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ORIGINAL ARTICLE

polyherbal shampoo with antifungal properties and comparison with allopathic marketed shampoo: a research

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Abstract:

The study aimed to formulate a pure herbal shampoo, evaluate, and compare its physicochemical shampoo formulated by adding the extracts of different herbs such as pomegranate, neem, hibiscus, shikakai, reetha, curry leaves, licorice, and orange peel. Small amount of methylparaben has been added as a preservative and pH adjusted with citric acid. Shampoo formulations were tested against fungus Malassezia furfur by agar well diffusion method. Results: The formulated herbal shampoo was clear and appealing. It showed good cleansing and detergency, low surface tension, small bubble size, and good foam stability after 5 min. The prepared shampoo and commercial shampoos showed comparable results for percent solid contents also. Conclusion: The results indicated that the formulated shampoo is having excellent, at par with commercially available shampoo. However, further, research and development are required to improve its quality and safety.

Keywords: Antifungal, Malassezia furfur, Herbal shampoo, allopathic/marketed shampoo, formulation.

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INTRODUCTION

Hairs are the integral part of human beauty. People are using herbs for cleaning, beautifying, and managing hair since the ancient era. As the time has passed, synthetic agents have taken a large share, but today people are getting aware of their harmful effects on hairs, skin, and eyes. These reasons attracted to community toward the herbal products, which are less expensive and have negligible side effects. The primary function of the shampoo is the cleansing or detergent action, but the removal of dandruff also one of the important characteristics of a good shampoo.[1] *Malassezia* species formerly known as *Pityrosporum* is a lipophilic, dimorphic opportunistic yeast causing skin and hair infections such as *Pityriasis versicolor*, seborrheic dermatitis, and dandruff. Dandruff medically described as *Pityriasis capitis* is caused by *Malassezia* species such as *Malassezia furfur*, *M. globosa, and Malassezia restricta.*[2,3] The word herbal signifies a symbol of safety in contrast to the synthetic one which has adverse effects on human health, today's busy life schedule has created the negligence of individual to protect their hair and maintain the hair homeostasis so there is a need to derived formulations for avoidinghair damages that contain herbal extracts.[4] Shampoos are not only used for cleansing hair but also used to maintain the hair soft, shiny, thicker, and longer and to remove the oiliness from the hair. Various forms available such as powder, clear liquid, lotion, solid gel, medicated, and liquid herbal shampoos.[5,6] Depending on the type nature of ingredients used, it may be simple shampoo, anti-dandruff shampoo, and antiseptic shampoo and shampoos containing vitamins, amino acids, and protein hydrolysate called as nutritional shampoo.[7]

MATERIALS AND METHODS

Collection of plant material

Pomegranate, reetha, shikakai, orange, and licorice were procured. The plant

Fungal strain was procured from MTCC (Microbial Type Culture Collection Centre and Gene Bank) Chandigarh, India. The fungal strains were cultured on Dixon agar medium at 28°C.

Preparation of crude extracts

Punica granatum L., Azadirachta indica, Murraya koenigii, Hibiscus rosa-sinensis, Sapindus mukorossi, Acacia concinna, Glycyrrhiza glabra, and Citrus sinensis conditioning antimicrobial and antifungal properties already reported were homogenized and extracted using water as a solvent. The extract was filtered and concentrated to dryness under reduced pressure and controlled temperature 25(50–55°C) to obtain solvent-free extracts were washed, weighed, and packed into plastic containers and stored in room temperature.

Preparation of polyherbal shampoo

The plant extracts were mixed in different proportions to obtain a shampoo whose formula is shown in Table 1. Herbal extracts were mixed with sufficient quantity of water in one part and triethanolamine lauryl sulfate was mixed with other parts of water after that methylparaben was also added with stirring. Finally, the pH of the solution was adjusted by adding sufficient quantity of 1.5% citric sinensis solution. Few drops of rose essential oil

were also added to impart aroma to the prepared shampoo, and the final volume was made to 50 mL with water solution.[8]

Evaluation of polyherbal shampoo

The prepared formulated shampoo was following the subjected parameters.

Physical evaluation

pH, ash, foaming capacity, viscosity, stability, detergency, etc.

Visual inspection/physical appearance of shampoo

The appearance or physical inspection of shampoo concern mainly about clarity of shampoo (transparency), color of content, odor, and total foam producing ability.[9]

Determination of pH

About 10% volume by volume shampoo solution in water (i.e., distilled) measured by Ph meter condition: Room temperature.[10]

Rheological evaluations

The viscosity of the shampoos was determined using Brookfield's viscometer.

Foam and foam stability

Ross-miles foam column is an accepted method for measuringfoam light and foam stability in this method 200 mL of a the column is measured at specified times, for example, height can be measured immediately after the shampoo solution has passed through the apparatus and 5 min thereafter. The height of column considered to be proportional to volume. The effect of hard water can also be studied by this method.

Detergency and cleaning action

Barnet and powers test place 5 g of wool yarn in grease in 200 mL of water containing 1 g of shampoo in flask. Shake the flask, 4 min (rate, 50 times in a minute), temperature of water was 35°C, after removing the solution, the sample was takeout. Dry the sample and weigh it. The amount of removed soil was calculated.

Wetting action

The Draves–Clarkson test is a standard method to determine the effectiveness of wetting of cotton skeins. This test was originally developed for evaluating products meant assisting in dyeing cotton yarns and fabrics. Although there is no relation between dyeing of cotton yarn or fabric and shampooing, this test can be used to study wetting action.[11]

Table 1: Formula for shampoo preparation							
Particulars	**Part used**	**Quantity (50 mL)**					
		F1	**F2**	**F3**	**F4**	**F5**	**F6**
Punica granatum	Fruit	0.25	0.5	1	1.5	2	2.5
Azadirachta indica	Leaves	0.25	0.5	1	1.5	2	2.5
Murraya koenigii	Leaves	0.25	0.5	1	1.5	2	2.5
Hibiscus rosa-sinensis	Flower	1	1	1	1	1	1
Sapindus mukorossi	Fruit	3	3	3	3	3	3
Acacia concinna	Fruit	3	3	3	3	3	3
Glycyrrhiza glabra	Root	1.5	1.5	1.5	1.5	1.5	1.5
Citrus sinensis	Peel	1.5	1.5	1.5	1.5	1.5	1.5
Triethanolamine lauryl sulfate	–	10 mL	10 mL	10 mL	10 mL	10 mL	10 mL
Methylparaben	–	0.25	0.25	0.25	0.25	0.25	0.25
Water	–	Q.S.	–	–	–	–	–
Perfume		Q.S.	–	–	–	–	–

Table 2: Evaluation of formulation for physical appearances and PH

F1	Dark Brown	5.23
F2	Dark Brown	5.42
F3	Dark Brown	5.22
F4	Dark Brown	5.62
F5	Dark Brown	5.51
F6	Dark Brown	5.42

Table 3: Base Optimization

S.No.	Particulars	F1	F2	F3
1	*Hibiscus rosasinensis* (Hibiscus)	0.25	0.5	1
2	*Sapindus mukorossi* (Reetha)	1	2	3
3	*Acacia concinna*(shikakai)	1	2	3
4	*Glycyrrhiza glabra*(Licorice)	0.5	1	1.5

Table 4: Formula for Shampoo Preparation

S. No.	Particulars	Part used	Quantity(50 ml)					
			F1	F2	F3	F4	F5	F6
1	Punica grantum	Fruit	0.25	0.5	1	1.5	2	2.5
2	Azadirachta Indica	Leaves	0.25	0.5	1	1.5	2	2.5
3	Murraya Koenigii	Leaves	0.25	0.5	1	1.5	2	2.5
4	Hibiscus Rosasinensis	Flower	1	0.5	1	1	1	1
5	Sapindus Mukorosi	Fruit	3	1	3	3	3	3
6	Acasia Concinna	Fruit	3	3	3	3	3	3
7	Gltcerrhiza Glabra	Root	1.5	3	1.5	1.5	1.5	1.5
8	Citrus Sinensis	Peel	1.5	1.5	1.5	1.5	1.5	1.5
9	Triethanol Lauryl Sulphate	-	10 ml	10 ml	10 ml	10 ml	10 ml	10 ml
	Methyl Parabene	-.	0.25	0.25	0.25	0.25	.025	0.25
	Water	-	q.s	q.s	q.s	q.s	q.s	q.s
	Perfumes	-	q.s	q.s	q.s	q.s	q.s	q.s

RESULTS & DICUSSION

Table 5: Evaluation of Formulation for Physical Appearance and pH

Formulation	Physical appearance	pH
F1	Dark brown	5.23
F2	Dark brown	5.42
F3	Dark brown	5.22
F4	Dark brown	5.62
F5	Dark brown	5.51
F6	Dark brown	5.42

The pH of shampoos has been shown to be important for improving and enhancing the qualities of hair, minimizing irritation to the eyes and stabilizing the ecological balance of the scalp. Mild acidity prevents swelling and promotes tightening of the scales, there by inducing shine. As seen from(Table 5) all six formulations shows the shampoos were acid balanced and were ranged 5-5.6, which is near to the skin pH and all formulations shows good pH range and also good physical appearance.

Table 6: Cleansing, Surface Tension and Detergency Parameters of Developed Formulation

Formulation	Cleaning (%)	Surface tension (dynes/cm)	Detergency (%)
F1	25.50	28.23	58.54
F2	27.21	29.06	60.23
F3	27.52	31.22	61.29
F4	28.16	32.43	62.25
F5	29.23	33.21	62.89
F6	29.72	33.56	63.22

It has been mentioned that a proper shampoo should be able to decrease the surface tension of pure water to about 40 dynes/cm. The reduction in surface tension of water from 72.8 dynes/cm to 34.2 dynes/ cm by the herbal shampoos is an indication of their good detergent action. The results are shown in (Table 6). Cleaning action was tested on wool yarn in grease. As seen from the results, there is a significant difference in the amount of sebum removed by the different shampoos.F6 formulation show good cleaning action.

Table 7: Evaluation of Foam Stability of Polyherbal Shampoo Formulations

Time (min)	Foam volume					
	F1	F2	F3	F4	F5	F6
1min	173	170	172	175	171	172
2min	172	169	170	173	169	171
3min	170	167	169	172	167	168
4min	169	166	167	170	166	167
5min	167	165	166	169	164	166

All the six shampoo formulations showed similar foaming characteristics in distilled water. All six formulations showed comparable foaming properties. The foam stability of herbal shampoos is listed in (Table 6). A point to be noted here is that there does not seem to be any correlation between detergency and foaming, which only confirms the fact that a shampoo that foams well need not clean well.

Table 8: Antimicrobial Activity of Polyherbal Shampoo (50ml)

formulation	Test organism	concentrations (mg/mL) (zone of inhibition in mm)			
		50	100	150	200
F1	Malassezia furfur.	21	20	18	16
F2	-	22	20	18	17
F3	-	23	18	16	15
F4	-	24	20	17	16
F5	-	25	23	21	19
F6	-	28	26	24	21
Base	-	10	8	7	5
Synthetic Marketed product	-	30	28	27	25
Herbal marketed product	-	28	27	26	25

Figure 1: Antifungal activities of prepared formulations

Figure 2: Nutrient media plate

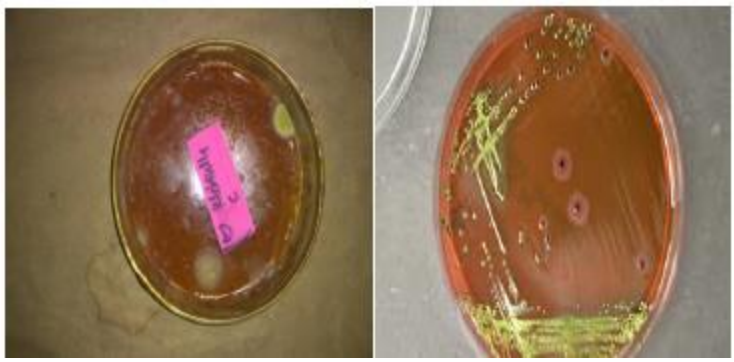


Figure 3: Plate after fungus growth

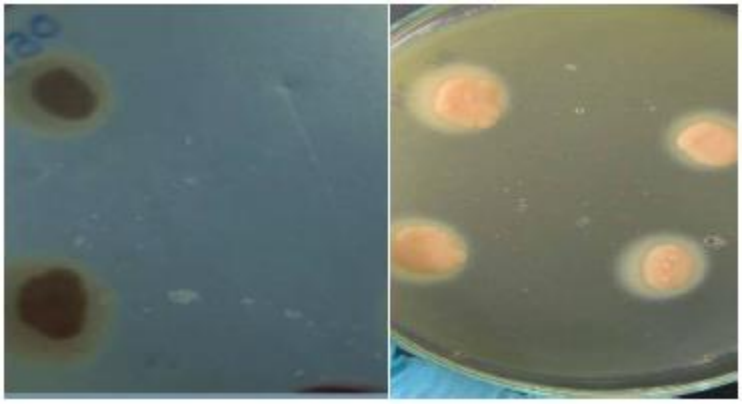
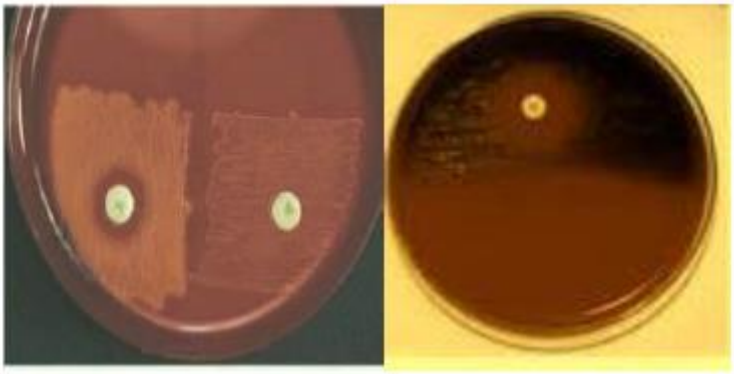


Figure 4: zone of inhibition



The results of antifungal activity are described in (Tables) and zone of inhibition of F1, F2, F3, F4 was shown in F4 respectively. The formulation F4 showed maximum zone of inhibition. Therefore it is concluded that as the

concentration of the herbs increased, the zone of inhibition was also increased, hence the formulation F6 was the best formulation for treating dandruff. The same was compared with marketed product, synthetic and herbal antidandruff shampoo containing ketoconazole (Nuforce shampoo) as an active ingredient and keshkanti (patanjali) used as herbal antidandruff shampoo. The result found that the formulated product shows better control over dandruff near the marketed product.

CONCLUSION

The aim of this study was to formulate a completely herbal shampoo which is at par with the synthetic shampoo available in the market. We formulated a polyherbal shampoo by using plant extract which are commonly used traditionally and lauded for their hair cleansing action across Asia. All the ingredients used to formulate shampoo are safer than silicones and polyquaterniums synthetic conditioning agents. Instead of using cationic conditioners we have used shikakai, hibiscus reetha and other plant extract to provide conditioning effect. The formulation of Anti-dandruff hair shampoo provides a method for treating a scalp dandruff or seborrhoeic dermatitis. Polyherbal anti-dandruff hair shampoo (F6) containing different

concentration of herbal extract of Pomegranate, reetha , shikakai, orange peel, licorice, curry leaves, neem leaves, hibiscus flower could be used as an effective in treatment of Dandruff on scalp. Pomegranate which is the main ingredient of the formulation and also new to introduce on malassezia furfur species as a antifungal agent. It show good antifungal effect in combination with increased concentration Several tests were performed for physicochemical properties of prepared shampoo for quality control test but further research and development is required to improve its overall quality.

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