

The Herbal Extraction of Cinnamon and Banyan Root Shampoo on Scalp by Cationic Polymer Effect

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Abstract: *The shampoo sector probably the largest unit sale among the hair care product. Now days the synthetic preservative and detergent have sometime has been the cause of adverse effect among consumer, the synthetic ingredient is by incorporating natural extract whose functionally is comparable with their synthetic ingredients. The cationic polymer play an important role in providing many of those feature. Cationic polymers are perhaps the most often and abundantly used polymer in hair care formulations. The polymer structure is designed with a large hydrophobic chain attached to a quaternary nitrogen group carrying a positive charge. Featuring a positive charge, cationic polymers bind to the keratin protein of hair by an electrostatic chemical bond due to its opposing negative charges. The quaternary nitrogen group attaches these polymers to the strand's surface while its long hydrophobic chain adds conditioning and detangling benefits to hair. Modern shampoo contains a wide variety of ingredients and other active ingredients but there is still a need a conditioning polymers. The polymers adsorb cationic moiety and is responsible for reduced friction between hairs. So the aim of study is to assess the conditioning efficacy of cationic polymers and to investigate their mechanism in a shampoo system.*

Keywords: cationic polymer, cinnamon bark, banyan root, shampoo, herbal extract etc

1. Introduction

Hair care and treatment has evolved significantly through the years as new formulations are continuously being explored in an attempt to meet the demand in cosmetic and medicinal fields. While standard hair care procedures include hair washing, aimed at hair cleansing and maintenance, as well as hair dyeing and bleaching formulations for hair embellishment, modern hair treatments are mainly focused on circumventing hair loss conditions, strengthening hair follicle properties and treat hair infestations. However, several challenges still persist, as conventional AC formulations exhibit sub - optimal performance and some may present toxicity issues, calling for an improved design of formulations regarding both efficacy and safety, Every hair care product must possess a suitable viscosity for it to be used effectively and remain stable during storage if not, results may be unsatisfactory or the entire product could become compromised over time. Viscosity - boosting polymers are used in hair shampoos, creams, and styling formulations. When selecting a polymer, there are various factors to consider such as the product type, desired viscosity level, and its compatibility with other ingredients. When selecting a polymer for a certain formulation, the desired result should be taken into account. Additionally, it is essential to consider the chemical properties associated with that specific class of polymer to achieve the most accurate outcome. For example, incorporating thickening polymer can significantly increase the product's viscosity and provide a desirable gelling effect. When it comes to hair care formulations, polymers are the popular choice. Not only do they stabilize and detangle strands, but they also offer a boost in mechanical strength as well as make styling effortless. Plus, your everyday grooming will be easier than ever. Scientific reports have evaluated their efficacy and have found them effective in controlling hair damage and boosting overall hair quality. Today, polymers have become essential elements of the majority of hair care products. It is truly remarkable to note the tremendous effect

that these incredible molecules are having on hair care research and development polymer not only help to reduce oil droplet size in water and decrease the water surface tension but also act as catalyst for greater emulsification that helps maintain product stability.

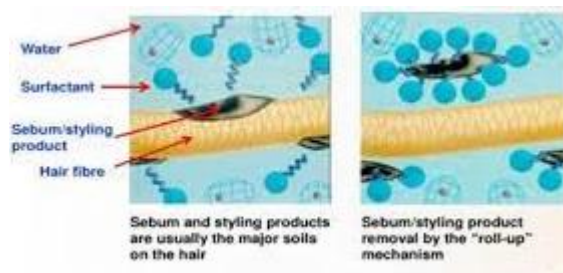


Figure 1: Cleansing mechanism of Shampoo

2. Materials and Methods

Cinnamon bark extract, banyan root extract Rose petal powder, cetosteryl alcohol, Glycerin, Purified water, shikakai extract, methyl Paraben, Propyl Paraben, Polyquaternium 44, Quaternized vinyl imidazolium salt, Guar Hydroxypropyl Trimonium Chloride etc.

Preparation of extract:

The extract was prepared by simple maceration. Firstly we were take 20 gm powder of plants such as cinnamon bark and banyan root they were dried pulverized in air, and then they were soaked with 200ml of water for 48hr. after 24hr solvent was decanted and the residue again soaked with the same solvent for 24hr. The total extract was combined and filter then the evaporation of solvent was done on heating mental this was dried and stored in desiccators for further use.

Formulation of Herbal Shampoo:

For Preparation of Shampoo saponification is done. The plant extract is added into the water to beaker and start agitation continue stirring while sprinkling in the cationic polymer once the polymer is completely dispersed adjust pH between 4 to 5 for cationic Guar Hydroxypropyl Trimonium Chloride polymer Polyquaternium7& 44 and Quaternized Vinyl Imidazolium salt. The rose petal powder and methyl and propyl paraben are dissolved separately in sufficient volume of water and then added to main solution. The whole solution is mixed well by gentle stirring excessive stirring may lead to bubble formation final volume of the preparation is usually adjusted by addition of clear sterile waste the gives clear liquid shampoo however, when the preparation contain shikakai extract it is required to adjust the viscosity of the shampoo viscosity adjustment is done by using an electrolyte solution. Finally under warm condition, the mixture is transferred into a suitable container and packed.

Formulated hair shampoo samples and the controls.**Table1:** Formulations of Herbal Shampoo

Sample	Shampoo Formulation
F1	Shampoo containing 0.125% herbal extract of formulation
F2	Shampoo containing 0.25% herbal extract of formulation
F3	Shampoo containing 0.50% herbal extract of formulation
F4	Shampoo base, without Cationic polymer
F5	Shampoo containing Herbal extract with cationic polymer
F6	Good Virtues Co Anti - Dandruff Care shampoo

**Figure 2:** Formulation of Shampoo**Evaluation parameter of shampoo:**

Physical Compatibility Test: Physical compatibility between the extract and Banyan root and cinnamon bark excipients was determined during the pre - formulation of shampoo. Banyan root and cinnamon bark extract was blended with each excipient in an equal amount. The mixtures were then transferred into universal bottles, respectively. The resulting mixtures were divided equally into two sets: control to be stored at room temperature, and test samples to be placed in the stability chamber at 40 °C and 75% relative humidity (RH) compared with the control samples to identify physical changes, such as colour, odour, texture, homogeneity, and phase separation weekly for a period of four weeks.

Physical Appearance: The formulated shampoo were observed for their visual appearance, transparency, colour, consistency etc.

pH – The pH of formulated shampoo was determined by using digital pH meter by dissolving 1gm shampoo in 100ml of water

Consistency - The consistency of formulated cream were determined by hand. Take pinch of shampoo and rubbed it with finger.

Percentage solid content –

The percentage solid content was determined by weighing about 4g of shampoo in evaporating dish. The liquid portion of shampoo was evaporated by placing in heating mental. Finally the weight and percentage of solid present in shampoo was calculated for complete drying.

Antimicrobial Activity –

In this method the agar is melted, cooled at 45°C, Inoculate with the test microorganism and then pour in the sterile petri plate. In this method when the agar plate has been solidified then holes about 9mm in diameter in the medium with sterile cork borer, Then the antimicrobial agent are placed in the hole and in another hole placed marketed formulation acts as standard, the diameter of zone of inhibition were measured after inoculation at 30 - 35°C for 2 - 3 days. The diameter of zone of inhibition gives an indication of the relative activity of different antimicrobial substance against tested microorganism.

Foam stability test–

The stability of foam was determined by using cylinder shake method. About 50 ml of 1% formulated shampoo taken in 250 ml measuring cylinder and shaken for 10 minutes. The total foam volume was measured after 1 minute and foam stability was determined by recording foam volume from 1 to 4 minute.

Dirt dispersion:

Two drops of shampoo 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 shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate or Heavy.

3. Result and Discussion**1) Physical compatibility**

Physical Compatibility Test of Pre - Formulation To maintain the properties and final product of the hair shampoo, the compatibility of the active ingredients and excipients was evaluated. This is to ensure that the final product produced meets the aesthetic function, and maintains the physical and chemical properties within the preparation. The physical compatibility study is essential to determine any incompatibility between the extract and excipients in the final formulation. The selection of suitable excipients in a formulation could produce desirable physical and chemical properties, avoid post - formulation degradation and hence ensure the stability of the active ingredients in the product

formulation. The physical compatibility test was performed by mixing the banyan root and cinnamon bark extract with various excipients used in the product formulation. No change in physical characteristics was noticed, in comparison with the control and stability.

2) Physicochemical Evaluation of Shampoo Formulation:

The physicochemical properties of the formulated hair shampoos containing herbal extract (F1, F2, and F3), F4, shampoo base (without herbal extract of formulation extract), and two commercially available hair shampoos (F5 and F6) were evaluated. The evaluation included assessments of colour, clarity, odour, texture, pH, percentage solid content, foam ability and stability, foam type, wetting time, dirt dispersion, and detergency ability. All formulations displayed positive attributes in terms of colour, clarity, texture, and odour. The acceptable pH of a hair shampoo is usually neutral or slightly acidic. Shampoos with slightly acidic pH can prevent the swelling of the hair cuticle, tightening the hair follicles and making the hair strand silky and smooth. The shampoo formulations F5, and F6 were pH - balanced (pH ranged between 5.5 and 5.9), which is the ideal pH in maintaining the isoelectric point of hair creatine. Shampoos which are suitable for scalp treatment should have, approximately, a pH of 5.5.

Physical Appearance/Visual Inspection The prepared shampoo was evaluated based on its colour, clarity, texture, and odour at room temperature.

pH Measurement: The pH of 10% v/v shampoo solution in distilled water was determined using a pH meter (pH/conductivity/TDS Meter, Cyber Scan PC 300, EUTECH instruments, Singapore) at room temperature. The measurements were repeated in triplicates and mean values and standard deviation (SD) were used for analysis. The pH meter was calibrated using standard buffers solution of pH 4, 7, and 10 before each use.

Surface Tension: The surface tension of the diluted shampoos (10% w/v in distilled water) was evaluated using tensiometer (Sigma 700, attention, Finland). The measurements were repeated in triplicates and mean values and standard deviation (SD) were calculated.

Percentage of Solid Contents: The solid content percentage was determined according to the method. In brief, a clean dry evaporating dish was weighed, and 4 g of shampoo samples were added. The dish and the sample were weighed again, and the exact weight of the sample was determined. The samples were then oven dried at 105 °C for 16 h or until a constant dry weight was achieved. The dried samples were cooled in a desiccator and were then weighed again to determine the total solid

Antimicrobial Activity: one microorganisms were selected for the antimicrobial evaluation: The ampicillin for *S. aureus*. A total of 0.25% DMSO was used as the negative control. The microtiter plate was incubated for 24–48 h. MIC was recorded as the lowest concentration which completely inhibited microbial growth. MBC was determined when no visible growth was seen on the first streak on the agar of the clear wells. The test was repeated three times.

Foaming Ability and Stability: The cylinder shake method was used to measure the foaming ability of the shampoo. An amount of 25 mL of the 1% (v/v) formulated shampoo solution was poured into a 250 mL graduated cylinder. Then, the graduated cylinder was covered with stopper and was shaken 10 times. The total volume of foam produced after 1 min of shaking was recorded and denoted as foam ability. Foam stability was determined by recording the foam volume after 1 min and after 4 min of shaking. The measurements were repeated in triplicates and mean values and standard deviation (SD) were calculated.

Dirt Dispersion Test: Dirt dispersion test was performed, a large test tube was filled with 5 mL of distilled water, as were two drops of shampoo. One drop of Indian ink was then added, and the test tube was stoppered and shaken for 15 times. The amount of ink staining in the foam was observed and categorised as none, light, moderate or heavy. The measurements were repeated in triplicates and mean values and standard deviation (SD) were determined.

4. Conclusion

The incorporation of cinnamon and banyan root herbal extracts into a shampoo formulation, enhanced by the cationic polymer, demonstrated positive effects on the scalp. The cationic polymer appeared to enhance significantly affect the delivery of the herbal extracts to the scalp, as evidenced by observations. While cinnamon and banyan root extracts have shown promising properties in traditional medicine, their efficacy in a shampoo formulation when combined with a cationic polymer requires further investigation. Overall, the results suggest that the developed shampoo formulation has the potential to benefit scalp health.

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