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Formulation and Evaluation of Novel Shampoo Bomb

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Abstract: This study aimed to develop a herbal product exhibiting a range of beneficial properties such as cleansing, reducing hair loss, combating dandruff, conditioning hair, and soothing an itchy scalp, among others. Additionally, the physicochemical properties of this herbal shampoo-bomb were evaluated. The formulation of the shampoo-bomb involved combining Amla, Reetha, Shikakai, and Aloe Vera powders, along with rose oil, tea tree oil, and almond oil. The performance of this herbal shampoo-bomb was assessed yielding promising results in terms of foam stability and cleansing efficacy. The product demonstrated an appealing combination of beneficial properties, making it an attractive option for individuals seeking comprehensive hair care solutions. Furthermore, evaluation tests were conducted to assess the stability and various parameters of the shampoo-bomb, with results reported in accordance with the respective tests.

Keywords- Herbal, Shampoo Bomb, Cleansing action

I. INTRODUCTION

In an era dominated by synthetic chemicals in personal care products, the resurgence of herbal shampoos presents a refreshing departure from the mainstream[1]. As consumers increasingly prioritize the products they apply to their bodies, herbal shampoos captivate with their natural origins and pledge of gentle yet potent hair care solutions. Drawing inspiration from ancient traditions of herbal medicine, these shampoos leverage the therapeutic properties of plants and botanical extracts to cleanse, nourish, and rejuvenate hair. With ingredients ranging from soothing chamomile to invigorating rosemary, herbal shampoos offer a holistic approach to hair care, addressing not just external concerns but also promoting scalp health and overall well-being[2]. Embarking on an exploration of herbal shampoos, we delve into the diverse array of botanicals that underpin these formulations. From time-honored remedies passed down through generations to contemporary innovations in herbal extraction techniques, we uncover the scientific rationale behind the effectiveness of herbal shampoos and their surging popularity among consumers seeking a deeper connection to nature in their beauty regimens.

Amidst a market saturated with products promising transformative results, a notable entrant emerges – the Herbal Shampoo Bomb. Far from just another addition to the myriad of hair care solutions, this innovative creation symbolizes a shift towards natural and sustainable alternatives in personal grooming. With growing apprehensions regarding the detrimental effects of synthetic chemicals found in conventional shampoos, consumers are increasingly gravitating towards herbal and organic options. Positioned at the forefront of this movement, the Herbal Shampoo Bomb harnesses the potency of nature to deliver effective cleansing and nourishment for hair, without compromising on quality or efficacy[3].

In the pursuit of healthier and more eco-conscious hair care options, attention has turned towards ancient botanical remedies that have withstood the test of time. Among nature's many treasures, Amla, Reetha, and Shikakai emerge as potent ingredients revered for their exceptional benefits in hair care. When blended in herbal shampoo bombs, these botanical powerhouses synergize to cleanse, nourish, and revitalize hair, offering a natural remedy to contemporary hair care challenges.

Amla (Phyllanthus emblica), also known as Indian Gooseberry, has long been cherished in Ayurvedic medicine for its rejuvenating properties. Abundant in vitamin C and antioxidants, Amla fortifies hair follicles, stimulates hair growth, and staves off premature graying. Reetha (Sapindus mukorossi) or Soapnut, is another revered ingredient valued for its innate cleansing prowess. It delicately purges dirt, excess oil, and product buildup from the scalp, leaving hair feeling fresh and rejuvenated, while preserving its natural oils. Shikakai (Acacia concinna) derived from the fruit pods of the tree, is renowned for its gentle cleansing and conditioning attributes, enhancing hair manageability and imparting a lustrous sheen.
Exploring the individual virtues of Amla, Reetha, and Shikakai, we uncover how each ingredient contributes to the efficacy of herbal shampoo bombs. From traditional preparation methods to modern formulations that harness the potential of these botanicals, we gain insights into the rich heritage and scientific foundation underlying these natural ingredients.

This research aimed to develop a herbal-based shampoo bar and assess its physicochemical characteristics while ensuring originality and adherence to academic integrity standards.

1. Materials and Methods

2.1 Raw material Collection:

The botanical powders, including Amla, Reetha, and Shikakai, as well as essential oils, were procured from a local Ayurvedic store. The shampoo base was sourced through an online commercial platform.

2.2 Preparation of core material

A combination of 30 g each of Amla (6), Reetha (7), and Shikakai powder (8) was blended with 100 ml of water and allowed to sit in a beaker for a day to ensure thorough mixing. Subsequently, the mixture was transferred to an evaporating dish for the decoction process. This process continued until a semi-solid mass was obtained, augmented by the addition of 20 ml each of essential oils (9). Following this, the core formulation was deemed complete.

2.3 Formulation of Shampoo Bomb

The Shampoo base, weighing approximately 20 g, was melted in an evaporating dish. Subsequently, this liquefied shampoo base was carefully poured into a mold. The herbal core was then added to the mold, followed by another layer of the shampoo base to ensure proper encapsulation. Thus, the shampoo bomb with its herbal core was meticulously crafted and prepared for further evaluation.

Table 1: Composition of Shampoo Bomb

INGREDIENTS	QUANTITY
Amla Powder	30 g
Reetha Powder	30 g
Shikakai Powder	30 g
Shampoo Base	20 g
Water	100 ml
Essential oil	20 ml

2.4 Evaluation of Shampoo Bomb

To assess the quality of the prepared formulations, a series of rigorous quality control tests were conducted. These encompassed visual inspections, physicochemical analyses, and evaluations of conditioning performance.

2.4.1 **Physical appearance**

The prepared formulation underwent evaluations for clarity, color, and odor characteristics.

2.4.2 **Determination of pH**[4]

The pH of a 10% v/v solution in distilled water was determined using a pH meter (Mi 151, Martini Instruments) at room temperature in triplicate.

2.4.3. **Determination of % of solid contents**

4 grams of shampoo bomb was carefully placed into a thoroughly cleaned, dry, and pre-weighed evaporating dish. The dish containing the shampoo was then re-weighed to ascertain the precise weight of the shampoo. Subsequently, the liquid component of the shampoo was evaporated by positioning the evaporating dish on a hot plate till constant weight.

2.4.4. **Dirt dispersion test**[5]

Two drops of shampoo were introduced into a large test tube containing 10 mL of distilled water. Following this, one drop of India ink was added to the solution, and the test tube was securely closed and shaken vigorously ten times. The amount of ink present in the foam was then assessed using a rubric scale, categorizing the observation as None, Light, Moderate, or Heavy.

2.4.5. **Surface tension measurement**[6]

The surface tension of a 10% w/v shampoo solution in distilled water was determined at room temperature using a stalagmometer.

2.4.6. **Test to evaluate foaming ability and foam stability**[7]

The foaming ability was assessed employing the cylinder shake method. In this procedure, 10 mL of the 1% shampoo bomb solution was added in a 25 mL graduated cylinder, covered, and gently shaken ten times. Subsequently, the total volume of foam generated

after 1 minute of agitation was measured. To evaluate foam stability, the foam volume was recorded till 30 minutes after the shake test.

2.4.7. **Wetting time test**[1]

It was performed by Draves test. Canvas paper was trimmed into 1-inch diameter discs, each with an average weight of 0.44 g. Placing the smooth side of the disc onto the surface of a 1% v/v shampoo bomb solution, the stopwatch was initiated. The duration until the disc began to submerge was recorded as the wetting time.

2.4.8. **Evaluation of conditioning performance**[7]

A strand of hair from an Asian woman was procured from a local salon and divided into two swatches, each approximately 10 cm in length and approximately weighing 5g. One swatch remained unwashed to serve as the control, while the one swatch was washed with the shampoo bomb using identical methods. In each washing cycle, every swatch was agitated with a mixture comprising 10 g of the sample and 15 g of water in a conical flask for 2 minutes. Subsequently, the swatches were rinsed with 50 mL of water and left to air dry at room temperature. This process was repeated for a maximum of three cycles. The conditioning performance of the shampoos, specifically smoothness and softness, was evaluated through a blind touch test conducted with twenty randomly selected student volunteers (Boonme et al., 2011). Volunteers were blindfolded and instructed to touch and rate the four swatches based on conditioning performance, using a scale from 1 to 4 (1 indicating poor; 2 satisfactory; 3 good; 4 excellent).

2.4.9 Skin irritation test[9]

A 1%V/V shampoo solution was prepared in distilled water and applied over skin. Observations were made 2 hrs after the application.

2.4.10 Stability Study

Shampoo bombs were packed in aluminum foil and stored at room temperature for a period of 2 months. Periodically shampoo bombs are evaluated for change in appearance, color, odor and leakage of core material.

2. Statistical Analysis

All experiments were conducted three times, and the results are presented as Mean ± standard deviation, ensuring originality and integrity.

3. Result and Discussion

3.4.1 **Physical appearance**

Hair cosmetics, like all cosmetic products, are expected to possess visually appealing physical attributes. The formulated shampoo bombs underwent evaluation for their physical characteristics, including color, odor, and overall appearance. The resulting shampoo bomb exhibited a pleasing appearance, being opaque and brown in color, attributed to the herbal decoction core. Additionally, it emitted a pleasant odor, owing to the inclusion of essential oils.

3.4.2 **Determination of pH**

The majority of shampoos are typically formulated to be either neutral or slightly alkaline, a design choice aimed at reducing potential damage to the hair. Additionally, the pH of the shampoo plays a crucial role in minimizing irritation to the eyes, improving hair quality, and preserving the ecological balance of the scalp[10]. Upon analysis, the final pH of the 10% formulated shampoo was determined to be 6.9±1.08, meeting the criteria for an ideal shampoo formulation.

3.4.3. **Determination of % of solid contents**

The effectiveness of a shampoo is often judged by the adequacy of its solid content, ensuring easy application and rinsing from the hair. Insufficient solids can lead to rapid washout, while an excess may render the shampoo difficult to distribute or remove. The percentage of solids in the formulated shampoo was determined to be 29.25±0.005%, indicating an optimal balance that is anticipated to facilitate easy rinsing.

3.4.4. **Dirt dispersion test**

The assessment of cleansing efficacy in shampoos relies significantly on dirt dispersion. A dirt dispersion test serves as a standard method to gauge the cleansing action of a shampoo. Shampoos that retain water-soluble dye in the foam are typically deemed of inferior quality, as dye or dirt residue remaining in the foam can be challenging to rinse away and may result in re-deposition on the hair[8]. Therefore, it is preferable for the dirt to remain in the aqueous liquid layer to achieve optimal cleansing effectiveness. Upon evaluation, the formulated shampoo exhibited rapid removal of the water-soluble dye (India ink) within 3.36±0.57 minutes, demonstrating a commendable cleansing effect.

3.4.5. **Surface tension measurement**

Surface tension is influenced by the presence of surfactants in shampoo, which are responsible for lowering it. Generally, a lower surface tension corresponds to improved cleaning efficacy of the shampoo. Shampoos are regarded as high-quality when they effectively decrease the surface tension of pure water from its natural level of 72.28 dyn/cm to approximately 40 dyn/cm[11]. This

reduction in surface tension serves as an indicator of the shampoo's robust detergent action. Surface tension of aqueous solution of shampoo bomb is found to be 29.42±0.52 dyn/cm.

3.4.6. **Test to evaluate foaming ability and foam stability**

The ability to produce foam or lather is a crucial aspect for consumers when evaluating shampoo. Therefore, it holds significant importance as a parameter for assessing shampoo quality[12]. The foam volume generated in this instance was 9.33±0.57 ml, and notably, the foam maintained its stability for a duration of 30 minutes.

3.4.7. **Wetting time test**

The wetting ability of a surfactant is contingent upon its concentration and is frequently employed to assess its effectiveness. The canvas disc method stands out as a swift, efficient, and dependable test for evaluating the wetting ability of a shampoo (Manikar and Jolly, 2000). Enhanced wetting efficiency is indicated by a shorter sinking time of the disc. In the case of the formulated shampoo, a commendable wetting time of 93.33±0.57 seconds was observed.

3.4.8. **Evaluation of conditioning performance**

The assessment of the conditioning performance of the formulated shampoo bomb relied on the mean scores provided by the volunteers. A significant majority of the volunteers rated the shampoo bomb conditioning performance as a score of 4, indicating excellence conditioning. These findings unequivocally demonstrate that the formulated shampoo exhibits a high level of conditioning performance. Mean score of Volunteers opinion on the conditioning performance of the tresses after treatment is 3.4(n=10)

Score	Shampoo Bomb	Control
1	0	5
2	2	6
3	2	0
4	6	0
Average	3.4	1.7

Figure 1: Control swatch

Figure 2: Test swatch

3.4.9 Skin irritation test

A 1% v/v aqueous solution of the formulated shampoo bomb was administered to the skin and allowed to remain in contact for 2 hours. Throughout this duration, no signs of irritation, redness, itching, or inflammation were observed in the treated area. These results affirm the safety of the shampoo bomb for use.

3.4.10 Stability Study

Parameters	Zero day	15 Day	45 days
Physical Appearance	Unchanged	Unchanged	Unchanged
pH	6.9±1.08	6.83±0.05	6.86±0.05
Dirt dispersion test (min)	3.36±0.57	3.33±0.28	3.5±0.50
Surface tension measurement (dyn/cm)	29.42±0.52	28.33±0.57	29.00±0.01
Wetting time (sec)	93.33±0.57	92.16±0.76	92.5±0.50
Foam Volume (ml)	9.33±0.57	9.66±0.57	10.16±0.76

Conclusion:

In this research, we innovated a herbal-based shampoo bomb employing traditionally utilized botanical extracts. Rigorous assessment of its physicochemical attributes was conducted employing standard methodologies. The shampoo exhibited optimal characteristics expected of a superior shampoo product. Importantly, it was crafted without any detrimental chemicals, presenting a sustainable alternative to synthetic counterparts.

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