IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Formulation And Evaluation Of Polyherbal Shampoo And Conditioner Using Neem, Bhringraj And Reetha Extract

Prathmesh Yeole*, Varsha Waghmare, Parnavi Badgujar.
Department of Pharmaceutics, Konkan Gyanpeeth Rahul Dharkar College of Pharmacy & Research Institute, Karjat.

***Abstract* — Background:** Neem extract, which has antifungal and antibacterial qualities that aid in healing and soothing itchy scalps and preventing dandruff, is included in the formulated shampoo. Bhringraj extract boosts blood circulation to the scalp and roots, encouraging hair growth. Reetha extract is utilized as a foaming agent in the shampoo; it can be used as a hair cleanser and also aids in removing lice from the hair. Milk is an excellent natural moisturizer and conditioner for hair.

Aim: The goal is to formulate and evaluate an herbal shampoo with all of its properties using natural ingredients, focusing on effectiveness and safety.

Methods: Extracts of *Azadirachta indica, Eclipta prostrata, Sapindus mukorossi*, and powders of *Ocimum sanctum* and *Acacia concinna*, cow milk, honey, and distilled water were used in the formulation and subjected to Physical appearance, Determination of pH, Determination of solid content percentage, wetting time, Cleansing action, Foaming ability and foam stability, Stability study, Conditioning attributes, Skin irritation test, Density, Dirt dispersion test, Particle size determination.

Conclusion: The evaluation parameters met the criteria and were within the acceptance range.

Result: The prepared herbal shampoo and conditioner were found to be in the specified pH range, have good cleansing action, good wetting time, good stability, good density, good foam formation, desirable conditioning properties and, no skin irritation, no dirt dispersion.

Keywords: - *Azadirachta indica, Eclipta prostrata, Sapindus mukorossi, evaluation, herbal shampoo, Conditioner.*

1. INTRODUCTION:

Our condition plays an important role in our appearance and self-perception. The quantity, quality, and style of hair determine our social status [1]. Shampoo is the most commonly used cosmetic product. It is a hair care product used to clean the scalp and hair on a daily basis. Shampoos are used as beautifying agents and are viscous solutions of detergents containing additives, preservatives, and active ingredients. It is applied to wet hair and massaged into the strands before rinsing with water. The aim of using shampoo is to remove dirt accumulated in the hair without removing much sebum. Many synthetic shampoos are available on the market, with or without medication. However, herbal shampoos are popular because they

are of natural origin, are safer, increase consumer demand, and do not cause side effects [2]. Formulating cosmetics from completely natural ingredients is a difficult job. The challenge here is to select substances that can reasonably be considered natural and to formulate them into cosmetics whose functions match those of synthetic substances. Choosing the parameters to evaluate a shampoo is a tiring task simply because there are countless basic testing methods available for this purpose. A more radical approach to popularizing herbal shampoos would be to change consumer perceptions of the product, emphasizing safety and effectiveness [3]. The objective of the present research work is to develop and evaluate an herbal shampoo containing various herbs for multiple uses, excluding all synthetic ingredients combined with traditional. This shampoo removes sebum, dirt, and dandruff from hair, promotes hair growth, strengthens and darkens hair. In addition, it also acts as a conditioning agent. This herbal shampoo does all these things without affecting or damaging the hair [4].

2. METHODOLOGY:

Materials - SLES & CDEA were bought on Amazon.com, the powder of *Azadirachta indica, Eclipta prostrata* & *Sapindus mukorossi* were bought from the local market.

Neem, bhringraj & reetha extraction: The extraction process was carried out by the maceration method: 10 grams of powdered neem, reetha, and bhringraj is mixed with 70 grams of glycerine and 30 millilitres of distilled water. After three weeks, the extract is ready and is extracted with muslin cloth before boiling.

Aloe vera gel extraction: The clear aloe vera gel was collected from the aloe vera plant.

Table No- 01: Formulation Table

Sr.no.	Ingredients	Percentage
1.	Cow milk	10v/v
2.	Honey	10v/v
3.	Bhringraj extract	5v/v
4.	Neem extract	5v/v
5.	Reetha extract	5v/v
6.	Tulsi	6v/v
7.	Methi	5w/v
8.	Shikakai	6v/v
9.	Aloe vera	8v/v
10.	SLES	10w/v
11.	CDEA	10v/v
12.	Lemon oil	0.1v/v
13.	Distilled water	Q. S.

3. FORMULATION OF HERBAL SHAMPOO

3.1 Procedure:

i. Take 10ml of cow milk & 10 ml of honey in a mortar pestle.
ii. Add 5gm of methi powder to the mortar.
iii. Weigh 8 ml of aloe vera & add it to the mortar.
iv. Weigh 5gm of bhringraj extract, 5gm of neem extract, 5gm of reetha extract & add it to the mortar.
v. Add 6gm tulsi & 6gm of shikakai to the mixture.
vi. Add 10ml of CDEA & 10gm of SLES to the mixture.
vii. Add distilled water as needed to create homogeneous and smooth paste.
viii. Now add 2-3 drops of lemon oil as a preservative.
ix. Continue to stir it for some time to avoid the formation of any lumps.
x. Allow it to cool & evaluate.

4. EVALUATION OF HERBAL SHAMPOO

To evaluate the prepared formulation, a quality control test contains visual evaluation and physicochemical properties such as pH, density, viscosity, foam volume, foam stability and wetting time which were performed using standard procedures.

4.1. Physical appearance/visual inspection: The formulation prepared was evaluated for the clarity, colour, odour and foam producing ability and fluidity. [5]– [11]

4.2. Determination of pH: A 10% v/v shampoo solution was constituted in distilled water and the pH of the solution was measured by using a calibrated pH meter [5]– [12]

4.3. Determination of solid content percentage: Weigh a clean, dry evaporation dish and add 4 g of shampoo to the evaporation dish. The evaporation dish containing the shampoo is placed on the heating plate until the liquid has evaporated. The weight of the solid content in the shampoo was calculated after drying [5], [8]– [10], [12]

4.4. Wetting time: Wetting time was the time duration required for the fabric paper to completely sink. A sheet of cloth paper weighing 0.42 g is cut into a disk 1 inch in diameter. On the shampoo surface [1%v/v], the fabric paper disc was kept in place and the time for the paper to flow was measured with a stopwatch [5]– [7], [10].

4.5. Cleansing action: The cleansing properties of herbal shampoos were evaluated by applying the shampoo to unwashed hair for 7 days. Shampoo is used to wash the hair of people who have applied the oil 4 to 5 hours before washing. The effectiveness of shampoo is evaluated based on its ability to remove oily dirt on the scalp [5], [6], [8]– [10].

4.6. Foaming ability and foam stability: The cylinder shaking method was used to determine the foaming ability. Put 50 ml of 1% herbal shampoo solution into a 250 ml measuring cylinder, cover with your hands and shake for 10 minutes. The total amount of foam after 1 min of stirring was recorded. After stirring, the foam volume was recorded at 1-minute intervals for 10 minutes. The amount of foam remained constant for a period of 5 minutes, which shows that the foam produced by the shampoo has good stability and has higher foaming properties possibly due to the presence of soap nuts. 1 ml shampoo dissolved in 2 ml water and shook vigorously for 10 minutes to create 0.4 ml foam [5]– [8], [10]– [12].

4.7. Stability study: The stability of the formulation was studied for a period of 4 weeks by keeping at a temperature of 25- 30°C [5], [7], [8], [10]– [12].

4.8. Conditioning attributes: After washing the hair, the conditioning effects were evaluated. Hair conditioning properties include all the desired benefits for hair, such as increased hair volume, improved luster, softness and silkiness.[5], [10].

4.9. Density: Take the weight of an empty pycnometer, then fill it till the neck with shampoo and weigh it along with shampoo. Again, fill the pycnometer with water and weigh it [5].

$$\text{Density} = \frac{Weight\ of\ pycnometer\ with\ shampoo - Weight\ of\ empty\ pycnometer}{Weight\ of\ pycnometer\ with\ water - Weight\ of\ empty\ pycnometer}$$

4.10. Dirt dispersion test: In 10 ml of pure water, add two drops of shampoo and place in a wide mouth test tube. Add a drop of India ink to the prepared shampoo and shake for 10 minutes after closing the test tube. The volume of ink in the foam is measured and the results are classified as none, light, moderate or heavy [6]– [11].

4.11. Particle size determination: To determine the particle size & size distribution of a herbal shampoo by microscopy method [13].

5. RESULTS

1. **Physical appearance/visual inspection:** The herbal shampoo formulation obtained was brownish green in colour and has a slight odour.

Figure No. – 01: Physical Appearance of Shampoo.

2. **pH:** The pH of the formulation was 6.7, which is within the acceptable range for shampoos, which is 5 to 7.8. The effect of herbal shampoo is similar to the skin because it is acid balanced. pH of shampoo is important to enhance hair quality, maintain the ecological balance of the scalp and reduce eye discomfort.

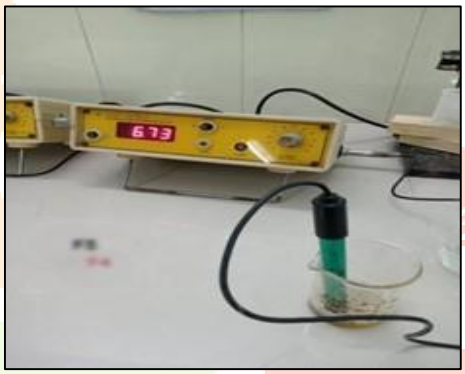

Figure No. – 02: pH of Shampoo.

3. **Percentage of solid content:** It will be difficult to massage the shampoo into your hair or rinse it off if the shampoo contains too many solids. The solids ratio gives a result of 4.5%.
4. **Wetting time:** The wetting ability of a surfactant depends on its concentration and is used to test its effectiveness. The wetting time of the herbal shampoo was 2.92 seconds, which is good.

Figure No. – 03: Wetting Time of Shampoo.

5. **Cleansing action:** Human hair that had been treated with oil and left unwashed for seven days was used to assess the cleaning activity. Detergency experiments' findings that the mixture could wash both oil and dirt out of hairs indicated that it had a considerable cleaning power. After shampooing, hair becomes silky and smooth, which is a result of the herbal shampoo's conditioning ability.

Figure No. – 04: Cleansing Action On Hairs.

6. **Foaming ability and foam stability:** One of the most crucial requirements for a shampoo, as seen by the consumer, is foam stability. Determining the foam stability of the shampoo was a crucial metric taken into account during examination. The shampoo formulation yields 40 millilitres of foam volume. The prepared shampoo produces compact, small, consistent, denser, and stable foam. Over the course of around five minutes, the volume of foam stays constant, indicating that the shampoo's created foam is stable and has higher foam properties.

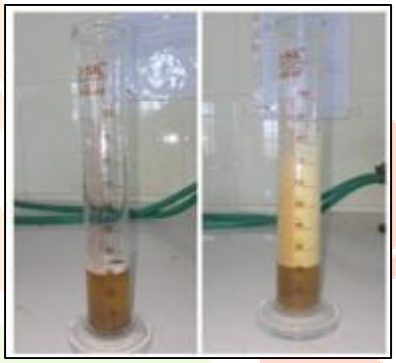

Figure No. – 05: Foaming Ability of Shampoo.

7. **Stability study:** During the storage period the formulation was found to be physically and chemically stable at typical room temperature of 25 to 30 °C, the herbal shampoo formulation is stable. It has good stability within two weeks of the stability study, according to the results.

8. **Conditioning attributes:** Several conditioning benefits were produced by the synthesized compound, such as increased hair mass and improved hair gloss. It also added luster, softness, and silkiness to hair.

9. **Density:** The density obtained was 0.95gm/ml which is good enough for its compactness.

10. **Dirt dispersion test:** In this test Indian ink was used and the volume of the ink in the test tube was measured & the result was graded as none.

Figure No. – 06: Dirt Dispersion.

11. Particle size:

Size range (µm)	Mean size range(d) (µm)	No. of particles (n)	Percentage particles (%)	nd	nd²	nd³	nd⁴
0-5	2.5	114	38%	285	712.5	1781.25	4,453.12
5-10	7.5	72	24%	540	4050	30,375	2,27,812.5
10-15	12.5	45	15%	562.5	7031.25	87,890.62	10,98,632.5
15-20	17.5	28	9.3%	490	8575	1,50,062.5	26,26,093.7
20-25	22.5	24	8%	540	12,150	2,73,375	61,50,937.5
25-30	27.5	13	4.3%	357.5	9831.25	2,70,359.3	74,34,880.7
30-35	32.5	2	0.6%	65	2112.5	68,656.25	22,31,328.1
35-40	37.5	2	0.6%	75	2812.5	1,05,468.7	39,55,076.2
40-45	42.5	-	-	-	-	-	-
45-50	47.5	-	-	-	-	-	-
50-55	52.5	-	-	-	-	-	-
55-60	57.5	-	-	-	-	-	-
		Σn = 300	-	Σnd = 2915	Σnd² = 47,275	Σnd³ = 9,87,968.62	Σnd⁴ = 2,37,29,214.52

Figure No. – 07: Particle Size.

1.Arithmetic mean diameter = $\frac{\Sigma\, nd}{\Sigma\, n} = \frac{2915}{300} = 9.71\mu m$

2.Surface length mean diameter = $\frac{\Sigma\, nd^2}{\Sigma\, nd} = \frac{47275}{2195} = 16.21\mu m$

3.Volume surface mean diameter = $\frac{\Sigma nd^3}{\Sigma\, nd^2} = \frac{9,87,968.62}{47,275} = 20.89\mu m$

4.Weight-moment mean diameter = $\frac{\boldsymbol{\Sigma nd^4}}{\boldsymbol{\Sigma nd^3}} = \frac{\mathbf{2,37,29,214.52}}{\mathbf{9,87,968.62}} = 24.01\mu m$

5. Surface number mean diameter = $\sqrt{\frac{\Sigma\, nd^2}{\Sigma\, n}} = \sqrt{\frac{47275}{300}} = 12.55\mu m$

6. The volume number mean diameter = $\sqrt[3]{\frac{\boldsymbol{\Sigma nd^3}}{\boldsymbol{\Sigma\, n}}} = \sqrt{\frac{\mathbf{9,87,968.62}}{\mathbf{300}}}$ 14.87µm

6. CONCLUSION:

Today's health and environmentally conscious consumers are getting more and more interested in natural products. Neem, Bhringraj, and Reetha extract is used to make a herbal shampoo, and evaluations were done for the following factors: physical appearance/visual inspection, PH determination, solid content percentage determination, wetting time, cleansing action, foaming ability and foam stability, stability study, conditioning factors, skin irritation test, density, and particle size determination. The evaluation parameter values were displayed with an acceptable range.Further studies are appreciated for comparing this preparation with marketed one and establishing some effective results for hair cleansing action and conditioning effect as well.

7. **ACKNOWLEDGMENT:** All authors acknowledge Dr. Mohan Kale, the principal of Konkan Gyanpeeth Rahul Dharkar College of Pharmacy & Research Institute in Karjat, Maharashtra, for providing constant encouragement and support.

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