

Formulation & Evaluation of Herbal Shampoo

Samiksha Santosh Revanwar

Under the Supervision of **Prof. Zulekha Yasmeen** (Assistant Professor)

Bachelor of Pharmacy, Kishori College of Pharmacy

Pimpalner Road, Beed – 431122

Abstract:-

The objective of this study is to formulate and evaluate poly-herbal shampoo for cosmetic purpose from herbal ingredients. Hibiscus powder, Neem powder, Henna powder, Amla powder, Shikakai powder, Ritha powder, Alo-vera gel was procured from local market in powdered form also gel form Banyan root powder and Soya milk is prepared by homemade method, then prepared decoction of these ingredients and mixing with each other and evaluated for its organoleptic and physico-chemical characteristics. Herbal shampoo is used to cleansing of the hair also conditioning, smoothing, of the hair surface, good health of hair, hair free of dandruff, dirt rease and lice above all, it's safety benefits are expected.

The advantage of herbal cosmetics is their non-toxic nature, reduce the allergic reactions and time tested usefulness of many ingredients. Thus in present work, we found good properties for the herbal shampoo and further optimization study benefits of herbal shampoo on human use as cosmetic product.



Fig no: 1 shampoo

INTRODUCTION:–

Shampoos are most probably used as cosmetics. It is a hair care product that is used for cleaning scalp and hair in our daily life. Shampoos are most likely utilized as beautifying agents and are a viscous solution of detergents containing suitable additives, preservatives, and active ingredients. It is usually applied on wet hair, massaging into the hair, and cleansed by rinsing with water. The purpose of using shampoo is to remove dirt that has built up on the hair without stripping out much of the sebum. Many synthetic shampoos are present in the current market, both medicated and non-medicated; however, herbal shampoo has become popular due to its natural origin, which is safer, increases consumer demand, and is free from side effects. In synthetic shampoos, surfactants (synthetic) are added mainly for their cleansing and foaming properties, but the continuous use of these surfactants leads to serious effects such as eye irritation, scalp irritation, loss of hair, and dryness of hair. As an alternative to synthetic shampoo, we can use shampoos containing natural herbs. However, formulating cosmetic products containing only natural substances is very difficult. There are a number of medicinal plants with potential effects on hair used traditionally over years around the world and are incorporated in shampoo formulation. These medicinal plants may be used in extract form, their powdered form, crude form, or their derivatives.

To develop a shampoo containing only one natural substance which would be safer with a milder effect, then the synthetic shampoo is difficult and also it should possess good foaming, detergency, and solid content as such synthetic shampoo. Hence, we considered in detailing an unadulterated natural cleanser utilizing conventional technique using regularly utilized plant material for hair washing. A shampoo is basically a solution of a detergent containing suitable additives for other benefits such as hair conditioning enhancement, lubrication, medication etc. Now-a-days many synthetic, herbal, medicated and non-medicated shampoos are available in the market but popularity of herbal shampoo among consumers is on the rise because of their belief that these products being of natural origin are safe and free from side effects. Synthetic surfactants are added to shampoo primarily for the foaming and cleansing action but their regular use leads to dryness of hair, hair loss, irritation to scalp and eyes.

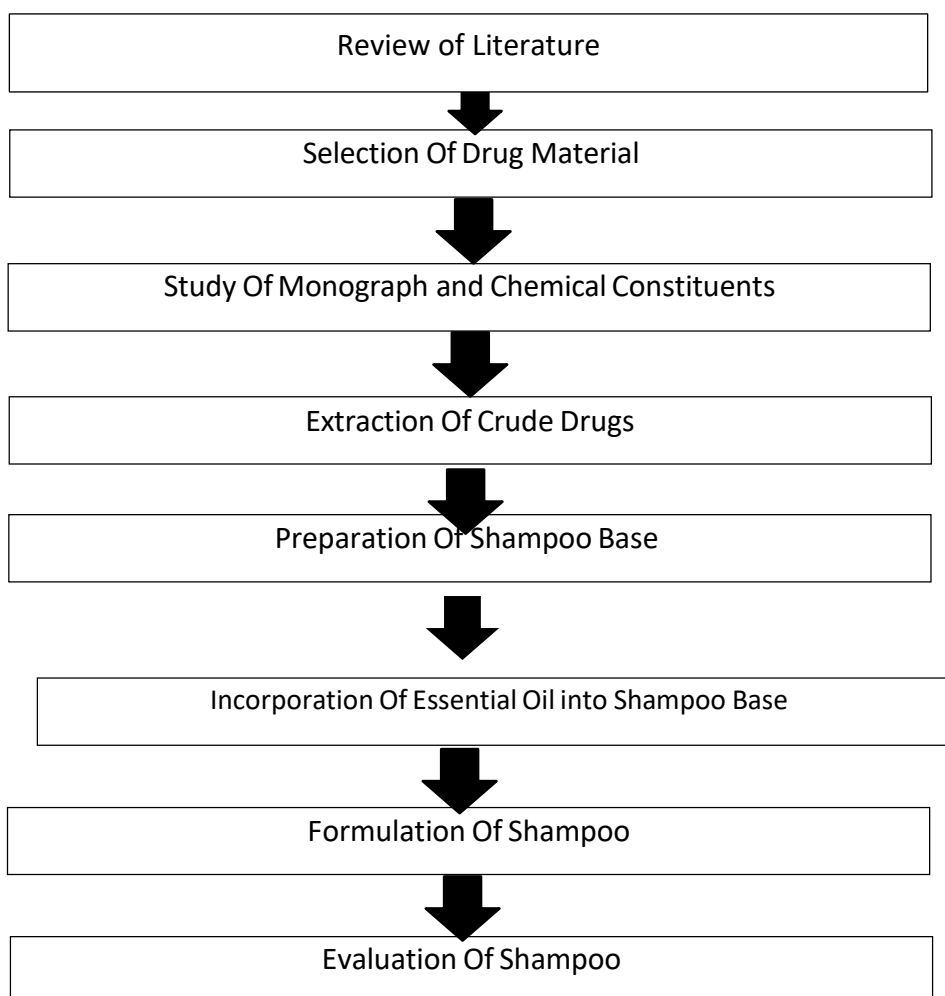
Herbal formulations are considered as an alternative to synthetic shampoo but formulating cosmetics using completely natural raw material is a difficult task. There are large numbers of medicinal plants which are reported to have beneficial effects on hair and are commonly used in formulation of shampoo. These plant products may be used in their powdered form, crude form, purified extracts, or derivative form. It is extremely difficult to prepare a herbal shampoo using a single natural material that would be milder and safer than the synthetic ones, and at the same time would compete favorably with its foaming, detergency and solid content.

We, therefore, considered to formulate a pure herbal shampoo using traditional and commonly used plant materials for hair washing in India and Gulf region especially in Oman.

LITREATURE REVIEW

- 1) Khaloud Al Badi, Shah Khan, "Formulation, evaluation A. and comparison of the herbal shampoo with commercial shampoo", BeniSuef University journal of Basic and applied science vol.3 pp.301-305, 2014.
- 2) Thitilertdecha N, Teerawutgulrag A, Kilburn J.D., Rakariyatham N. Identification of major phenolic compounds from *Nephelium lappaceum* L. and their antioxidant activities. *Molecules* Thitilertdecha N, Teerawutgulrag A, Kilburn 2010;15:1453-65.
- 3) Mahendran Sekar, And Haleeda Ageela Merican Noordin Nazaruddin Merican Noordin Formulation And Evaluation Of Herbal Shampoo Containing Rambutan Leaves Extract *Int J Pharm Bio Sci* 2016 Oct; 7(4): (P) 146 - 151.
- 4) Sachin Dubey, Neelesh Nema and S. Nayak "Preparation and Evaluation of Herbal Shampoo Powder" *Ancient Science of Life* Vol: XXVI (1) 2004 Pages 38 - 44
- 5) A.R. Mainkar and C. I. Jolly "Formulations of natural shampoo" *international journal of cosmetic science* vol. 23 2001 pages 59-62.
- 6) Gholamreza Dehghan Noudeh, Fariba Sharififar, Payam Khazaeli, Ehsan Mohajeri and Javad Jahanbakhsh Formulation of herbal conditionershampoo by using extract of fenugreek seeds and evaluation of its physicochemical parameters *African Journal of Pharmacy and Pharmacology* Vol. 5(22), pp.2420-2427, 2011.
- 7) Ashok kumar, Rakeshroshanmali, "Evaluation prepared Shampoo formulations and to compare formulated shampoo with marketed shampoo" *international journal of pharmaceutical science review and research*, vol. 3 pp 120-126, 2010.
- 8) Shah Prachi and Dasani Sonal, "Preparation of Herbello- An Herbal Antidandruff Shampoo" *IJPBS Volume 5* issue 2 pp 220-228, 2015.
- 9) Jaya Preethi P., Padmini K., Srikanth J., Lohita M., et al, "A Review on Herbal Shampoo and its Evaluation" *Asian J. Pharm.* Vol. 3 issue 4 Pg 153-156, 2013.
- 10) Richa Madhu Sharma, Kinjal Shah, Janki Patel, "Evaluation of prepared formulations and to compare formulated shampoo with marketed shampoos" *international journal of Pharmacy and Pharmaceutical sciences*. Vol.2 issue 4 pg. 402-405, 2011.
- 11) Shinde P.R., Tatiya A.U., Surana S.J., Formulation Development and Evaluation of Herbal Antidandruff Shampoo" *International Journal of Research in Cosmetic Science*, Vol. 3 issue 2 pg. 25-33, 2013.
- 12) Prabhat Desai, Shiny Phatarperkar, "Formulation and evaluation of Herbal Shampoo formulations and to compare formulated shampoo with Marketed Shampoos" *World journal of pharmaceutical sciences*, vol. 5 issue 9 pg. 1467-1477, 2016.258

PLAN OF WORK:



BENIFITS OF HEARBAL SHAMPOO: -

1. More Shine
2. Less Hair Loss
3. Long Lasting Colour
4. Stronger and More Fortified Hairs
5. All Natural, No Chemicals
6. Wont Irritate Skin or Scalp
7. Keep Healthy Natural Oil



Fig: 2 Amla



Fig no: 3 RITHA



Fig no: 4 Shikakai

FUNCTION OF HEARBAL SHAMPOO:-

- Lubrication
- Conditioning
- Hair Growth
- Maintenance of Hair Colour
- Medication.

DESIRED PROPERTIES OF HEARBAL SHAMPOO:-

1. Ease of Application
2. Removal of More Debris
3. Easy Wet Combing
4. Fragrance
5. Low Level of irritation
6. Well Preserved
7. Good Stability..

ADAVANTAGES OF HERBAL SHAMPOO:-

1. Pure and Organic Ingredient
2. Free from Side Effects
3. No Surfactants .



Fig no: 5 Natural shampoo

INGREDIENTS :-

Materials required	Quantity to beWeighed
Soap nut extract	0.5 g
Amla extract	0.5 g
Shikakai extract	0.5 g
Bhingraj extract	0.5 g
Retha extract	0.5 g
Gelatin	q.s
Lemon Juice	q.s
Rose Oil	q.s

TABLE NO : 1

USE OF INGREDIENTS:-

1. Soap Nut Extract –

- A. Stops Hair Fall
- B. Prevents Dandruff
- C. Fight Against Scalp Infection



Fig no: 6 soap nut extract

2. Amla Extract :-

- A. Strengthen the Scalp and Hair.
- B. Reduce premature pigment loss from hair, or greying.
- C. Stimulate Hair Growth. iv. Reduce Hair Loss.
- D. Prevent or treat dandruff and dryscalp.
- E. Prevent or treat Fungal and Bacterial hair and Scalp infections.
- F. Improve overall appearance of Hairs



Fig no:7 Amla Extract

3. Shikakai Extract :-

1. Cleanses Hair.
2. Add more Shine to the Hairs,.
3. Prevents Grays.
4. Crubs Hair Loss
5. Prevents Lice, Psoriasis, Eczema & Scabies.
6. Provides Nourishment to the hair and promote healthyand rapid hair growth.
7. Prevents Split ends.

**Fig no: 8 Shikakai Extract****5. Bhringraj Extract: –**

1. Treats baldness and helps in growth of hairs.
2. Makes Hair Lustrous

**Fig no : 9 Bhringraj Extract**

6. Senna Extract :-

1. Strong Hairs
2. Great Conditioner
3. Combats Hair Loss



Fig no : 10 Senna Extract

8. Gelatin: –

1. Gelatin Can improve hair thickness and growth.
2. Gelatin supplement or placebo for 50 weeks to 24 people with alopecia.
3. It gives thickness to hairs. iv. For strengthening of Hairs



fig no :11 Gelatin

9. Lemon Juice: –



1. Add More shine.
2. Get rid of dandruff
3. Split ends
4. Reduces Hair fall




1. Gives Natural colour to hairs
2. Detox the scalp
3. Promotes the growth of hairs
4. Great hair mask for dry and damage hair





Fig no : 12 Lemon Juice

DESCRIPTION OF THE INGREDIENTS –

SR.NO	COMMON NAME	PICTURES	BOTANICAL NAME	FAMILY	USED
	Hibiscus		Hibiscus rosa-sinensis	MALVOCEACE	Used to the conditioning agent
	Amla		Emblica officinalis	Phyllanthaceae	Used to the anti dandruff agent

	Shikakai	 Fig no: 3 RITHA	Acacia concinna	Mimosaceae	Used to anti dandruff agent
	Soapnut	 Fig no: 4 Sikakai	Sapindus Indica	Soapberry	Anti dandruff
	Bhringraj		Eclipta prostrate	Asteraceae	For hair growth

	Aloe vera		Aloe barbadensis	Asphudclacea	Nourshing hairs antidandruff
	Neem		Azadirachta indica	Mohogony	Dandruff and hair fall used

FORMULATION OF HERBAL SHAMPOO: –

Method :

- Accurately weigh all the required herbs extracts using weigh balance, added 10% gelatin solution into the herbal extract and mix. Gelatin solution is prepared by add 1gm of gelatin powder to 50ml of boiling water respectively if available.
- Above prepared solution completes the mixed by shaking the continuously at a time interval of 20 min., if heat required then heated properly on indirectly.
- Add 1ml or 3ml of lemon Juice was added with constant stirring.
- Then add the few drops of rose oil (perfume) using dropper to impart the pleasant fragrance to the shampoo prepared. - Then lastly check the pH level of prepared shampoo and adjust its pH, adding the citric acid and added methyl paraben as a preservative.
- Then perform the various evaluations tests of prepared herbal shampoo formulations.

	<u>Particulars</u>	<u>Uses</u>	<u>F1</u>	<u>F2</u>	<u>F3</u>
2.	Aloe(Aloebarbadensis) leaf	Conditioning,Hairlustring	2g	1g	0.5g
3.	Neem(Azardictaindica)leaf	Antiseptic and antibacterial	2g	1g	0.5g
4.	Shikakai(Acaciaconcinna) fruit	Foam base	2g	1g	0.5g
5.	Ritha(Sapindustrifolatus)fruit	Saponins	2g	1g	0.5g
6.	Amla(Emblia officinalis) fruit	Hairgrowthpromoter	2g	1g	0.5g
7.	Gelatin Solution	Base	2g	1g	0.5g
10.	Rose Oil	Fragrance	q.s	q.s	q.s
11.	Sodium Lauryl sulphate	Surfactant	15g	10g	5g

Table no : 2

EVALUATION OF HERBAL SHAMPOO :-

(I) Organoleptic evaluation :-

Organoleptic evaluation on the parameters like colour, odour taste and texture was carried out. Colour and texture was evaluated by vision and touch sensation respectively. For taste and odour evaluation a team of five taste and odour sensitive persons was formed and random sampling was performed.

(II) General powder characteristics:

General powder characteristics includes evaluation of those parameters which are going to affect the external properties (like flow properties, appearance, packaging criteria etc.) of the preparation. Characteristics evaluated under this section are powder form, particle size angle of repose and bulk density. Sample for all these evaluation were taken at three different level i.e. from top, middle and lower level.

A. Particle size

Particle size is a parameter, which affect various properties like spreadability, grittiness etc., particle size was determined by sieving method by using I.P. Standard sieves by mechanical shaking for 10 min.

B. Angle of repose

It is defined as the maximum angle possible in between the surface of pile of powder to the horizontal flow. Funnel method Required quality of dried powder is taken in a funnel placed at a height of 6 cm from a horizontal base. The powder was allowed to flow to form a heap over the paper on the horizontal plane. The height and radius of the powder was noted and recorded the angle of repose (θ) can be calculated by using the formula. Open - ended cylinder method ISSN 2320-5407 International Journal of Advanced Research (2015), Volume 3, Issue 3, 939- 946 942 Required amount of dried powder is placed in a cylindrical tube open at both ends is placed on a horizontal surface. Then the funnel should be raised to form a heap. The height and radius of the heap is noted and recorded. For the above two methods, the angle of repose (θ) can be calculated by using the formula. $\theta = \tan^{-1}(h / r)$ Where, θ – Angle of repose, h – Height of the heap, r – Radius of the base

C. Bulk density

Bulk Density is the ratio between the given mass of a powder and its bulk volume. Required amount of the powder is dried and filled in a 50 ml measuring cylinder up to 50 ml mark. Then the cylinder is dropped onto a hard wood surface from a height of 1 inch at 2 second intervals. The volume of the powder is measured. Then the powder is weighed. This is repeated to get average values. The Bulk Density is calculated by using the below given formula.

Mass of the herbal powder shampoo Bulk Density =
Volume of the herbal powder shampoo

A. Tapped density

The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample. After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped for 1 min and volume or mass readings are taken until little further volume or mass change was observed. It was expressed in grams per cubic centimeter (g/cm³).

B. Physicochemical evaluation pH

The pH of 10% shampoo solution in distilled water was determined at room temperature 25°C. The pH was measured by using digital pH Meter.

C. Washability

Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

D. Solubility

Solubility is defined as the ability of the substance to soluble in a solvent. One gram of the powder is weighed accurately and transferred into a beaker containing 100 ml of water. This was shaken well and warmed to increase the solubility. Then cooled and filter it, the residue obtained is weighed and noted.

E. Loss on drying

Loss on drying is the loss of mass expressed in percent m/m. Two gram of the powder was weighed accurately and transferred into a dry Petri dish. The Petri dish is placed in a dessicator for 2 days over calcium chloride crystals. Then the powder was taken and weighed accurately to find out the weight loss during drying.

F. Extractive values

Determination of alcohol soluble extractive 5 g of the each air dried herbal shampoo powder was weighed and macerated with 100 ml of Alcohol of the specified strength in a closed flask for twenty-four hours, shaken frequently during six hours and allowed to stand for eighteen hours. Filtered, by taking precautions against loss of solvent, 25 ml of the filtrate was evaporated to dryness in a tare flat bottomed shallow dish, and dry at 105 °C, to constant weight and weighed. The percentage of alcohol-soluble extractive with reference to the air-dried drug was calculated.

Determination of water soluble extractive Proceeded as directed for the determination of alcohol-soluble extractive, using chloroform water instead of ethanol. The percentage of water-soluble extractive was calculated for each sample.

G. Ash value

Total ash content Ash value is calculated to determine the inorganic contents which is characteristic for a herb. About 2 Gm of powder drug was taken in silicon dish previously ignited and weighed. Temperature was increased by gradually increasing the heat not exceeding to red colour. After complete burning, ash is cooled and weighed.

A. Dirt dispersion

Two drops of 1% each shampoo powders were added in a large test tube contain 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shaken for 10 times. The amount of ink in the foam of was estimated as None, Light, Moderate, or Heavy.

B. Moisture content determination

10 g of each herbal shampoo powder was weighed in a tare evaporating dish and kept in hot air oven at 105°C. Repeated the drying until the constant weight loss was observed after the interval of 30 minutes. The moisture content was calculated for each sample.

C. Wetting time

The canvas 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 of 1% w/v and the stopwatch started. The time required for the disc to begin to sink was measured acutely and noted as the wetting time.

D. Stability Study

Stability and acceptability of Organoleptic properties (odor and color) of formulations during the storage period indicated that they are chemically and physically stable

E. Nature of hair after washes

Nature of hair after wash can be done by collecting the responses of volunteers.

F. Foaming index

One gram of the powder was weighed accurately and transferred into 250 ml conical flask containing 100 ml of boiling water. Then it is warmed gently for 30 minutes, cooled and filtered and make up the volume to 100 ml in standard volumetric flask. This extract is taken in 10 test tubes in a series of successive portion of 1, 2, 3....10 ml and remaining volume is made up with water to 10 ml. Then the test tubes were shaken in longwise motion for 15 seconds at speed of 2 frequencies / second. Then the tubes are allowed to stand for 15 minutes. The height of the foam was measured. Foaming index = $1000/a$

G. Swelling index

The swelling index is the volume in milliliters occupied by one gram of a drug, including any adhering mucilage, after it has swollen in an aqueous liquid for 4 hour. Accurately weighed 1 g of the powder and transferred it into glass stopper measuring cylinder containing 25 ml of water. Then it is shaken thoroughly at every 10 minutes for 1 hour. After that it was kept for 3 hours at room temperature. The volume was measured in ml.

H. Skin/eye irritation test

The eye and skin irritation tests revealed that the herbal shampoo powder shows no harmful effect on skin and eye. This is due to the absence of synthetic surfactants. Most of the synthetic surfactants produce inflammation of the eyelid and corneal irritation. But in this formulation of herbal shampoo powder, the uses of all ingredients are obtained naturally. So it does not produce any harmful effect on skin

PHYSICOCHEMICAL PROPERTIES OF HERBAL SHAMPOO:-

<u>Evaluation test</u>	<u>Formulated Shampoo</u>
Colour	Brown
Transparency	Clear
Odour	Good
pH of 10% solution	7
Solid contents (%)	23.25
Foam volume (ml)	25
Foam type	Dense, small
Surface tension (dynes/cm)	35.18
Wetting time (s)	120 s

Table no : 3

LIMITATIONS OF HERBAL SHAMPOO:-

1. Natural products affect product uniformity, Quality control.
2. Seasonal variation of plant constituents.
3. Less stable, So preservatives should be added.
4. Vary in consistency from batch to batch.
5. Air loss shampoos contain essential vitamins and minerals, which supposedly can stop your receding hairline with regular usage.
6. Most of these shampoos are priced in between \$10-200 per bottle, which is why they are such an appealing choice to treat hair loss.
7. Plus, unlike other hair treatments, you can get shampoos in just about any retail store or online, which is convenient.
8. However, while inexpensive shampoos may seem promising as a simple solution to male pattern balding, many of them cannot back up their claims for the most part.
9. Additionally, many of the shampoo products on the market today contain sodium lauryl sulfate, which has been linked to a worsening of thinning hair in men.
10. Hair loss is a complicated situation and can be caused by any one of many things.
11. One of the most common causes is an imbalance in hormones, which cannot be treated by shampoos.
12. Specifically, high DHT levels are the most common cause of alopecia in men and no shampoo alone can block DHT from causing your hair to fall out if you are already experiencing it.
13. The major problem with shampoos is that they are merely topical cleansers; they cannot penetrate the scalp or hair follicles.
14. They can provide some level of DHT-reduction at the surface level, but it is minimal compared to taking an ingestible.
15. Topical treatment that is absorbed by the scalp. For this reason, the positive effects of what a shampoo can do to prevent further alopecia are limited.

RESULT: –

The shampoo was formulated by admixing the equal amount of the aqueous extracts of all the ingredients with soap nut. The above plant extract contains phytoconstituents like saponins which is a natural surfactant having detergent property and foaming property. An ideal shampoo must have adequate viscosity and many natural substances possess good viscosity. The gelatin solution (10%) behaves as a pseudoplastic forming clear solutions. Lemon juice (1 ml) added to the shampoo serves as anti-dandruff agent, natural antioxidant, and chelating agent and maintains the acidic pH in the formulation.

Evaluation of polyherbal shampoo powder

1) Organoleptic evaluation:-

Sr. no.	rganoleptic evaluation	Result
1	Colour	Yellowish green
2	Odour	Slight pleasant
3	Taste	Characteristics
4	Texture	Fine smooth

1) General powder characteristics:-

Sr no	Powder characteristics	Result
1	Particle size	25-20 micrometer
2	Angle of repose	a) $34^{\circ} 9'$ b) $31^{\circ} 3'$
3	Bulk density	0.354
4	Tapped density	0.340

a: Funnel Method;

b: Open ended cylinder method

Angle of Repose calculation of herbal powder

Sr no	Method	Height of cone (cm)	Radius of cone (cm)	$\tan \theta$ (h/r)	Average $\tan \theta$	$\theta = \tan^{-1} (h/r)$	Flow property
1	Funnel Method	2.7 2.6 2.6	3.9 3.8 3.8	0.692 0.684 0.684	0.686	$34^{\circ} 9'$	Good flow
2	Open ended cylinder Method	2.5 2.3 2.4	4.2 3.7 3.9	0.595 0.621 0.615	0.621	$31^{\circ} 3'$	Good flow

Bulk density calculation of herbal powder.

Sr no.	Bulk volume(ml)	Mass of powder (g)	Bulk density (g/ml)	Ave bulk density(g/ml)
1	45	16.2	0.36	0.36
2	46	16.2	0.352	0.354
3	46	16.2	0.352	0.352

Tapped density calculation of herbal powder

Sr no.	Tapped volume	of the powder	Tapped density (g/ml)	Ave tapped density (g/ml)
1	50	17.6	0.343	0.343
2	50	17.6	0.340	0.340
3	50	17.6	0.337	0.337

Physicochemical Property

Sr no.	ysiochemicalevaluation	Result
1	pH	5.5
2	Washability	Easily washable
3	Solubility	Soluble
4	Skin / Eye irritation	No harmful effect onthe skin
5	Foaming capacity	Good foaming
6	Extractive values	

CONCLUSION:–

The present study was carried out with the aim of preparing the herbal shampoo that reduces hair loss during combing, safer than the chemical conditioning agents as well as to strengthen the hair growth. Herbal shampoo was formulated with the aqueous extract of medicinal plants that are commonly used for cleansing hair traditionally. Use of conditioning agents (synthetic) reduces the protein or hair loss. To provide the effective conditioning effects, the present study involves the use of shikakai, amla, and other plant extracts instead of synthetic cationic conditioners. The main purpose behind this investigation was to develop a stable and functionally effective shampoo by excluding all types of synthetic additives, which are normally incorporated in such formulations. To evaluate for good product performance of the prepared shampoo, many tests were performed. The results of the evaluation study of the developed shampoo revealed a comparable result for quality control test, but further scientific validation is needed for its overall quality.

REFERENCES :–

1. Mainkar AR, Jolly CI. Formulation of natural shampoos. Int J Cosmet Sci.
2. Aghel N, Moghimipour B, Dana RA. Formulation of a herbal shampoo using total saponins of *Acanthophyllum squarrosum*. Iran J Pharm Res.
3. Potluri A, Asma SS, Rallapally N, Durrivel S, Harish GA. Review on herbs used in anti-dandruff shampoo and its evaluation parameters. Indo Am J Pharm Res.
4. Shinde PR, Tatiya AU, Surana SJ. Formulation development and evaluation of herbal anti-dandruff shampoo. Int J Res Cosmet Sci.
5. Firthouse PU. Effects of *Ocimum sanctum* and *Azadirachta indica* on the formulation of anti-dandruff herbal shampoo powder. Der Pharm Lett.
6. Pooja A, Arun N, Maninder K. Shampoos based on synthetic ingredients vis-à-vis shampoos based on herbal ingredients: A review. Int J Pharm Sci Rev Res.
7. Kapoor VP. Herbal cosmetics for skin and hair care. Nat Prod Radiance.
8. Khushboo PS, Jadhav VM, Kadam VJ, Sathe NS. *Psoralea corylifolia* Linn.- "Kushtanashini". Pharmacogn Rev.
9. Srivasuki KP. Nutritional and health care benefits of amla. J Pharm.
10. Roy RK, Thakur M, Dixit VK. Hair growth promoting activity of *Eclipta alba* in male albino rats. Arch Dermatol Res.
11. Tarun J, Susan J, Suria J, Susan VJ, Criton S. Evaluation of pH of bathing soaps and shampoos for skin and hair care. Indian J Dermatol.
12. Badi KA, Khan SA. Formulation, evaluation and comparison of the herbal shampoo with the commercial shampoo. Beni-Suef Univ J Basic Appl Sci.
13. Gaud RS, Gupta GD. Practical Physical Pharmacy. 1st ed. New Delhi: C.B.S. Publisher and Distributer;.
14. Mainkar AR, Jolly CI. Evaluation of commercial herbal shampoos. Int J Cosmet Sci.
15. Klein K. Evaluation of shampoo foam. Cosmet Toilet Mag.
16. Ali HS, Kadhim RB. Formulation and evaluation of herbal shampoo from *Ziziphus spinaleaves* extract. Int J Res Appl Pharm.

17. Boonme P, Pakpayat N, Yotmanee K, Kunlawijitrungsee S, Maneenuan D. Evaluation of shampoos containing silicone quaternary microemulsion. *J App Pharm Sci*.
18. Baran R, Maibach HI. Cosmetic dermatology in children. In: *Text Book of Cosmetic Dermatology*. 2nd ed. London: CRC Press; .
19. Ireland S, Carlino K, Gould L, Frazier F, Haycock P, Ilton S, et al. Shampoo after craniotomy: A pilot study. *Can J Neurosci Nurs*
20. Sarath C, Vipin KV, Ann RA, Lindumol KV, Arun S. Development and evaluation of anti-dandruff shampoo based on natural sources. *J Pharm Phytother* .
21. Teltscher, Kate (2000). "The Shampooing Surgeon and the Persian Prince: Two Indians in Early Nineteenth-century Britain". *Interventions: International Journal of Postcolonial Studies*.
22. American Heritage Dictionary of the English Language, 4th Edition, See Shampoo; Also see Shampoo. Hobson-Jobson (1903), University of Chicago.
23. Robbins, Clarence R., Chemical and physical behavior of human hair, 4th ed (Springer Verlag: New York) 200
24. The World of Hair, A Scientific Companion by Dr. John Gray, Macmillan Press Limited, 1977, pp. 23-24.
25. Gitanjali, Deokar; Prajakta, Pethkar; Swati, Bakshe; Kiran, Erande; Rajendra, Bhambar (15 July 2014). "Antimalassezia Activity of Medicated Anti-dandruff Shampoo Formulated with Microwave Dried Garlic Powder with Improved Allicin Stability". *The Natural Products Journal*.
26. Method for shampooing a pet using a foam-dispensed pet shampoo composition", issued 1997-04-23
27. Some of the information is collected from the college
28. Akula, NP (2015), "Preparation and evaluation of shampoo powder containing herbal ingredients", *Asian journal of pharmaceutical and clinical research*, Vol. 8(1), 266- 270.
29. Patil, SS; Mane, YJ and Mohite, SK (2015), "Formulation and evaluation of herbal shampoo powder", *International Journal of Advanced Research*, Vol. 3(3), 939-946.
30. Wani, S; Khot, N and Buchake VV (2014), "Preparation & evaluation of anti-dandruff polyherbal powder shampoo", *Pharmacophore (An International Research Journal)* Vol. 5(1), 77-84.
31. Fatima Grace X, Rahul Raj S, Sowmya KV, Reshma I, Shanmuganathan S (2015), "Development and evaluation of a polyherbal shampoo", *Adv J Pharm Life Sci Res*, Vol. 3(1), 13-16. Arora R et al *The Pharmaceutical and Chemical Journal*, 2019, 6(4):74-80
32. Maniker, AR and Jolly, CI (2001) "Formulation of natural shampoo", *Int J Cosm Sci*, Vol. 23(1), 59-62.
33. Mendhekar, SY; Tajane, AS; Shitole, PB; Jadhav S and Gaikwad DD (2017) "Formulation and evaluation of polyherbal shampoo and compare with marketed shampoos", *World Journal of Pharmacy and Pharmaceutical Sciences*, Vol. 6(12), 1388-1397.
34. Pandey, S; Meshya, N and D. Viral (2010), "Herbs play an important role in the field of cosmetics", *Int J Pharm Tech Res*, Vol. 2(1), 632-639.
35. Sutar, M; Deshmukh, S; Chavan, M and Singh, S (2013) "Preparation and evaluation of polyherbal shampoo powder", *International Journal of Pharmacy and Biological Sciences*, Vol. 3(2), 151-159.
36. Namita and Nimisha, (2013) "Formulation and evaluation of herbal shampoo having antimicrobial

potential”, International Journal of Pharmacy and Pharmaceutical Sciences, Vol. 5, (3), 708-712.

37. Badi, KA and Khan, SA (2014), “Formulation, evaluation and comparison of the herbal shampoo with the commercial shampoos” *beni-suef university journal of basic and applied sciences*3, 301-305.
38. Dash, GK and Noor Husna Nazirah Binti A. Razak, (2017), “Formulation and evaluation of a herbal shampoo” *Indo American Journal of Pharmaceutical Sciences*, Vol.4 (09), 2860-2865.
39. Deeksha; Malviya, R and Sharma PK, (2014) “Advancement in shampoo (a dermal care product): preparation methods, patents and commercial utility”, *Recent Pat Inflamm Allergy Drug Discov*, Vol. 8(1), 48-58.
40. Dessai, P and Phatarpekar, S (2016) “Formulation and evaluation of herbal shampoo formulations and to compare formulated shampoo with marketed shampoos”, *World Journal of Pharmacy and Pharmaceutical Sciences*, Vol. 5(9), 1467-1477.
41. Sharma, RM; Shah, K and Patel J, (2011), “Evaluation of prepared herbal shampoo formulations and to compare formulated shampoo with marketed shampoos” *International Journal of Pharmacy and Pharmaceutical Sciences*, Vol. 3(4),402-405.
42. Umbach W., (1991) “Cosmetics and Toiletries Development”, *Production and Use*,26.
43. Barel A.O., Paye M. and Maibach H.I., *Handbook of Cosmetic Science and Technology*. (2001) 423, 583-588, 773-775.
44. Utane, R; Deo, S and Itankar, P (2017) “Preparation of herbal shampoo (hs) by green method and their characterization” *International Journal of Researches in Social Sciences and Information Studies*, Vol. 5, 254-258.
45. Sharma, RM; Shah, K and Patel, J (2011) “Evaluation of prepared formulations and to compare formulated shampoo with marketed shampoos” *International Journal of Pharmacy and Pharmaceutical Sciences*. Vol.2 (4) 402-405.
46. Shinde, PR; Tatiya, AU and Surana, SJ (2013) “Formulation Development and Evaluation of Herbal Antidandruff Shampoo” *International Journal of Research in Cosmetic Science*, Vol. 3(2), 25-33.
47. Kumar, A and Mali, RR (2010) “Evaluation of prepared shampoo formulations and to compare formulated shampoo with marketed shampoos” *International Journal of Pharmaceutical Sciences Review and Research* Vol. 3(1), 120-126
48. Ireland, S; Carlino, K; Gould, L; Frazier, F; Haycock, P; Ilton, S; Deptuck, R; Bousfield, B; Verge, D; Antoni, K; MacRae, L; Renshaw, H; Bialachowski, A; Chagnon, C and Reddy, K (2007) *Can. J. Neurosci. Nurs.* Vol. 29(1), 14-9.