



FORMULATION AND EVALUATION OF HERBAL SHAMPOO CONTAINING RAMBUTAN LEAVES EXTRACT

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ABSTRACT

Rambutan (*Nephelium lappaceum* Linn.) can be found widely in Malaysia, belongs to the family Sapindaceae. The leaves of rambutan are traditionally used for hair care and many people experience a noticeable change in their hair quality in just a few weeks. However, there is no study has been reported in herbal shampoo preparation containing rambutan leaves extract. The present study was aimed to formulate an herbal shampoo containing rambutan leaves extract and to evaluate its physicochemical properties. The herbal shampoo was formulated by incorporating the methanolic extract of rambutan leaves. Several tests such as visual inspection, pH, percentage of solid contents, foam ability and stability studies were performed to determine the physicochemical properties of the formulated herbal shampoo. The conditioning performance was evaluated by administering a blind test to 11 volunteers. The majority of the volunteers rated that the tresses washed with formulated shampoo was found to be 2.18 ± 0.40 . The results clearly indicates that the formulated shampoo is having a satisfactory conditioning performance level. All the ingredients used to formulate shampoo are safer and the physicochemical evaluation showed ideal results, but further research is required to improve its quality and identify the constituents that are responsible for the performance.

KEYWORDS: *Nephelium lappaceum*; Rambutan leaves; Herbal Shampoo



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INTRODUCTION

Herbal shampoo is a cosmetic preparation which uses herbs from plants and it is meant for washing of hair and scalp just like a regular shampoo. It is an alternative to the synthetic shampoo available in market. Herbalists today, believe in helping people build their good health with the help of natural sources.¹ Thus, the herbal shampoo is important as people nowadays prefer herbal products than chemical products because it is proved that herbs enhance health. During the past few decades, there has been a dramatic increase in the use of natural products in cosmetics.² This is because people are getting aware of the benefit of herbs in the products that they use daily such as cosmetic products. The awareness and need for cosmetics with herbs are on the rise, primarily because it is believed that these products are safe and free from side effects.² Rambutan (*Nephelium lappaceum* Linn.) can be found widely in Malaysia. Belongs to the family Sapindaceae, rambutan is in the same group with sub-tropical fruits such as lychee and longan.³ Rambutan has many biological activities beneficial to health. They also exhibit a wide range of biological activity, antimicrobial activity, anti-carcinogenicity and anti-proliferation and many biological activities can be attributed to their antioxidant properties.⁴⁻⁵ It is common for us to eat the fruits and the other parts of it are not fully utilized. Rambutan has been used as traditional medicine for centuries especially as a remedy for diabetes and high blood pressure.⁶ The leaves of rambutan are believed to be having several beneficial potentials in the scope of hair care and in medicine field. According to the beliefs of the community, rambutan helps them in various ways when used traditionally. The leaves of rambutan are traditionally used for hair care and many people experience a noticeable change in their hair quality in just a few weeks. However, there has been no reported study regarding the preparation of herbal shampoo containing rambutan leaves extract even though the leaves of rambutan were traditionally used for hair care. Hence, in this present study we are interested in formulating an herbal shampoo containing methanolic extract of rambutan leaves. The formulated shampoo also evaluated by using standard methods.

MATERIALS AND METHODS

Plant collection

The leaves of rambutan (*Nephelium lappaceum*) were obtained from a local area in Ipoh, Perak Darul Ridzuan and authenticated (Ref no: UniKL/RCMP/022).

Extraction

Rambutan leaves were washed under the running water to remove contaminants; it was dried under shade, coarsely powdered and extracted by cold maceration separately by agitation using 70% methanol for 7 days. The marc was squeezed out and filtered off. The combined filtrate was concentrated by allowing it to be evaporated from the petri dish. The concentrated extracts were stored in air-tight containers in a refrigerator at 4 °C until further use.

Qualitative phytochemical analysis

The methanolic extract of *Nephelium lappaceum* Linn. leaves were subjected to the phytochemical analysis by using various chemical tests to identify the phytoconstituents present in it.⁷

Tests for alkaloids: Dragendorff's test, Wagner's test, Mayer's test and Hager's test.

Tests for carbohydrates: Molisch test, Fehling's test and Benedict's test

Tests for Proteins: Biuret test, Xanthoproteic test and Lead acetate test:

Tests for steroids and sterols: Libermann-Burchard test and Salkowaski test.

Tests for glycosides: Legal test, Baljet test, Borntrager's test and Keller-Kiliani test.

Test for flavonoids: Shinoda test.

Tests for tannins: Lead acetate test and gelatin test.

Test for fixed oils: Spot test and saponification test

Formulation of herbal shampoo

The herbal shampoo was prepared by using primary emulsion method whose formula is shown in Table 1. The proportion of oil : water : gum is 4 : 2 : 1. The oil part comprised of castor oil and the methanolic extract of rambutan leaves. Polyethylene glycol (PEG) 400, glycerine, sodium lauryl sulphate and methyl paraben made the water part. The gum used was acacia and tragacanth in which resulted in the oil in water (o/w) emulsion. The final volume was made to 100 ml with PEG 400 and glycerine. Finally, the pH of the solution was adjusted by adding sufficient quantity of 1% citric acid solution. Few drops of essential oil were also added to impart aroma to the prepared shampoo.

Table 1
Composition of formulated herbal shampoo

Material	Quantity
Rambutan leaves extract	3 g
Castor oil	17 ml
Polyethylene glycol 400	2 ml
Glycerin	8 ml
Sodium lauryl sulphate	1%
Methyl paraben (0.05%)	1 ml
Acacia	3 g
Tragacanth powder	2 g
Citric acid	q.s
Essential oil	q.s

Evaluation of formulated shampoo

To evaluate the quality of prepared formulation, several quality tests were performed.

Physical appearance / Visual inspection

The formulated shampoo was evaluated for the colour, transparency, odor and foam producing ability.

Determination of pH

The pH of the 10% v/v shampoo solution in distilled water was determined using pH tester at room temperature.⁸

Determination of percentage of solid contents

In a previously clean, dry and weighed evaporating dish, 4 g of formulated shampoo were retained. It was then weighed again to confirm the exact weight of the shampoo. The liquid portion of the shampoo was evaporated by placing the dish on hot plate. The weight and percentage of the solid contents of shampoo left after complete drying was calculated.⁹

Foaming ability and foam stability

Cylinder shake method was used to test for the foaming ability. 50 ml of the 1% formulated shampoo solution was placed into a 250 ml graduated cylinder, covered with one hand and shaken for 10 times. After 1 min of shaking, the total volume of the foam content was recorded. Foam stability was valued by recording the foam volume after 1 min and 4 min of shake test.

Stability study

The stability study was carried out for the prepared shampoo at standard room temperature of 25 – 30 °C for 6 weeks.

Evaluation of conditioning performance

A hair tress of Malay woman was obtained voluntarily. It was cut into two swatches with approximately the length of 12 cm and the weight of 2 g. A swatch without washing served as the control. Another swatch was washed with the formulated shampoo. For each cycle, the swatch was shaken with the mixture of 10 g of a sample and 15 g of water in a conical flask for 2 min and then rinsed with 50 ml water. Afterward, the tress was left for air drying at room temperature. The tress was washed for maximum ten cycles. The conditioning performance of the shampoos i.e., smoothness and softness was evaluated by a blind touch test, administered to twenty randomly selected student volunteers. The consent form with test procedure was given to the student volunteers to get their permission. The under graduate students were voluntarily participated in this study. All the students were blind folded and asked to touch and rate the tress for conditioning performance from score 1 to 4 (1 = poor; 2 = satisfactory; 3 = good; 4 = excellent).

RESULTS AND DISCUSSION

The yield of methanolic extract of rambutan leaves was found to be 47.66% with respect to the dry weight of leaves powder. Various phytochemicals present in the leaves of this plant are responsible for the therapeutic effects. The preliminary phytochemical screening of methanolic extract of rambutan leaves showed the presence of alkaloids, carbohydrates, proteins, steroids, glycoside, flavonoids, tannins, fixed oils and saponins as in Table 2.

Table 2
Qualitative phytochemicals analysis of methanolic extract of Rambutan leaves

Phytoconstituents	Methanolic extract of rambutan leaves
Alkaloids	+
Carbohydrates	+
Proteins	+
Steroids and sterols	+
Glycosides	+
Flavonoids	+
Tannins	+
Fixed oils	+
Saponins	+

+ indicates present; - indicates absent

Formulation of herbal shampoo

The herbal shampoo was prepared by using primary emulsion method. This is for the purpose of ensuring stability and preventing incompatibility. A methanolic extraction procedure was done on the rambutan leaves as methanol proved to be the ideal solvent to produce a higher yield percentage of extract when compared to other alcoholic solvents. It is also good in preserving the antioxidants present in the rambutan leaves and has low free radical scavenging activity, suggesting it as the best extraction to promote the health benefits in rambutan leaves.¹⁰ The yield of methanolic extract of rambutan leaves was found to be 47.66% with respect to the dry weight of leaves powder. Castor oil is considered as a holy grail for hair for its natural properties that help to

boost hair and scalp health. It is made up of mainly ricinoleic acid or methyl ricinoleate that strengthens and moisturizes hair follicles and hair cuticles to prevent hair fall and dryness besides boosting hair volume. Polyethylene glycols or PEG-400 is used in the formulation as a binder, emulsion stabilizer, solvent, and humectant. It has low dermal toxicity and is not mutagenic or carcinogenic, making it safe for use and suitable for sensitive skin. Glycerin is a clear, colorless, viscous liquid obtained from natural sources and is used in the formulation as humectant to stop the shampoo from losing moisture prematurely besides acting as conditioning agent for hair and skin. Little amount of sodium lauryl sulphate was used to boost one of the phytochemicals of *Nephelium lappaceum* that is saponin

so that it possesses good detergency and foaming properties. The use of methyl paraben is for the purpose of further preserving the shampoo. Acacia gum is derived from *Acacia seyal* tree in Africa while tragacanth gum is obtained from the dried sap of Middle Eastern *Astragalus* legumes. The gums are used as natural thickener and emulsifier agents in the formulation as they are known to have moisturizing properties for hair. Citric acid was used so as to adjust

the pH to the desired level. Few drops of essential oil were also added to impart aroma to the prepared shampoo.

Evaluation of shampoo

The formulated herbal shampoo containing rambutan leaves extract was evaluated for several physicochemical tests and the results were discussed below and shown in Table 3.

Table 3
Physicochemical evaluation of formulated herbal shampoo containing Rambutan leaves extract

Parameter	Results
Colour	Brown
Transparency	Opaque
Odour	Good
pH (10% solution)	5.5
Percentage of solid contents	26.08%
Foam producing ability	Yes
Foam volume (ml)	6 ml
Foam type	Small, compact, dense and uniform
Foam stability	Good

Physical appearance / Visual inspection

As any other cosmetic products, the attractiveness of shampoos for consumers tends to be judged visually, thus having good physical appearance is important. Our formulated shampoo as shown in Figure 1 was opaque

and brown in colour. It has a good odour given by the fragrance in the ingredients and also a good foam producing ability. The formulated shampoo was observed to be significantly different with commercial shampoo in terms of color and transparency.¹¹



Figure 1
Formulated herbal shampoo containing rambutan leaves extract

pH

The pH balance of products is important as it affects the skins and surfaces as they are being used. The pH of our formulated shampoo was 5.5, falling within the ideal pH range for shampoo which is between 5 and 7.⁸ It is noted that the formulated shampoo is slightly acidic.

Percentage of solid contents

The percentage ranges of solid contents of well-prepared shampoos are between 20 to 30%. Basically, low amount of solid will result in watery formulation that is capable of being washed away too quickly. However, if too many solids are present, it will be hard to wash out. The formulated herbal shampoo using rambutan leaves extract was found to be having solids contents of

26.08% and it is suggestive that it can be washed out easily.

Foam ability and foam stability

One of the imperative parameter in evaluation of a shampoo is the lathering or mostly described as foaming. The herbal shampoo using rambutan (*Nephelium lappaceum*) leaves extract resulted in the formation of small, compact, dense and uniform type of foam. The foam volume remained unchanged within the 5-minute time frame suggesting that the foams produced have good stability.

Stability study

The formulated herbal shampoo using rambutan leaves extract is chemically and physically stable at standard room temperature of 25 – 30 °C. Several parameters such as physical appearance, odour, and colour of the

prepared shampoo were noticed and the results shown in Table 4 indicate that it possesses good stability within the 6 weeks of stability study.

Table 4
Stability study of formulated herbal shampoo

No.	Parameter	2 weeks	4 weeks	6 weeks
1	Physical appearance	/	/	/
2	Odor	/	/	/
3	Colour	/	/	/

Note: / means as characteristic

Conditioning performance

Conditioning performance of the formulated shampoo on both controlled and tested tress was shown in Table 5 (Figure 2). The majority of the students rated that the tresses washed with formulated shampoo were found to be 2.18 ± 0.40 . The students rated the unwashed tresses higher and it was noted that they preferred the

feel of the unwashed tresses than the tresses washed with the formulated shampoo. It was also observed that the washed tresses were slightly coarser than the unwashed ones. The results indicated that the formulated shampoo has satisfactory conditioning performance.¹¹



Figure 2
Assessment of the controlled and tested tress for conditioning performance

Table 5
Mean score of student volunteers opinion on conditioning performance of the tresses after treatment with shampoo (n=11)

Score	Formulated herbal shampoo	No washing
1	0	0
2	9	0
3	2	8
4	0	3
Mean	2.18	3.27
Standard deviation	0.40	0.47

(1 = poor, 2 = satisfactory, 3 = good, 4 = excellent)

CONCLUSION

The present study, we formulated an herbal shampoo containing rambutan leaves extract which is traditionally used for hair cleansing in Malaysia. All the ingredients used to formulate the shampoo are safer than generic commercial shampoos and the physicochemical evaluation showed ideal results, but further research is required to improve its quality especially on the conditioning performance and to identify the constituents which are responsible for the performance.

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CONFLICT OF INTEREST

All the authors declared that there is no conflict of interest.

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