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Research Article

Formulation, Evaluation and Comparative Study of Polyherbal Shampoo with Marketed Synthetic Shampoo

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Abstract

Shampoo is one of the most common form of taking care of hair for cleansing, remove dirt, grease and debris from the scalp. Polyherbal shampoos were prepared using extracts of *Phyllanthus embilica L*, Orange peel along with Lemon juice, Reetha powder in different concentrations. Visual assessment, pH, wetting time, detergency, foaming ability, viscosity, conditioning action were evaluated for formulated Polyherbal shampoo. The pH of shampoos produced with natural extracts is closer to the skin's pH of 5.0 to 6.0. The formulated shampoo has good rheological capabilities and is nearly identical to its marketed counterparts. The deeper areas of skin can be affected by synthetic surfactants like SLS, Span 20, and Tween 80, which can harm cell membranes. In our study powdered soapnut, sometimes called Reetha is used as natural detergent, the detergency percentage of F1 formulation was found to be 23.8%, which is satisfactory. Conditioning action of F1 and F2 formulation is found to be score 2.8 and 3, which is good while comparing with marketed shampoo. The manufactured shampoos were stable, unvarying, thicker and comparable as that of commercially marketed shampoos. The formulated polyherbal shampoos have consistent organoleptic properties, favourable pH, and good cleansing, detergency, conditioning, and foaming capabilities.

Keywords: Polyherbal, shampoo, detergent, hair, cosmetic, amla

1. INTRODUCTION:

Cosmetics are substances applied to the human body to improve its appearance or smell. Products designed to be applied on the body to enhance attractive traits, cleanse, beautify, or change appearance are called cosmetics. The definition of cosmetics is mildly abrasive substances that are applied on the skin by rubbing, sprinkling, or other techniques with the intention of cleaning, beautifying, and enhancing the attractiveness, changing the appearance, or maintaining the skin or hair in good condition, which is why a contemporary face powder combines a number of ingredients [1]. The human body component most vulnerable to filth, UV rays, pollution, and other environmental factors is still the hair and scalp. As a result of dirty hair, issues including dandruff, greying hair, itchy scalp, and alopecia are widespread across the globe. Shampoos are designed to do more than just clean overall hair; they also add appeal. The hair feels silky, lustrous, and manageable after using it [2]. There are numerous synthetic shampoos on the market, both medicated, non-medicated; however, Due to its natural origins, herbal shampoo has become more and more popular, is safer, raises demand from customers, and has no harmful effects [3]. Medications are one of the many ingredients used to make shampoos. These drugs have side effects such as hair loss, dry hair, and graying of the hair. Herbal ingredients' affordability, nontoxicity, and accessibility support their use in cosmetics. Because they contain vitamins, amino acids, sugars, glycosides, phytohormones, bioflavonoids, fruit acids, and essential oils, natural plant extracts have various benefits for skin and hair when added to hair formulations in traditional medical systems [4].

Hair has a significant role in a person's overall appearance and serves as a health indicator. The tissue known as epithelium, which is equivalent to the epidermis' cuticle, makes up hair. Hair lacks its own blood vessels and nerve supplies. The dermal layer provides the blood and nerve supplies. The pilosebaceous follicle in the dermis is where the three basic components of hair—the bulb, the root, and the stem-are implanted. The part of the hair that causes it to grow is called the bulb, which is also its deepest point. Even after being trimmed, it keeps growing. Color is determined by pigmentation. Hair shaft's makeup is composed of three sections: the cortex, the medulla, and the cuticle. The cuticle is an extremely resilient covering of dead cells that overlap and provide a barrier to guard against external aggressors and the outside world.

Endocuticle and exocuticle make up this structure. Smooth cuticles allow light to reflect off of them and reduce friction between the hair shafts. It does, in fact, give hair its sheen and texture. Keratin filament which is parallel to the longitudinal axis of the hair shaft, an amorphous matrix of high sulphur proteins, and densely packed, spindle-shaped cortical cells makes up the cortex. Specifically, cysteine residues in adjacent keratin filaments have a tendency to create covalent disulfide connections with strong crosslinks between neighboring keratin chains, which helps to provide the structure and shape. Hair can be categorized as coarse, medium, or fine and is made up of ceratoids or proteins [5].

The hair root spreads to form a spherical hair bulb at bottom of hair. Inside the back of the hair bulb is the hair papilla, which supplies blood to the hair root. In the hair bulb, closed to the papilla, new hair cells are constantly growing. The hair bulb is constantly producing new cells. These cells solidify and adhere to one another. This group of hardened hair cells gives rise to the entire hair strand. Over time, the hair is gradually forced upward out of the skin because newly formed, hardened cells continue to adhere to it from below. At the base of the hair, the hair root spreads and forms a spherical hair bulb. The hair papilla, which provides blood to the hair root, is located inside the back of the hair bulb. Newly grown hair cells are continuously proliferating in the hair bulb, which is closed to the papilla. New cells are continuously being produced by the hair bulb. These cells bind to one another and solidify. The complete hair strand originates from this collection of cells from stiffened hair. Newly created, hardened cells continue to stick to the skin from below, progressively forcing the hair upward out of it over time [6].

There are four stages in cycle of hair growth:

- Anagen or growth phase: This is the stage of growth. This stage takes several years to complete.
- Catagen or transitional phase: In this stage, the hair follicle shrinks and hair growth becomes slower.
- Telogenor resting phase: During this time, hair development ceases and new hair pushes out the old, beginning the growth phase.
- Exogen phase: The final stage of hair development cycle, during which the hair strand fully sheds from the scalp.

Polyherbal shampoo

Polyherbal shampoos are cosmetic products made with several traditional Ayurvedic herbs to cleanse the hair and scalp. They harness the power of multiple plant-based components to provide a comprehensive approach to hair health. They are employed to remove filth, oils, dandruff, pollutants from the environment, etc. Polyherbal formulations are thought to be a good substitute for synthetic shampoo, however it can be challenging to formulate cosmetics with just natural ingredients. Medicinal plants are often employed in shampoo composition because of their therapeutic benefits on hair. It is possible to use these plant materials as powder, crude, pure extracts, or derivatives [7].

Although making cosmetics using purely natural ingredients is challenging, polyherbal formulations are thought to be an alternative to synthetic shampoo. Making polyherbal shampoo in a blender is really challenging as it is a natural substance that would rival synthetic ones favorably in terms of detergency, foaming and solid content while also being kinder and safer. The potential of an ingredient to both prevent skin damage and enhance skin quality by washing, nourishing, and shielding the skin is taken into consideration when choosing main ingredients of hair care products [8]. Depending on the components, polyherbal shampoos can be basic or plain, antibacterial or anti-dandruff, or nutritional, vitamins, and amino acids, in order to meet stability standards. The main components of a shampoo are conditioning agents, active ingredients that promote hair growth, and additives that alter the effects of surfactant (such as foam stabilizers, viscosity control agents, and viscosity modifiers). Preservatives are also used, and fragrances and essences are incorporated into the product to make it stable and aesthetic. To improve the stability and safety of a shampoo composition, some of these ingredients must be added [9].

In contrast to synthetic shampoo, which contains chemicals derived from artificial sources, polyherbal shampoo is made entirely of natural materials. Since they are organic and derived from natural sources, they are safe. Since the majority of them have been put to the test and found to have positive features and health advantages, they are excellent for the overall hair. They are incredibly beneficial in treating and caring for the hair and scalp because of their vitamin, nutritional, conditioning, and moisturizing qualities [10].

2. MATERIALS AND METHODS:

The fresh fruits of *Phyllanthus embilica L* were collected from Medicinal Plants Garden of Girijananda Chowdhury University Tezpur, Assam, India and was authenticated at the Department of Botany, Gauhati University, Assam vide reference no. Herb./GUBH/2024/069. Orange peel, Lemon juice obtained from Tezpur Local market and other components used in this work are Laboratory and cosmetic grade.

2.1 Ingredients, chemicals and excipients used in the study

Table 1: Ingredients used in Herbal shampoo

S.N.	Name of Materials	Medicinal use	Source/Procured from
1.	Amla *Phyllanthus embilica L*	Anti-dandruff agent, promotes hair growth	Medicinal plant garden, GCU, Tezpur
2.	Orange peel	Anti-oxidant agent	Local vendor
3.	Lemon juice	Antimicrobial angent	Local vendor
4.	Reetha powder	Foaming agent	Beauty Herbal, Kolkata.
5.	Almond oil	Moisturizing agent	Pallav Chemicals & Solvents Pvt.Ltd
6.	Castor oil	Conditioning agent	Sisco Research Laboratories Pvt.Ltd
7.	Nigella seeds	Hair growth	Local vendor
8.	Guar gum	Thickening agent	Central Drug House (P) Ltd.
9.	Methyl paraben	Preservative	Sisco Research Laboratories Pvt. Ltd.
10.	Lavender oil	Fragrance	Manash Lifestyle Pvt. Ltd.
11.	Gelatin	Gelling agent	Citreos Fine Chem, Surat

2.2 Herbal extraction:

2.2.a *Extraction of Amla*

The fruits collected were subjected to distillation flask for the crude extraction in Soxhlet's apparatus. For extraction, the fruits of *Phyllanthus embilica L* were dried and powdered and 100g of powdered fruit was kept in a round bottom flask fitted with a reflux condenser and extracted with distilled water (250 ml) in Soxhlet's apparatus for 6-8 hours. The obtained extract (figure 1 and 2) was concentrated up to the semisolid form under reduced pressure in hot water bath and stored in a desiccator till further use [11].

Figure 1: Extraction of *Phyllanthus embilica L*

Figure 2: Extraction of orange peel

2.2.b *Extraction of Orange peel*

Ethyl acetate was infused to extract orange peels. 100ml of ethyl acetate was added to 35 g of dried orange peel in a stoppered glass bottle, which was then kept separately and covered for at least 12 hours.

2.2.c *Preparation of Lemon juice*

Fresh whole lemons were collected and washed properly. It was cut into pieces and the juice was strained out. The juice was then kept in a clean container and stored in a refrigerator till further use.

2.2.d *Preparation of 10% Gelatin solution*

For the preparation of 10% gelatin solution, 10 gm of gelatin was weighed and 100ml of distilled water was added to it with continuous stirring.

2.3 *Formulation of Polyherbal Shampoo*

The composition of a polyherbal shampoo was prepared as per the formula given in Table 2. A 10% gelatin solution was prepared, in which the guar gum was added and stirred continuously. After proper mixing, the herbal extracts of amla, reetha, orange peel, lemon juice and nigella seeds were accurately weighed and added and mixed continuously by placing the beaker on a magnetic stirrer. Olive oil and castor oil was then added

simultaneously by continuous stirring. Methyl paraben was added to prevent microbial growth or any undesirable chemical changes. To improve the fragrance in the formulation, a adequate amount of essential oil (lavender oil) was incorporated and the volume was made up to 100 ml with gelatin solution.

Table 2: Formulation of Herbal shampoo

S.N.	Materials required	Quantity(100ml)	
		F1	F2
1.	Amla extract	10gm	35gm
2.	Orange peel extract	15ml	10ml
3.	Reetha powder	15gm	20 gm
4.	Lemon juice	10ml	10ml
5.	Almond oil	10ml	5ml
6.	Castor oil	10ml	5ml
7.	Nigella seeds	1gm	1gm
8.	Guar gum	5gm	3gm
9.	Methyl paraben	0.5gm	0.5gm
10.	Lavender oil	q.s	q.s
11.	Gelatin	q.s	q.s

2.4 Evaluation of polyherbal shampoo and marketed shampoo

To understand the efficacy, quality, and performance of cosmetics, evaluation is crucial. It is also important to determine whether the products have any potentially harmful or sensitive impacts on the human body. The prepared formulation and marketed shampoo was assessed for the performance of the product, including the organoleptic characteristics, pH, physical characterization along with test for foamability, cleansing action and wetting timewas performed using standard protocol.

2.4.a ***Physical appearance /Visual inspection:*** The formulated herbal shampoo and marketed shampoo was evaluated based on their physical appearance in terms of colour, odour, texture and clarity [12].

2.4.b *Determination of pH:* The pH of the shampoos was determined at room temperature 25°C, by making a solution of 10% shampoo solution in distilled water, using a digital pH meter.

2.4.c *Determination of wetting time:* The amount of time required to completely sink the canvas paper was used to determine the wetting times of the commercially available shampoo and the polyherbal shampoo formulation. A 0.44-gram piece of canvas paper was cut into a 1-inch-diameter disc. The canvas paper disc was placed over the 1% shampoo solution, and the stopwatch was used to measure how long it took for the paper to sink [13].

2.4.d *Detergency evaluation:* Detergency action was evaluated by taking 5 grams of cotton ball were placed in oil, after that it was placed in 200 ml of water containing 1 gram of shampoo in a flask. The flask was shaken for 5 minutes continuously. After removing the solution, the sample was extracted, dried, and weighed [14]. The following formula was utilised to determine the quantity of grease removed:

$$DP = 100(1 - \frac{T}{C})$$

In which, DP is the percentage of detergency power, C is the weight of sebum in the control sample and T is the weight of sebum in the test sample.

2.4.e *Determination of solid content:* In this evaluation, firstly the weight of an empty, dry, clean evaporating dish was determined and recorded. After adding a sample of shampoo weighing roughly 4 g to the dish, the initial weight of the shampoo was ascertained by weighing the dish. The shampoo dish was set on a hot plate and allowed to completely evaporate in order to calculate the dried weight of the shampoo [15]. The following formula was used to get the proportion of solids.

$$Percentage\ of\ the\ solids = \frac{Dried\ weight\ of\ shampoo}{Initial\ weight\ of\ shampoo} \times 100$$

2.4.f *Determination of Foaming ability:* For determining the foaming ability, the cylinder shake method was employed in the foaming ability. 50 ml of the 1% shampoo solution was put to a 250 ml graduated cylinder, and the cylinder was then covered. The initial amount of foam created by the polyherbal shampoo and marketed shampoo was measured. The final volume was then recorded by shaking the measuring cylinder 10 times [5], and the foam formulation was calculated using the following formula:

Foam formation= Final volume of shampoo- Initial volume of shampoo

2.4.g *Determination of viscosity:* Brookfield viscometer (Model D 220, USA) connected with a spindle type T-96 and configured at different spindle speeds was used to measure the viscosity of each shampoo composition. The sample container's size and temperature remained constant throughout the experiment [13].

2.4.h *Determination of Surface tension:* Surface tension was measured using distilled water at room temperature and a 10% shampoo dilution. Because grease and other lubricants have a significant impact on surface tension, the stalagmometer was carefully cleaned using purified water and chronic acid [16]. The data obtained was calculated by following the equation given below:

$$R_2 = \frac{(W_3 - W_1)n_1}{(W_2 - W_1)n_2} \times R_1$$

Where,

W_1 is weight of empty beaker.

W_2 is weight of beaker with distilled water.

W_3 is Weight of beaker with shampoo solution.

n_1 is no. of drops of distilled water.

n_2 is no. of drops of shampoo solution.

R_1 is surface tension of distilled water at room temperature.

R_2 is surface tension of shampoo solution.

2.4.i *Determination of Conditioning action*: To determine the conditioning action of shampoo, an artificial hair tress belonging to an Indian woman was purchased from a nearby salon and separated into four swatches, each weighing 1.5g and measuring roughly 10 cm in length (three test and one control). The test swatch was the one that washed with the formulation and marketed shampoo, whereas the control swatch was the one that was left unwashed. The shampoo and water mixture (10:15) was added to each hair strand for two minutes in a conical flask, and 50 millilitres of distilled water were used for washing. The process was carried out a maximum of three to five times for each tree, which was allowed to air dry at room temperature. A blind touch test was used to assess the shampoo's conditioning impact in terms of smoothness and softness using stu dent volunteers; 20 numbers were chosen at random. All of the chosen students were asked to touch the hair that had been washed with the prepared shampoo in order to score the conditioning effectiveness of the shampoo on a scale of 1 to 4, where 4 means great, 3 means good, 2 means satisfactory, and 1 means bad [14].

3. RESULTS AND DISCUSSION:

Evaluation of polyherbal shampoo and marketed shampoo

The comparative effectiveness of formulated polyherbal and commercial shampoo was evaluated, the results of which are discussed below:

3.a Physical Appearance/ Visual Assessment

As with other cosmetic preparations, a shampoo should look fantastic. Shampoo formulation and marketing were evaluated based on physical attributes such color, texture, odor, and transparency. Both F1 and F2 reported that the freshly made shampoo was opaque, silky, and thick, with a good scent. The colour of shampoo for F1 was brown whereas for F2 it was dark brown whereas in case of the marketed shampoo it was discovered to be transparent, light orange in colour, smooth texture and had pleasant odour. Physical appearance are mentioned in table 3.

Table 3: Physical appearance of prepared formulated shampoo and marketed sample

S.N.	Specification	Formulated shampoo (F1)	Formulated shampoo (F2)	Marketed shampoo (VLCC)
1.	Colour	Brown	Dark brown	Light orange
2.	Odour	Pleasant	Pleasant	Pleasant
3.	Texture	Smooth	Smooth	Smooth
4.	Clarity	Opaque	Opaque	Transparent

3.b pH Determination

The pH is a crucial factor in evaluating shampoos since it causes skin and eye discomfort while being essential for healthy, lustrous hair and scalp tightness. The pH is one of the ways to minimize damage to the hair. Shampoo's pH improves hair's characteristics and preserves the scalp's natural equilibrium. The pH of both commercial shampoo and formulated herbal shampoo was found to be within the optimal range (between 7 and 5). The formulated polyherbal shampoo (F1) shows pH value of 5.33±0.57 and F2 shows a pH of 5.66±0.28 where as in case of marketed shampoo (VLCC), it shows a pH of 6.16±0.28 given in Table 4, which is nearby to the skin pH.

3.c Determination of Wetting Time

The concentration of a surfactant determines its wetting capacity. The lower the time required for sinking, the greater the wetting efficiency. The canvas disc method is an effective, quick, simple, and dependable, is used to assess the shampoo's wetting ability. The canvas was divided into discs with a diameter of 1 inch and an average weight of 0.44 gm. The disc drifted around on surface of Polyherbal shampoo solution (1%v/v) and as well as on the exterior of the marketed solution (1%v/v), and the stopwatch was made to start. The amount of time it took for the disc to start sinking was precisely measured and recorded. Every shampoo was discovered to wet in two to three seconds.The wetting time for the formulated polyherbal shampoos was found to be 3.83±0.57 for F1, 3.5±0.5 for F2 and in case of Marketed shampoo, it was found to be 2.33±0.57. It can be concluded that marketed shampoo contains the maximum concentration of detergents because it had the least wetting time as compared to the formulated shampoo which showed maximum wetting time (Table 5) so, it means that our formulated herbal shampoo has the least amount of detergent in it..

3.d Detergency Evaluation:

The detergency evaluation or cleaning action was tested on cotton ball in oil which is shown in figure 3. The primary function of a shampoo is to remove dirt or sebum from hair or to cleanse. A shampoo should be able to have a good detergency power which can range from 18-33%. The data show that the various shampoos

remove notably varying amounts of sebum. When compared to the marketed formulations, the final formulation's detergency ability was determined to be relatively similar, as demonstrated by the results of detergency testing, ranging from 18 to 33%. The results are presented in Table 5.

Figure 3: Detergency evaluation

3.e Determination of Solid Content

According to studies, show that shampoos with higher solids percentages are more difficult to remove from hair, while shampoos with lower solids percentages stay fluid and come off faster. Good shampoos usually have 20%-30% solid content as it is effortless to be applied and rinse out from the hair. In the same way that too many particles will be difficult to work into the hair or remove, too little solids will make the product too liquid and wash away too quickly. The percent solid contents of all tested shampoo was found within the range of 26%-29% indicating that they are simple to wash off (Table 5).

3.f Determination of Foaming Ability

The foam test was performed to evaluate shampoo formulations' foaming ability compared with standard marketed formulation. It was calculated by measuring foam height of all shampoo formulations. Although foam creation has nothing to do with how well shampoos clean, it is nonetheless significant since it matters a great deal to the customer. It was observed that the polyherbal herbal shampoo showed a foaming ability of 1-2cm while the marketed formulation showed around 9cm. A shampoo that foams well need not clean well, as there does not appear to be a direct association between detergency and foaming. The observed results are presented in Table 5.

3.g Determination of Viscosity

The shampoo's viscosity affects how easily it flows out of the container, how evenly it distributes when applied to hair, how long it lasts on its own, and how consistent the product is inside the container. The viscosity of the samples varies gradually with an increase in rpm, as demonstrated by the rheological evaluation results, indicating that the shampoo compositions were reliant on time. Second, the data indicated that viscosity decreased as rpm increased, indicating that the shampoo compositions were either pseudoplastic or shear thinning. The pseudoplastic behavior displayed by these formulations is a desired quality in shampoo formulations. The polyherbal shampoos had high viscosity at low rpm, and their viscosity increased as the shear rate increased. This is a beneficial characteristic that makes it easier to spread the shampoos across hair. The result of viscosity is listed on Table 5.

3.h Determination of Surface Tension

According to past studies, a perfect shampoo should be able to lower the surface tension of distant water from 72 dynes/ cm to around 40 dynes/cm. Reduction of surface tension is one of the mechanisms linked to deterrence. The good detergent effect of the polyherbal shampoos is demonstrated by the decrease in water's surface tension from 72.8 dynes/cm to 40.31 dynes/cm. The prepared formulations have the capability to reduce the surface tension. The values found to be between 40-41dyne/cm which shows that the prepared formulations has a good surfactant and detergency property and thus it helps in removal of dirt from hairs. While the marketed shampoo showed a surface tension reduction of water from 72.8 dynes/cm to 41.37dynes/cm. thus it can be concluded that the formulated shampoos has better surfactant and detergency property. The results are shown in table 5.

3.i Determination of Conditioning Action

The conditioning effect of each of the three shampoos was determined by tabulating the participants' mean ratings in Table 4. As anticipated, the control hair, which washed without shampoo, received the lowest possible score of 1.2 from the majority of volunteers who evaluated the formulated polyherbal shampoo's finest conditioning ability. The hair's conditioning effectiveness after cleaning with the specially developed polyherbal shampoo F1 scored 2.8 and F2 scored 3 out of 4, which was found to be more than the ratings of commercial shampoo scored 2.5. The outcomes showed that the polyherbal shampoo formulation had a high degree of conditioning performance. Conditioning test is shown in figure 4.

Table 4: Conditioning performance of formulated and marketed shampoo

SCORE	F1	F2	VLCC	CONTROL
1	1	1	1	15
2	4	3	4	5
3	12	11	10	0
4	3	5	3	0
Average	2.8	3	2.5	1.2

The mean score based on the opinion given by the volunteers from student population (n=20) on the conditioning effect of shampoos on the selected tresses. Score 1 - poor, Score 2 - fair, Score 3 - good, and Score 4 – excellent.

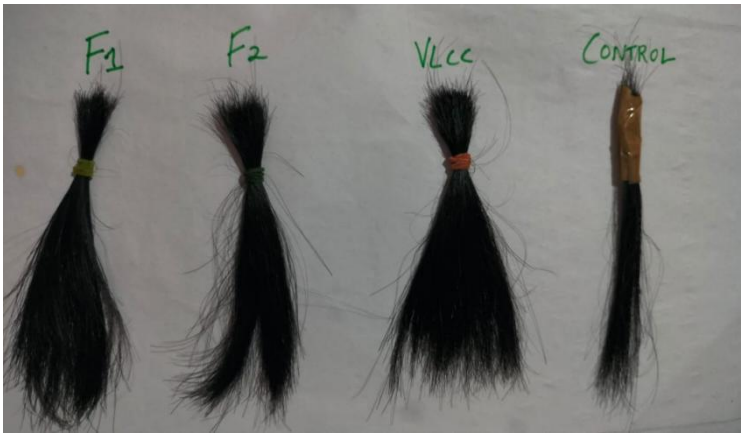

Figure 4: Determination of Conditioning action

Table 5: Physical evaluation of formulated polyherbal and commercial shampoo

SPECIFICATION	FORMULATED SHAMPOO (F1)	FORMULATED SHAMPOO (F2)	MARKETED SHAMPOO (VLCC)
Colour	Brown	Dark brown	Light orange
Odour	Pleasant	Pleasant	Pleasant
Texture	Smooth	Smooth	Smooth
Clarity	Opaque	Opaque	Transparent
pH(10% solution)	5.33±0.57	5.66±0.28	6.16±0.28
Wetting Time	3.83±0.76	3.5±0.5	2.33±0.57
Detergency action	23.83±5.69	22.29±3.89	25.53±0.93
% of Solid content	29.36±0.96	26.89±0.41	28.52±1.79
Foaming ability	1.63±0.05	1.76±0.05	9.6±0.1
Viscosity	14810cp	10380cp	1726cp
Surface tension	40.93dynes/cm	40.31dynes/cm	41.37dynes/cm
Conditioning action	2.8	3	2.5

Results are *mean±standard deviation (n=3).

4. Statistical Evaluation for Detergency:

The ANOVA testing results for the detergency values are as follows which are given in table 6.

Table 6: ANOVA testing result for detergency

Source	**Sum of Square**	**df**	**Mean Square**	**F-value**	**P-value**
Sample	15.7626	**2**	7.8813	0.4888	0.6358
Residual	96.7462	**6**	16.1244	**-**	**-**

Interpretation:

The **F-value** (0.4888) is low, indicating that the variation in detergency values between the formulations (F1, F2, VLCC) is not statistically significant.

The **p-value** (0.6358) is greater than 0.05, supporting the conclusion that there is no significant difference in detergency values among the three samples at the 5% significance level.

5. CONCLUSION:

The present study was carried out to prepare a polyherbal shampoo which has natural surfactant action as the marketed shampoo contains lots of synthetic ionic or non-ionic surfactant which is overall harmful to the skin as well as body. Formulators must educate consumers about the hazardous consequences of synthetic detergents and chemical additives in shampoos. The shampoo was formulated with the fruit

extract of *Phyllanthus embilica L* plant which is traditionally used to promote hair growth along with other ingredients like orange peel extract, reetha powder and lemon juice. The primary goal behind this investigation was to develop stable and effective shampoo. Different types of evaluation parameters were carried out to check the performance of the prepared polyherbal shampoo which was compared with the commercial shampoo (VLCC). The characterization test of the prepared polyherbal shampoo showed a comparable result to the marketed shampoo, but further studies and scientific validation will be required to assure its overall quality.

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