used effectively as an alternative to chemical agents in various antidandruff formulations.

Properties of shampoo

It should effectively and completely remove dust or soil, excessive sebum or other fatty substances and loose corneal cells from the hair. It should produce a good amount of foam to satisfy the psychological requirements of the user. It should be easily removed on rinsing with water. It should leave the hair non dry, soft, lustrous with good manageability and minimum fly away. It should impart a pleasant fragrance to the hair. It should not cause any side effects/irritation to skin or eye. It should not make the hand rough and chapped (2). More radical approach in reducing the synthetic ingredients is by incorporating natural extract whose functionality is comparable with their synthetic ingredients. Herbal shampoo contains all the natural ingredients with herb extract. It helps hairs to improvise their quality of moisture, shine, growth, thickening, strength of hair roots. The most advantageous thing of herbal shampoo is that it has no any side effects. Herbal shampoo contains Amla, Reetha, Shikakai, Brahmi, Bhringaraj, Nagarmotha, Alovera, etc. all the nature things (3). Formulating cosmetics using completely natural raw materials is a difficult task. The challenge lies in selecting materials that can be rationally justified as 'natural' and formulating them into cosmetics whose functionality is comparable with their synthetic counterparts.

A shampoo is a cleaning aid for the hair and is counted among the foremost beauty products. Today's shampoo formulations are beyond the stage of pure cleaning of the hair. Additional benefits are expected, e.g., conditioning, smoothing of the hair surface, good health of hair, i.e., hair free of dandruff, dirt, grease and lice and, above all, its safety benefits are expected (4). Shampoos are of various types, like powder shampoo, clear liquid shampoo liquid shampoo, lotion shampoo, solid gel shampoo, medicated shampoo, liquid herbal shampoo etc. As far as herbal shampoos are concerned in stability criteria. Depending upon the nature of the ingredients they may be simple or plain

shampoo, antiseptic or antidandruff shampoo and nutritional shampoo containing vitamin, amino acids, proteins hydrolysate (5).

MATERIALS AND METHODS

Plant material

Thespesia populnea leaves were collected from Kasaragod district, Kerala, India. The sample drug has been identified and authenticated from the Department of Botany, Govt College Kasaragod.

Preparation of extract

The fresh leaves were collected, the drug was air dried in the shade and stored in polythene bags. The dried leaves were powdered and extracted using methanol by soxhlation method (6).

Preparation of shampoo

To formulate a clear shampoo base, six samples, designated as F1 to F6 were prepared as shown in table no 1. F1 to F6 were prepared by incorporation of 30% w/w of *T. populnea* leaf extract in 1%, 2.5%, 5%, 10%, 15%, 20% w/w of Sodium Lauryl Sulphate as detergent respectively. EDTA was used as sequestering agent and glycerin was used as humectant. The volume was completed with distilled water to 100ml (7). The methanolic extract of *T. populnea* leaf was used for the preparation of shampoo. The same method was followed for the preparation of control shampoo as mentioned above. However, no color or perfume was included in the formulation.

Evaluation of shampoo

Following parameters were used for the evaluation of shampoo

Visual appearance

The prepared shampoo was visually inspected for its clarity, color and transparency. The prepared shampoo was also evaluated for the presence of particles. Smears of shampoo was prepared on glass slide and observed under the microscope for the presence of any particles or grittiness. The appearance of shampoo is show in Table-2.

pH of the shampoo

Developed formulation was diluted using distilled water to prepare a sample with 10 % concentration. The prepared sample was checked for pH using a digital pH meter at room temperature $30\pm 2^{\circ}\text{C}$. The results are shown in Table-2.

Foaming ability and foam stability

Cylinder shake method with slight modification was used for determining foaming ability. 50ml of the 1% shampoo solution was put into a 250 ml graduated measuring cylinder and covered with hand. Measuring cylinder was shaken for 1 minute. The total volume of the foam contents after 1-minute shaking was recorded. The procedure was continued for 5 minutes. Calculated the volume of the foam. The results are shown in Table-2.

Surface tension

Dilute the shampoo using distilled water to fix 10% as concentration. Measurements were carried out using stalagmometer. Dip the flattened end of stalagmometer in to beaker containing sample of developed shampoo and suck it until the level reaches the mark. Fix that in the stand and allow the sample to run slowly from the mark. Count the number of drops formed when level of liquid reaches from A to B. Repeat the experiment with distilled water. The data was calculated using following equation,

$$R_2 = \frac{(W_3 - W_1) N_1 \times R_1}{(W_2 - W_1) N_2}$$

W1 = weight of empty beaker. W2 is weight of beaker with distilled water

W3 = Weight of beaker with shampoo solution. N1 is no. of drops of distilled water.

N2 = no. of drops of shampoo solution.

R1 = surface tension of distilled water at room temperature. R2 = surface tension of shampoo solution. The results are shown in Table-2.

Percentage of solid content

4g of the prepared shampoo were placed in a clean dry evaporating dish. The weight of the dish and shampoo was determined. The liquid portion of the shampoo was evaporated by placing on a hot plate. Then the weight of the shampoo solid contents after complete drying was determined. The results are shown in Table-2.

Cleaning action- 5 grams of wool yarn was added in grease and it was placed in flask containing 200 ml of water with 1 gram of shampoo. Temperature of content in the flask was maintained at $30 \pm 2^\circ\text{C}$. The flask was shaken for 4 minutes at the rate of 50 shakes per minute. The solution was removed and sample was taken out, dried and weighed. The amount of

grease removed was calculated by using the following equation

$$DP = 100(1 - T/C)$$

In which, DP= percentage of detergency power, C= weight of sebum in the control sample and T= weight of sebum in the test sample (8). The results are shown in Table-2.

Viscosity

Viscosity was determined by using the brook field viscometer. The results are shown in Table-3.

Anti-Dandruff activity

Methanolic leaf extract of *T. populnea* has been incorporated into a shampoo and studied for its antidandruff properties. However, there are no reports regarding evaluation of antidandruff activity of this herb. Hence the drug was evaluated for antidandruff activity in *Malassezia furfur*. Study was employed for *Malassezia furfur* testing anti-dandruff activity using the cup-plate method. The culture was maintained on Sabouraud's Dextrose Agar media. 20 ml of melted sabouraud's dextrose agar medium, coated with a drop of olive oil was inoculated with 0.2 ml of 72-hour old suspension of *Malassezia furfur* and poured in to a Petri dish. The cups (10 mm diameter) were punched in the Petri dishes and filled with different concentration of leaf extract in Di Methyl Sulphoxide solution (10 ml of shampoo in 100 ml of DMSO) and standard (2% Ketoconazole) was added to the wells. Then the plate was incubated at room temperature for 5-7 days as shown in below figure. After the completion of incubation period, the zone of inhibition in millimeter was measured (9).

Stability study

Placebo and the medicated shampoo were evaluated for their thermostability and results are shown in table-5 (10).

RESULTS AND DISCUSSION

All the six formulations showed good pH, foaming ability, solid content, surface tension, cleaning action. Stability studies were carried out. The studies however were done for a period of 30 days. Parameters such as pH, foaming ability, solid content, surface tension, cleaning action were evaluated. pH was maintained throughout the study which was found to be 5.9 ± 0.01 .

Foaming ability was also measured and found to be less in variation with the initially prepared shampoo. The formulated shampoos were tested for antidandruff activity.

Six formulations were prepared and evaluated for its physicochemical parameters. It is shown in table 1 and 2.

Table-1 Formulation of shampoo

S. NO	INGREDIENTS	F1 (%)	F2 (%)	F3 (%)	F4 (%)	F5 (%)	F6 (%)
1	Extract of <i>T.populnea</i>	30	30	30	30	30	30
2	Sodium Lauryl Sulphate	1	2.5	5	10	15	20
3	EDTA	0.15	0.15	0.15	0.15	0.15	0.15
4	Glycerin	1	1	1	1	1	1
5	Distilled water (q.s.)	100 ml	100 ml	100 ml	100 ml	100 ml	100 ml

The formulated shampoos were tested for antidandruff activity. The results were shown in fig-1, 2 and table-4.

Table-2 Data showing physico-chemical attributes of herbal shampoo

Formulation code	Appearance	PH	solid content (%)	surface tension (dynes cm ⁻¹)	foaming ability	Cleaning action(%)
F1	+++	5.40±0.06	23.12±0.02	33.7±0.03	+++	28.24±0.05
F2	++	5.68±0.01	24.26±0.04	32.8 ±0.06	++	30.20±0.31
F3	+++	5.92±0.04	25.10±0.01	34.6±0.02	+++	33.12±0.01
F4	+++	6.2±0.01	29.30±0.02	34.8±0.04	+++	31.26±0.02
F5	+++	5.62±0.02	24.14±0.06	35.5±0.03	+++	29.32±0.01
F6	++	5.68±0.4	26.20±0.06	34.6±0.06	++	30.22±0.04

All values are expressed as mean ± SD

++= fair, +++=good

Table- 3 Data showing viscosities of herbal shampoo

Speed (rpm)	F1	F2	F3	F4	F5	F6
	viscosity	viscosity	viscosity	viscosity	viscosity	Viscosity
0.3	95633.23	90522.10	85625.32	89321.25	85662.42	96254.48
0.5	84325.12	80568.36	74633.25	75235.89	70236.45	85632.42
1	78362.56	75366.21	65324.22	68693.12	55632.24	70125.36
1.5	65324.89	62358.45	45568.48	50378.45	39568.24	59635.22
2.5	50258.32	45236.89	25666.25	40589.98	29452.85	45698.45
5	30485.36	25364.45	17263.22	21378.75	12634.25	32478.76
10	15789.23	10236.56	10256.42	15365.21	9869.10	10025.69

Table- 4 Result showing anti-dandruff activity by agar well diffusion method

Samples	Zone of inhibition in mm	Dandruff culture
Leaf extract (30%)	17mm	<i>Malassezia furfur</i>
Leaf extracts as shampoo (30%)	20mm	
Ketoconazole (2%)	22mm	

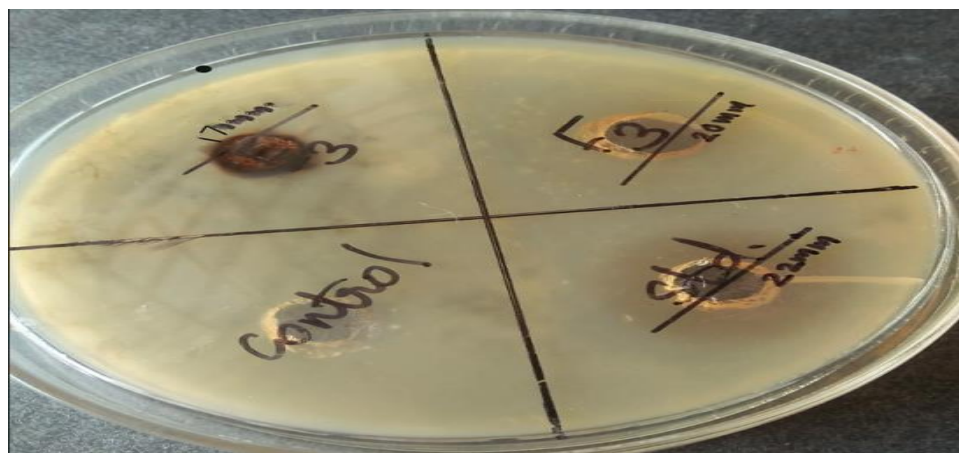


Fig-1 Zone of inhibition of 100µl (std, shampoo and extract)

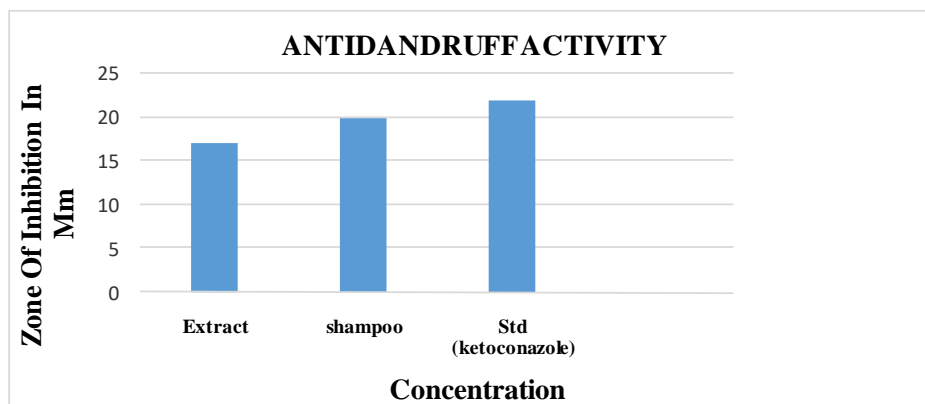


Fig-2 Graphical representation of standarad, shampoo and extract

Table-5 Results of stability studies after 30 days

Formula tion code	Appearance	PH	solid content (%)	Viscosity (cps)	surface tension (dynes cm ⁻¹)	foaming ability	Cleaning action
F3	+++	5.90±0.06	25.10±0.01	84663.28	34.1±0.03	+++	33.10±0.02

All values are expressed as mean ± SD; +++=good

CONCLUSION

Shampoo formulation of methanolic extract *T.populnea* prepared using Sodium Lauryl Sulphate and gave a shampoo of satisfactory physicochemical parameters. Stability studies of the formulations carried out was satisfactory. Study for effects of the formulated shampoos on *Malassezia furfur* showed that drug alone promoted antidandruff activity. The antidandruff properties of this herb may be due to their alkaloid, flavonoid, saponin. Further studies are required to confirm the role of each of these phyto constituents on antidandruff activity. This is the first report on the scientific evaluation of *T.populnea* leaf extract and its shampoo for antidandruff activity. Thus our study reveals both leaf extract to be good antidandruff; its methanolic extract may be formulated as shampoo with satisfactory physicochemical parameters.

ACKNOWLEDGMENT

We are very thankful to respected principal and management of Malik Deenar College of pharmacy, Kerala for their support

REFERENCES

1. Kumar V P, Rao V P, Prince R, Terejamma K, Chaitanya T, Desu K P. Formulation and evaluation of herbal anti-dandruff shampoo from Bhingaraj leaves. *ARC. J.Parm.Sci.* 2018; 4(2):29-33.
2. Surupsing M V, Akash D P, Harishchandra M Y, Vipul H J, Pawar S P. Formulation and evaluation of herbal shampoo powder. *Int.J.Pharm.Chem.Res.* 2017;3(3):492-498.
3. Utane r, Deo s, Itankar P. Preparation of herbal shampoo(HS) by green method and their characterization. *Int. J. Res. Soc. Info.Stu.* 2017;5(1):254-258.
4. Shewet S P, Yuvaraj M J, Shrinivas M K. Formulation and evaluation of herbal shampoo powder. *Int.J.adv.res.* 2015;3(3):939-94.
5. Vijayalakshmi A, Sangeetha S, Ranjith N. Formulation and evaluation of herbal shampoo. *Asi.J.Pharm.Cli.Res.* 2018;11(4):121-124.
6. Sruthi D R, Indira G. A comparative evaluation of maceration soxhlet and ultra sound assisted extraction for the phytochemical screening of the leaves of *Nephelium lappaceum* L(sapindaceae). *J.Pharmaco. Phyto.* 2016;5(5):386-389.
7. Heyam A S, Bazigha K R. Formulation and evaluation of herbal shampoo from *Ziziphus spina* leaves extract. *Int.J.Res.Ayu.Pharm.* 2011;2(6):1802-1806.
8. Swarnlata S, Hargude S M, Deep kaur C, Shailendra S. Formulation and evaluation of herbal shampoo containing extract of *Allium sativum*. *Res.J.Trop.Cos.Sci.* 2011;2(1):18-20.
9. Zoya M, Bhiku, Gaura S. Anti-dandruff activity of synthetic and herbal shampoo on dandruff causing isolate: *Malassezia*. *Int.J.App.Res.* 2016;2(7):80-85.
10. Kumar A, Rakesh roshan mali. Evaluation of prepared shampoo formulations and to compare formulated shampoo with marketed shampoos. *Int.Pharm.Sci.Rev. Res.* 2010;3(1):120-126.