



Formulation and evaluation of poly herbal shampoos for its antimicrobial and anti-lice activity

Suriyaprakash T.N.K.^{1,*}, Kalaivani R², S.Lakshmana Prabu³ and Sumathi A¹

¹Department of Pharmaceutics, Periyar College of Pharmaceutical Sciences, Trichy-620021

²Department of Pharmacy Practice, Thanthai Roever College of Pharmacy, Perambalur-621212

³Department of Pharmaceutical Technology, Anna University of Technology, Tiruchirappalli – 620 024.

ARTICLE INFO

Article history:

Received: 24 July 2011;

Received in revised form:

20 September 2011;

Accepted: 26 September 2011;

Keywords

Shampoo,
Thulasi,
Herbal,
Neem,
Mehandi,
Gooseberry.

ABSTRACT

Shampoos are products which remove surface grease and dirt from the hair shaft and scalp. The cleansing or detergent action of a shampoo along with anti microbial and anti-lice activity is beneficial for the consumers. Now a days herbal shampoo shows better activity, safer and popular when compared to the synthetic shampoos. We made an attempt to formulate a poly herbal shampoo by using neem leaf, thulasi leaf, mehandi leaf and gooseberry fruit along with synthetic compounds. The prepared formulations were evaluated for its physicochemical properties, anti-microbial and anti-lice activity; which was compared with the marketed products. The herbal shampoos showed better effects than marketed synthetic shampoo and also with lesser side effects.

© 2011 Elixir All rights reserved.

Introduction

From ancient time beyond memory, mankind have been borrowing abundantly from nature to care for their health, skin and hair, as natural ingredients that have preventive, protective and corrective action. The warehouse of cosmetics, nature provides such versatile natural ingredients that enhance beauty of the skin and hair.

Hair is one of the external barometers of internal body conditions. Shampooing is the most common form of hair treatment. The primary function of shampoo is aimed at cleansing of the hair necessitated due to accumulated sebum, dust, scalp debris etc^{1,2}. Various shampoo formulations are associated with hair quality, hair care habit and specific problems such as treatment of oily hairs, dandruff and for androgenic alopecia. Shampoos are liquid, creamy or gel like preparations. The consistency of the preparation depends on the inclusion of traditional soaps saturated with glycerides and natural or synthetic fatty alcohols or the thickening agents (e.g. gum, resin and PEG). Indian women use herbals such as *shikkakai* and *reetha* that are natural cleansing agents without harmful effects.

Nowadays natural sources remain attractive primarily when compared to the synthetic one, so herbal shampoos are popular with the consumer when compared to the synthetic one.

The head lice *Pediculus humanus capitis* De Gear, is an ectoparasite confined to the scalp of hair of humans. *P. humanus capitis* infection cause skin irritation, pruritis and sleep loss as well as occasional secondary bacterial infection³. The best sources for the insect control are the plant essential oils due to their bioactive chemicals⁴. Research interest in head lice reemerged because of report of resistance to tropical pediculocides that has been documented around the world⁵.

We made an attempt to formulate herb-based shampoo by incorporating the natural components such as neem leaf^{6,7} (botanical source - *Azadiracta indica*, family – Meliaceae, English name: neem, margosa), thulasi leaf⁸ (botanical source: *Ocimum sanctum*, family – Labiatae, English name - Sacred basil), mehandi leaf⁹, (botanical Source - *Lawsonia alba*, family – Lythraeaceae, English Name - Henna, Indian Privet) and gooseberry fruit¹⁰ (botanical source - *Emblica officinalis*, family – Euphorbiaceae, English name – Amla) as well as synthetic ingredients in a proper proportion and the evaluation of its detergency characteristics, antimicrobial and anti-lice property and compared with the marketed shampoo preparation.

Material and Methods

Specimen collection

The plant specimens were collected from forests surrounding Trichy District, Tamil Nadu, during August month and identified and authenticated by Botanist. The leaf portions were washed thoroughly with water and dried in shadow. The shadow dried leaves were powdered, sieved using 60 meshes and stored in well closed container. The fruit was dried under shade for 10–15 d. Then the seeds were removed from the fruit, powdered and passed through # 60 sieve to get fine powder. Sodium lauryl sulphate, sodium carboxy methyl cellulose and colorants were purchased from Nice Chemicals, India. Egg was purchased locally.

Preparation of aqueous extract

The dried powdered leaves were kept in a round-bottom flask fitted with a reflux condenser and extracted with distilled water for six hours. The obtained extract was concentrated under reduced pressure and stored in refrigerator until use.

Preparation of Shampoo

Five formulations (F1 to F5) were prepared by using colloidal mill. Different proportions of the ingredients were

taken in colloidal mill and blended until to get a good consistency and uniform distribution and volume was made up to 100 ml. Initially suspending agent was soaked in hot water and left overnight for swelling. The composition of the formulation is shown in Table 1.

Evaluation of the formulation ¹¹⁻¹⁷

Physical appearance/visual inspection

The prepared formulations were evaluated in terms of their clarity, foam producing ability and fluidity.

Ease of Distribution

Ease of distribution was performed by applying 5 ml of the formulation over the wet hair and the time taken to complete distribution was measured.

Lathering Power

Lathering power was performed based on three properties viz. the speed at which the shampoo lathered, whether the shampoo produced loose foam or creamy foam and the duration till which the foam was stable.

Ease of Rinsing

The time taken to remove the detergent was performed by applying 5 ml of the shampoo and time taken for complete removal of frothing from wash water was determined.

Ease of Combing

Ease of combing was performed by passing a comb through the wet hair and checking whether the comb glides smoothly.

Removal of Oily Matter

Removal of oily matter was performed by applying 5 ml of the shampoo and checked its texture to ascertain the removal of oily matter.

Lustre of Hair

The lustre of hair was tested by checking the shine on the hair after drying.

Speed of Drying

The speed of drying was performed by applying 5ml of the shampoo in hair and dried after washing. The drying of hair was performed by using a table fan with constant speed and distance from the subject.

Ease of Combing (Dry)

Ease of combing was performed by passing a comb through the dry hair and checking whether the comb glides smoothly.

Determination of pH

The pH of 10% shampoo solution in distilled water was determined at room temperature.

Foaming Power

Foaming power for the formulation was performed by using 10 ml of the shampoo in a measuring cylinder and then shaken in a mechanical shaker for 1 minute. The volume was then measured and foaming power was calculated.

Anti-microbial Action

Anti-microbial action of the formulations was carried out in Mueller Hinton Agar medium by using *Staphylococcus albus* and *Escherichia coli*. 1 ml of the formulation was added into the well made in Mueller Hinton Agar medium and incubated at 37°C for 24 hrs. The zone of inhibition was measured individually and compared.

Anti-lice property

Anti-lice activity of the prepared formulations was performed by placing ten live lice in petri dishes containing 1 ml of 10 % of the formulation. The time taken by the last lice to the mortality [mortality was defined as lack of limbs and gut and failure to respond when the legs were stroked with forceps¹²] faint was checked and noted.

Result and Discussion

Natural products have been used in traditional medicine for thousands of years and recently have been evincing more interest. Natural source remain attractive primarily because they are inexpensive, less toxic, readily available, capable of multitude of chemical modifications, potentially degradable and compatible due to their natural origin when compared with synthetic products.,.

Ideal characteristics for shampoo is that it must clean hair and scalp without leaving the hair greasy or dry and unmanageable, it should have desirable hair conditioning action, it should not produce irritation in eye and scalp, in case of anti-dandruff shampoo it should not have side effects and prevent infection for a certain period after the shampooing, it should reduce the degree of itching, scaling and inflammation associated with the disease and it should be easily removed from the hair.

The prepared formulations were evaluated for its physical appearance visually for consistency.

The formulations were tested for ease of distribution, lathering power, ease of rinsing, ease of combing (wet), removal of oily matter, luster of hair, speed of drying, ease of combing (dry), pH and foaming power. The results are shown in Table 2.

The evaluation results revealed that formulation F1 took least time for distribution when compared to all other formulation. In lathering powder, marketed shampoo showed better results but Formulation F1 and F2 were creamy and matching the marketed products in consistency; whereas formulation F1 showed comparable foam stability with market formulation, whereas other showed less foam stability. In the case of ease of rinsing F1 was rinsed out quickly when compare to other formulations.

In ease of combing only control shampoo combed without friction whereas other formulations showed combing with friction. In removal of oily matter only partial grease was removed in all formulation; may be due to insufficient quantity of shampoo used for the evaluation.

In maintaining luster of hair all the formulations showed fairly good luster except the control. In speed of drying formulation F4 took more time whereas other formulations showed no difference in speed of drying. In the case ease of combing (dry) the formulations F1, F2 and F4 showed better result when compared to the other formulations including the marked products.

The pH of shampoo is important for improving and enhancing the qualities of hair, minimizing irritation to the eyes and stabilizing the ecological balance of the scalp. The pH of all the formulations was found to be between 7 and 8.5; which was neutral or slightly alkaline in nature. Also the marketed shampoo showed very good foaming power when compared to the prepared formulation whereas formulation F4 showed comparable foaming power with the marketed products.

The antimicrobial activity was carried out by zone of inhibition method using *S. albus* and *E. Coli*.

The marketed products showed better zone of inhibition; whereas the formulations showed slightly lesser zone of inhibition in *E. Coli*. Formulation F1 showed better antimicrobial activity for *Staphylococcus albus* when compare to all other formulations including marketed products. The results are shown in Table 3. The antimicrobial activity results are shown in Figure 1 and 2.

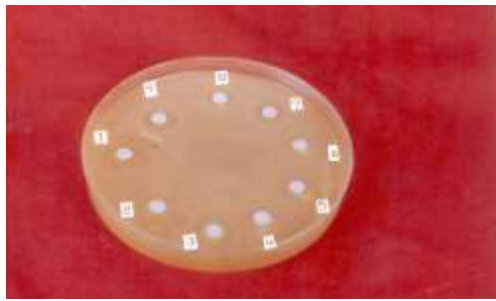


Fig.1 - Anti-microbial Action – Staphylococcus albus

1, 2, 3 & 4 – Prepared herbal shampoos, 5 – Control shampoo, 6, 7, 8 & 9 – Marketed shampoos



Fig.2 - Anti-microbial Action – Escherichia coli

1, 2, 3 & 4 – Prepared herbal shampoos, 5 – Control shampoo, 6, 7, 8 & 9 – Marketed shampoos

Anti-lice activity was performed by using live lice and measured the fainting time. The fainting time for Formulations F1, F2 and marketed products was found to be 5 min which was comparable one. The results are shown in Table 4.

Conclusion

From these results, the prepared herbal formulation were comparable to the marketed shampoos in many parameters particularly formulation F1. There is considerable awareness regarding the utility of herbs for the conditioning of hair. These herbal formulation showed excellent results and can easily be replaced to the available synthetic shampoos. The lather, stability of foam, removal of dirt etc. showed excellent results for formulation F1 that comprises of all the herbs. With regard to anti-lice (which is prevalent in tropical countries) and anti-microbial characteristics, the herbal shampoos showed excellent results without the addition of bacteriostatic agents. This formulation F1 can be extended for animal studies. The interference by sodium lauryl sulphate was minimal from the results observed.

References

1. Ashok Kumar, Rakesh RM. Evaluation Of Prepared Shampoo Formulations And To Compare Formulated Shampoo With Marketed Shampoos. International Journal of Pharmaceutical Sciences Review and Research. 2010; 3(1): 120-126.
2. Nasrin A, Eskandar M, Azadeh RD. Formulation of a Herbal Shampoo using Total Saponins of *Acanthophyllum squarrosum*. Iranian Journal of Pharmaceutical Research. 2007; 6 (3): 167-172.
3. Vijayalakshmi M, Periyannayagam K, Lakshmana Prabu S. *In vitro* Antilice activity of *Dichrostachys cinerea* (L.) Wight & Arn. Int J PharmTech Res. 2010; 2(4): 2210-2213.
4. Yang Y.C, Lee H.S, Clark J.M and Ahn Y.J, Insecticidal Activity of Plant Essential oils Against *Pediculus humanus capitis* (Anoplura:Pediculidae), J. MedicalEntomology, 2004, 41(4), 699-704.
5. Head Lice, Parasites and Health, 2004, 20, 1-2.
6. Robert, B., T. Henry, A. Melia (1999) in Medicinal Plants, Asiatic Publishing House, Delhi, Vol. I, pp.62.
7. Azadiracta, I. (1985) in, The Wealth of India, (Y.R. Chadha eds.) Publications & Information Directorate, CSIR, New Delhi, Vol. I, pp 504-511.
8. Ocimum, S. (1966) in, The Wealth of India, (S. H. Zaheer eds.) National Institute of Science Communication, CSIR, New Delhi, Vol. VII: pp 87-89.
9. Lawsonia, L. (1962) in The Wealth of India, (M.S. Thacker eds.) National Institute of Science Communication, CSIR, New Delhi, Vol. VI: pp 47-50.
10. Emblica, R. (2002) in The Wealth of India, (R.A. Mashelkar eds.) National Institute of Science Communication, CSIR, New Delhi, Vol. III: pp 75-78.
11. Harry, R.G. (2000) “Shampoos”, in “Cosmeticology”, (M.R. Martin eds.) Chemical Publishing Co., New York, pp 601-633.
12. Thompson, D., C. Lemaster, R. Allen, J. Whittam (1985) *J. Soc. Cosmet. Chem.* 36: 271-86.
13. Mainkar A.R., and Jolly C.I. International Journal of Cosmetic Science, (2000) 22(5), 385 – 391.
14. Clarke, J., C.R. Robbins, B. Schroff (1989) *J. Soc. Cosmet. Chem.* 40: 309-32.
15. Breuer M.M., (1981) *J. Soc. Cosmet. Chem.* 32: 437-38.
16. Griffin J.J., Corcoran R.F., Akana K.K., J. Chme., 54th ed., (1977) 553-554.
17. Domingo Campos F.J., R.M.D. Tanti (1983) *Cosmet. Toiletries* 98: 121-130

Table 1 - Different herbal shampoo formulations

Ingredients	Batch				
	F1	F2	F3	F4	F5
Neem extract (ml)	10	10	10	10	---
Mehandi extract (ml)	10	---	10	10	---
Thulasi extract (ml)	10	10	---	10	---
Gooseberry extract (ml)	10	10	10	---	---
Sodium carboxy methyl cellulose (%)	5	5	5	5	5
Sodium lauryl sulphate (%)	5	5	5	5	5
Egg white (ml)	5	5	5	5	5
De-mineralized Water	Quantity sufficient to produce 100 ml				

Table 2 - Evaluation of Shampoos

S.No.	Evaluation tests	Batch				Control	Marketed Products				
		I	II	III	IV		V	VI	VII	VIII	IX
1.	Ease of distribution	***	**	**	**	**	**	*	**	**	
2.	Lathering popup	Speed required	L	L	L	L	LT	LT	VL	LT	LT
		Creamy or Loose	CCC	CCC	LC	LC	LC	CCC	LO	CCC	CCC
		Stability	***	**	**	**	*	**	**	***	**
3.	Ease of rinsing	***	**	*	**	**	**	*	**	**	
4.	Ease of combing (wet)	**	*	**	**	***	**	**	**	**	
5.	Removal of oily matter	**	*	**	*	**	**	*	**	*	
6.	Luster of hair	**	**	*	**	***	**	**	**	**	
7.	Speed of drying (min.)	8	9	8	14	10	10	9	8	9	
8.	Ease of combing (dry)	**	***	**	*	*	**	*	**	*	
9.	pH	7	7.5	8	8	8.5	7	7	7	7	
10.	Foaming power (%)	12.5	16.25	15	120	25	120	100	150	200	

*** Best; ** Better; * Good.

Creaminess: L-Less Creamy; CCC-Highly Creamy; LT-Least Creamy; LC-Less Creamy; VL-Very Less Creamy and LO-Loose.

Table 3 – Anti-Microbial Activity For Liquid Cream Shampoo

Organisms	Batch - Zone of inhibition (in mm)								
	I	II	III	IV	V	VI	VII	VIII	IX
<i>Escherichia coli</i>	7	8	6	5	Nil	10	7	13	5
<i>Staphylococcus albus</i>	15	7	8	6	Nil	10	9	12	5

Table 4 – Anti-Lice Activity For Liquid Cream Shampoo

Organism	Batch - Fainting time of lice (in minutes)								
	I	II	III	IV	V	VI	VII	VIII	IX
Lice	5	5	10	12	30	7	5	5	10