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Formulation and Evaluation of Polyherbal Anti-Dandruff Shampoo and its Marketed Comparison

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ABSTRACT

The most popular type of hair treatment is shampooing. Shampoos are an aqueous or creamy soap or detergent solution for washing hair, cleaning of hair shaft and scalp. In the current environment, it appears unlikely that herbal shampoo will be popular with customers, despite the fact that it performs better and is safer than synthetic shampoo. A more extreme strategy to popularizing herbal shampoo would be to alter customer expectations of what a shampoo should be, with a focus on safety and efficacy. The goal of this research work was to develop and formulate herbo cosmetic prepration using antifungal drug and contain polyherbal ingredients in shampoo for cosmetic purposes. In this work replace dangerous synthetic ingredients in herbal shampoo formulations with a safe alternative. Natural anti- dandruff shampoo was developed by utilizing a anti-fungal herbs *Argemone mexicana and Caolotropis gigantea* and herbal ingredients such as *Spindus mukorrosi andAcacia concinna* and the resulting formulation was evaluation for pH, viscosity, foaming stability, and evaluation satisfaction. Dandruff is a widespread scalp ailment induced by the Malassezia furfur. It can be totally eradicated, however it can be efficiently regulated and handledby such approach. Several anti-fungal drugs are used in hair care preparations for the management of dandruff in the current study.

Keywords- Herbal shampoo, physicochemical approach, Anti-dandruff, *Malassezia furfur, calotropis gigantea, Argemone maxicana.*

I. INTRODUCTION

Dandruff is a skin disorder or disease that does not pose a major health risk but can cause embarrassment and a terrible social image. It cannot be denied that synthetic shampoo gives instant shine, lusture sometime helps to remove dandruff after wash also but the control and clinical cure are not completely addressed and reoccurrence is noticed, and hair becomes dry after prolong use together with many other scalp problems. Hair and skin care can boost one's self-esteem and represent one's social standing. Hair loss was discovered to be a serious issue for both men and women, and the majority of intellectuals would prefer to use herbal solutions for their hair and skin care.[1-8]

The development of such herbal cosmeceuticals hair care formulation at commercial level with certain more efforts, will help the people from non-life threatening common embarrassing situation and negative social image, which may arise due to dandruff and hair fall. Hair loss was discovered to be a serious issue for both men and women, and the majority of intellectuals would prefer to use herbal solutions for their hair and skin care. Natural ingredients in Herbocosmeceuticals are becoming increasingly popular, as most people now prefer natural products to synthetic chemicals for "hair" care in order to enhance their beauty or boost their confidence, as these products provide the body with nutrients and improve health, resulting in happiness. This can happen when a product has multiple intended applications. such as shampoo, which is a cosmetic because it cleans the hair, and antidandruff shampoo,

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which is a medication since it treats dandruff. The present study is an effort to promote green pharmacy.[10-15]

II. MATERIAL

Calotropis gigantean, *Argemone mexicana*, *Spindus muccorossi*, *Acacia concinna*, Citric Acid, Benzoic Acid, Methyl Paraben, Glycerin, Tween 80, Ethylene diamine tetra acetic acid

III. METHEDOLOGY

3.1 Collection of Plant Material

The leaves of *Calotropis gigantea and Argemone mexicana* were collected from waste land and road side wild area, Kanpur (U.P.) India, in the month of October 2018. After its collection, washed thoroughly with water to ensure the absence of foreign organic matter, fungi and other organism, 1kg of total leaves were collected for the present study **(**Orhevba *et.* al.2013).

3.2 Processing of Plant Material

The fresh leaves of *Calotropis gigantea* and *Argemone gigantea collected* were thoroughly washed with tap water and finally rinsed with distilled water. The leaves were tray dryer at 50-70º temperature and powdered by using electric grinder.

3.3 Sequential Extraction Method

Plant powder (25g) was extracted with 200 ml of four different solvents according to their increasing polarity i.e, Hexane, Chloroform, Ethyl acetate and Ethanol in a soxhlet apparatus at 60 degree C for 8 to 9 hrs. The mixture was stirred at 2 hours intervals using a sterile glass rod. At the end extract were concentrated with the aid of rota evaporator at (40-55º C). The concentrated extract was stored in cool place prior to use.[16-25]

3.4 Cold Maceration Process

In the process, coarsely powdered fruits of each 100 gram *Spindus mukorossi* and *Acacia concinna* stains were placed in a stoppered container with 70% ethanol (v/v) as a solvent and allow to stand for 72 hours and with the aqueous extract was filtered with what men filter paper and concentrated with rota evaporator to obtain semi solid mass.[26]

IV. CHARACTERIZATION OF SHAMPOO/EVALUATION OF HERBAL SHAMPOO

As well to ensure the quality of the products, specific tests for shampoo formulations including: surface tension, foam volume and foam stability, detergency, and preliminary stability study were also carried out[27-30].

4.1 Visual Appearance-

The formulation was observed for their physical appearance/visual inspection. The prepared formulations were evaluated in terms of their transparency, colour, foam producing ability and viscosity.[31]

4.2 Determination of pH-

The pH of shampoo solution (10% w/v) in distilled water was determined at room temperature. The pH was measured by pH meter (Mettler Toledo, USA).[32]

4.3 Percentage of Solid Contents

Four grams 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.[33]

4.4 Surface Tension Measurement

The surface tension measurement of the diluted shampoos (10% w/v in distilled water) was carried out at 20 °C using tensiometer and the data calculated by following equation given bellow. (Kumar A., et al 2010)[34,35].

$$R_2 = (W_3 \_ W_1)n_1/(W_2 \_ W_1)\, n_2 \times R_1$$

Where W_1 is weight of empty beaker.

W2 is weight of beaker with shampoo solution. N1 is no of drops of distilled water

N2 is no of drops of shampoo solution.

R1 is surface tension of distilled water at room temperature. R2 is surface tension of shampoo solution.

4.5 Wetting Time

The filter paper was cut into 1-inch diameter discs having an average weight of 0.44 g. The disc was floated on the surface of shampoo solution 1% w/v. (Khaloud A. B. *et.* al 2014)[36]

4.6 Measurement of Viscosity

The viscosity of the prepared formulations was measured at room temperature using a programmable rheometer (Brookfield DV-III Ultra, Brookfield Engineering Laboratories Inc., USA) fitted with a spindle type S 62 while set at different spindle speeds (Kadhim R. B., *et.* al 2011.)[37].

4.7 Dirt Dispersion

Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. One drop of India ink was added; the test tube was shacked for ten times. (Kumar A., *et.* al 2010, Kadhim R. B., *et.* al 2011, and Khaloud A. B. *et.* al 2014)[38].

4.8 Foam, Volume and Stability

Take 50 ml of the 1% shampoo solution was put into a 250ml graduated cylinder and covered the cylinder with hand and shake for 10 minutes. 1 minute shaking was immediately recorded (Kumar A., *et.* al 2010)

4.9 Detergency Evaluation

Although sebum removal was the primary aim of a herbal shampoo, experimental detergency test evaluation has been difficult to standardize, as there is

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no real agreement on a standard sebum, a reproducible sebum process or the amount of sebum a shampoo should ideally remove. Later, the approach turned to evaluating detergency using as little as 3gm of hair clippings obtained from salons, used hair tresses soiled with artificial sebum for evaluating detergency (Thompson *et* al. 2011).[39]

V. RESULT AND DISSCUSSION

5.1 Formulation of Anti Dandruff Herbal Shampoo-

Formulation and development of anti-dandruff herbal shampoo, firstly shampoo base was prepared with water. We had taken warm water composition and take 1% HPMC with slightly well mixing 15 minutes, then add up with slightly 5% sapindus mukorossi and 5% acacia concinna mix properly. One base is ready; other phase was prepared with also water in adjust with methyl peraben and pH maintained adding quantity of 1% citric acid solution. Then also added, antidandruff plant extract for herbal antidandruff shampoo formulation. Both phases were adding with slightly and prepared herbal shampoo volume was made up volume with 1%HPMC.[40]

5.2 Herbal Anti-Dandruff Shampoo Formulation

To formulate herbal shampoo base, Reetha and Shikakai extracts were prepared and were concentrated. Then definite amount of Reetha and Shikakai extract concentrate were dissolved in warm purified water and also added, antidandruff plant leaf extract of Argemone mexicana and calotropis gigaentea for herbal antidandruff shampoo formulation. Then in another aqueous phase H.P.M.C, methyl peraben and citric acid were added with slightly steering. Both phase were than mixed for 20minutes and final volume was adjusted up to 100ml.

Table 1: Composition of anti-dandruff herbal shampoo formulation

No.	Herbal shampoo formulation ingredients	(W/W) %	Use
1.	*Argemone mexicana* and *Calotropis gigantea*	25%	Plant extract
2.	*Acacia concinna*	5%	Detergent
3.	*Sapindus mukorossi*	5%	Anti-dandruff
4.	HPMC	1%	Natural thickening agent
5.	Citric acid	0.3%	Preservatives
6.	Methyl Peraben	0.05%	Preservatives
7.	Water	q.s.	Base

Table 2: Formulations of Shampoos

Ingredients	Function	Formulations (w/w) %								
		F1	F2	F3	F4	F5	F6	F7	F8	F9
SodiumLauryl Sulphate	Detergent	10%	20%	30%	-	-	-	15%	15%	-
Sodium chloride	Thickening agent	3%	3%	3%	-	-	-	1%	-	-
Hydroxypropyl methyl cellulose	Viscosity increasing, Thickening agent	-	-	-	-	-	-	-	1%	1%
Gelatine	Natural Gum	-	-	-	10%	20%	30%	-	-	-
Reetha	Foaming agent, detergent	-	-	-	5%	5%	5%	-	-	5%
Shikakai	Hair cleanser	-	-	-	5%	5%	5%	-	-	5%
Citric acid	PH adjuster & preservative	-	-	-	-	-	-	0.3%	0.3%	0.3%
Benzoic acid	Preservative	-	-	-	0.5%	0.5%	0.5%	-	-	-
Methyl peraben	Preservative	0.8%	0.8%	0.8%	-	-	-	-	-	0.5%
Glycerine	Humectant	-	-	-	-	-	-	1%	1%	-
Tween 80	Solubilizing Agent	-	-	-	-	-	-	1%	1%	-
EDTA	Sequestering agent	-	-	-	-	-	-	1%	1%	-
Water	Base	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s

F1, F2, F3, - 100 ml Synthetic shampoo preparation base.F4, F5, F6, - 100 ml Herbal shampoo preparation base. F7 - 100 ml synthetic shampoo preparation base. F8 - 100 ml synthetic shampoo preparation base. F9 - 100ml herbal shampoo preparation base.

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Table 3: Herbal Formulations

S.NO	INGREIDIENTS	FUNCTION	HERBAL FORMULATION (w/w %)				
			F6	F7	F8	F9	F10
1.	**Reetha**	Detergent	5%	5%	5%	5%	5%
2.	**Shikakai**	Cleaning agent	5%	5%	5%	5%	5%
3.	***Argemone Mexicana***	Plant Extract	-	-	-	-	25%
4.	***Calotropis gigantean***	Plant Extract	-	-	-	-	25%
5.	**Gelatine**	Thickening agent	10%	20%	30%	-	-
6.	**HPMC**	Viscous agent	-	-	-	1%	1%
7.	**Citric acid**	pH & preservative	-	-	-	0.3%	0.3%
8.	**Benzoic acid**	Preservative	0.5%	0.5%	0.5%	-	-
9.	**Methyl paraben**	Preservative	0.8%	0.8%	0.8%	0.5%	0.5%

5.3 Evaluation of Hair Care Herbal Shampoo Formulation

The prepared herbal shampoo formulation was evaluated for visual appearance. The formulated and marketed shampoos were evaluated for physical characteristics such as colour, odour and transparency. Our prepared herbal antidandruff shampoo was not transparent, it was dark brown and had good odour. No significant difference was observed in terms of odour, and detergency, foaming characteristics between commercial and formulated shampoo except for colour.

(A) Visual Appearance.

The formulation of herbal shampoo was prepared and visual appearance is dark brown colour, and its odour was characteristics.

Figure 1. F10 & F8 Prepared herbal shampoo and synthetic shampoo

Table 4: Evaluation of Formulation for physical appearance and pH

S.no	Formulation	Physical appearance	pH
1.	F1	White, thick , and characterstics	4
2.	F2	White, thick , and characterstics	4
3.	F3	White, thick , and characterstics	4
4.	F4	Dark brown, thick	5
5.	F5	Dark brown, thick	5
6.	F6	Dark brown, thick	5
7.	F7	Transeparent, viscous &characteristic	6
8.	F8	Transeparent, viscous &characteristic	6
9.	F9	Dark brown, viscous &characteristic	5.3
10.	F10	Dark brown, viscous & characteristic	5.3
11.	Marketed Dove shampoo	Pearlishwhite, viscous &characteristic	6
12.	Marketed Head & Shoulders shampoo	Light blue and characterstics	6
13.	Marketed Patanjali	Pearlish light green, and characterstics	6

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(b) Determination of pH

The pH of shampoo also helps controlled irritation to the eyes, we enhance the qualities of hair and maintain the ecological balance of the scalp.5.4 Ph. The pH of tested commercial shampoos was found within the preferred range (between 7 and 5). The acid balanced values were observed with commercial shampoos marketed shampoo -6, synthetic shampoo 6.) But the pH of F10 herbal formulated shampoo was found to be nearly neutral (6-5) (Tarun et al., 2014).

(c). Viscosity

The results of rheological evaluation showed that the viscosity of the samples changes gradually with the increase in rpm. Herbal antidandruff Formulation of shampoo (F5), synthetic shampoo formulation (F4) and marketed shampoo(F3,F2,F1) data showed the viscosity decreases with increase in rpm, these formulations showed pseudo plastic behavior which is a desirable attributein shampoos formulation. At low rpm the herbal shampoos showed high viscosity and increase in the shear rate the viscosity of the shampoos drops, this is a favorable property which eases the spreading of the shampoos on hair. The low range of rpm set was 6RPM and high rate of 12RPM(Singh *et.* al 2014).

Figure 2: viscosity of herbal shampoo by Brookfield viscometer.

Table 5: Comparison of herbal shampoo formulation with synthetic and marketedformulation.

S. No.	Measurement	DOVE	Head & Shoulder	PATENJALI Anti- dandruff	Synthetic Formulation (F8)	Herbal Shampoo (F9)	Herbal Shampoo (F10)
6 RPM							
1.	6 RPM	11356cP	1635cp	1520cp	1295cp	1085cp	1068cp
2.	TARC%	47%	33%	7.6%	12.4%	12.3%	14%
3.	Spindle No	62	62	62	62	62	62
4.	TEMP	28ºC	28ºC	28ºC	28ºC	28ºC	30ºC
12 RPM							
5.	12 RPM	12645cp	1783cp	1638cp	1362cp	1273cp	1185cp
6.	TARC	62%	52%	13%	23.4%	16%	16.8%
7.	Spindle No	62	62	62	62	62	62
8.	TEMP	28ºC	28ºC	28ºC	28ºC	28ºC	30ºC

(d) Percent Solid Content

Shampoo with high solid content will be very difficult to rinse and hard to work with the hair. The prepared herbal shampoo contains less % of solid content. Thus, they considered easy to wash out when having less solid content during preparation of shampoos. The %solid content is very less with Herbal shampoo formulation (F5) show **(**Vijyalaxmi *et.* al 2018**).**

(e) Foaming Ability and Foaming Stability

Foaming ability and foaming stability from the consumer point of view, foam stability is one of the important needs of a shampoo. Important parameter that was considered in the shampoo evaluation was determination of foaming stability. Data Comparison study with marketed, synthetic and herbal shampoo formulations result. Marketed shampoo was producing a foam with 1 minute in xxx ml (DOVE), xxx ml (H & SH) and xxx ml of (PATANJALI). The prepared shampoo generates uniform, small sized, compact, denser, and stable foam. The foam volume remains same throughout the period of about 5 min showing that the generated foam by the shampoo has good stability and the prepared shampoo exhibits higher foam property which present in shikakai and Reetha.

Table 6: Foam stability of herbal shampoo formulation and comparison with marketed shampoo

S. No	Formulations	Foam volume
1.	F1	215 ± 2.51
2.	F2	210 ± 2.51
3.	F3	220 ± 1.51

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4.	F4	188 ± 3.01
5.	F5	152 ± 2.0
6.	F6	155 ± 1.51
7.	F7	235 ± 1.51
8.	F8	235 ± 1.71
9.	F9	220 ± 1.51
10.	F10	240 ± 2.51
11.	DOVE	245 ± 2.51
12.	MARKETED H	245 ± 2.51
	& SH	
13.	Marketed Patanjali	230 ± 2.51

Table 7: Herbal hair care shampoo formulations and its evaluation

Parameter	Physical appearances	pH	Wetting test	Surface tension	Foam volume	Detergency test	Solid Content
FORMULATIONS							
F1	White, thick and characterstics	4	2±0.5	40.25±1.32	215 ± 2.51	45±0.32	4.35 ± 0.5
F2	White, thick and characterstics	4	2±0.57	42.58±4.4	210 ± 2.51	48± 1.52	6.5 ± 0.6
F3	White, thick and characterstics	4	2±0.57	54.12±4.1	220 ± 1.51	50± 1.7	5.8 ± 0.3
F4	Dark brown, thick	5	2±0.5	64.55±1.02	188 ± 3.01	34± 1.5	3.48 ± 0.27
F5	Dark brown, thick	5	3±0.5	54.4±.9	152 ± 2.0	66± 2.5	4.06± 0.14
F6	Dark brown, thick	5	2±0.5	64.07±0.9	155 ± 1.51	35± 2.08	4.30 ± 1.3
F7	Transeparent, viscous and characterstick	6	3±0.5	39.18±1.02	235 ± 1.51	38± 1.8	2.15 ± 0.3
F8	Transeparent, viscous and characterstick	6	2±0.5	37±2.51	235 ± 1.71	38± 1.5	2.48 ± 0.16
F9	Dark brown , viscous and characterstick	5.3	2±0.5	32.82±2.9	220 ± 1.51	50 ± 1.56	2.15 ± 0.19
F10	Dark brown , viscous and characterstick	5.3	2±0.5	31.89±1.5	240 ± 2.51	66±1.5	2.19± 0.15
MARKETED DOVE	Pearlish white, viscous and charactersticks	6	2±0.5	31.49±1.83	245 ± 2.51	77±1.5	2.98 ± 0.12
MARKETED H & SH	Light blue and Characterstics	6	2±0.5	32.57±1.5	245 ± 2.51	72±2.1	2.87 ± 2.51
MARKETED PATNJALI	Pearlish light green, and characterstics	6	2±0.5	31.42±2.85	230 ± 2.51	75±1.5	2.27 ± 2.51

(f) Evaluation of Detergency

Following are the steps for detergency evaluation test-

- Prepared artificial sebum was dissolved in n- hexane (20 ml) solvent
- Each 3 gm weight of artificial hair swatches was taken (fig.4).
- Each hair swatches were dip into sebum and keep it for15 minutes (fig.5).
- Each swatch was dip in artificial sebum and then

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dried for evaporation (fig.6)

- After the hexane has been evaporated, weighed the leftover sebum (fig.7).
- At last wash sebum with herbal, synthetic and marketed shampoo, and then compare the detergency with the following formula-

Detergency = 100 – (T x 100/C)

Where T is the weight of sebum in test swatch and C is the weight of sebum in controlswatch. (Saad H. A.et al 2011)

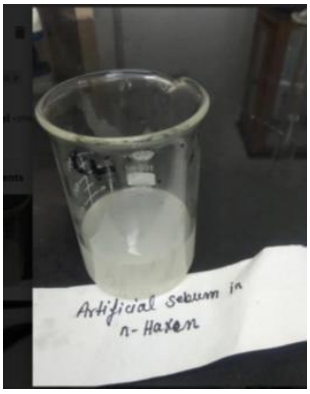

Figure:3

Figure:4

Figure:5

Figure:6

Figure:7

Figure:8

Table 8: Present Detergency test comparison with marketed formulation herbal shampoo formulation and synthetic formulation.

S. No.	Formulation	Detergency
1.	Marketed DOVE	77 ± 1.5
2	Marketed H &SH	75±1.9
3.	Marketed Patanjali	72±2.1
4.	F8	66± 2.5
5.	F9	50 ±1.56
6.	F10	66±1.5

VI. CONCLUSION

From this formulation study it can be concluded that the formulated anti dandruff herbal shampoos are better in a variety of aspects. The marketed synthetic shampoos have lots of synthetic compounds which can harm scalp and not treated dandruff. Further from the existing find out about it can be come to end that herbal anti dandruff shampoos are formulated and are recovered in overall performance as that of the marketed formulation but further lookup is required for the betterment of its quality. We formulated an anti-dandruff herbal shampoo containing Argemone mexicana, and calotropis gigantea, spindus mukorossi, and acacia concinna and leaves extract combination used for remove dandruff of human hair. It concludes that the formulated

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shampoo was safe and effective to use.Dandruff is a dermatological condition or disease which doesn't have serious threat to life but can lead to embarrassing situations and negative social image. It cannot be denied that synthetic shampoo give instant shine, lusture sometime helps to remove dandruff after wash also but the control and clinical cure are not completely addressed and reoccurrence is noticed, and hair becomes dry after prolong use together with many other scalp problems.It is required to have a green uprising which may definitely support our society to survive healthier and long established.

DECLARATIONS

Conflict of Interest –

No potential conflicts of interest are declared by the authors.

Ethical Approval –

This article does not contain any experiments involving human subjects or animals that were conducted by the author.

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