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Assessment and comparison of herbal and synthetic shampoos

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Abstract

Today's shampoo formulations are beyond the stage of pure cleaning of the hair. Additional benefits like conditioning, smoothing, good health of hair and above all, its safety benefits are expected. A more radical approach in popularizing herbal shampoo would change the consumers expectation emphasising safety and efficacy. Thus this study aims to investigate and compare quality of marketed herbal and synthetic shampoos formulations. The selected shampoos were evaluated for their physicochemical properties, including pH, solid content, rheological measurements, dirt dispersion level, foaming ability and stability, wetting time and surface tension. All herbal shampoos showed pH within the specified range, a comparable percentage of solids, stable foam formation and a highly viscous nature along with the good wetting ability when compared to synthetic shampoos. Thus, people should become more aware of how natural products can positively affect our lives and must make the switch and opting for safer and healthier options.

Keywords: Shampoo, herbal, synthetic, quality, physicochemical properties

Introduction

Cosmetics are products that are created for application on the body for the purpose of cleansing, beautifying or altering appearance and enhancing attractive features. They are the articles with mild action on the human body, which are intended to be applied through rubbing, sprinkling or other methods, aiming to clean, beautify and increase the attractiveness, alter the appearance or to keep the skin or hair in good condition ^[1].

Shampoos are probably the most widely used cosmetic products for daily cleansing of the hair and scalp. A shampoo may be describe as a hair care preparation of a surfactant in a suitable form liquid, solid or powder mainly used for the removal of oils, dirt, skin particles, dandruff, environmental pollutants and other contaminant particles that gradually build up in it ^[2].

Now a day's many synthetic, herbal, medicated, non medicated shampoos are available in market but popularity of herbal shampoos is increasing due to natural origin which is safer, increases consumer demand and free from side effects³. In synthetic shampoos, surfactants (synthetic) are added mainly for their cleansing and foaming property, but the continuous use of these surfactants leads to serious effects such as eye irritation, scalp irritation, loss of hair, and dryness of hairs. Alternative to synthetic shampoo we can use shampoos containing natural herbals ^[4].

Herbal shampoo is a type of cosmetic preparation that uses herbs from plants as an alternative to the synthetic shampoo available in market. There are large numbers of medicinal plants which are reported to have beneficial effects on hair and are commonly used in formulation of shampoo ^[5]. The evaluation of such formulations is also very important to know their performance, quality and effectiveness. It is also necessary to check whether the products have any sensitivity toxic effects on human body. The work was done keeping the ideas of Bureau of Indian standards to analyze the cosmetics products.

This study was designed to evaluate different marketed synthetic and herbal shampoo formulations in search of a safe and effective cosmetic product. Evaluation comprises the quality control tests including visual assessment and physicochemical controls such as pH, dirt dispersion, solid content, wetting time, surface tension, rheological evaluations and foaming ability and foam stability.

Material and Methods

Various brands of synthetic F₁ (Dove), F₂ (Tresseemme), F₃ (Head and Shoulder), F₄ (Pantene) and herbal shampoos F₅ (Indulekha) F₆ (Medikare), F₇ (Patanjali Kesh Kanti) and F₈ (Shikakai) were purchased from the local market. All other chemicals used were of analytical grade.

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Physical appearance [2].

The samples were evaluated in terms of their clarity, color, odour and foam producing ability.

Determination of pH [6].

pH of 10% v/v shampoo solutions in distilled water was determined by using digital pH meter (Model 111).

Dispersion of dirt [6].

A test tube containing specified amount of water (10 ml) and 2 drops of shampoo were added followed by addition of 1 drop of India ink into it. The test was stoppered and shaken 10 times. The visual estimation of ink in the foam is carried out to estimate the amount of ink as nil, light, moderate or heavy.

Determination of percentage solid content [7, 8].

The solid content of shampoos was determined by weight difference method. 4 gm of each sample of shampoo was taken in evaporating dish. The samples were evaporated by heating and cooled at room temperature. The weight of shampoo (only solids) was calculated after complete drying.

Wetting time [5].

A canvas paper was cut into 1 inch diameter disc having a average weight of 0.44 gm. The smooth surface of disc was placed on the surface of 1% v/v shampoo solution and the stopwatch started. The time require for the disc to begin to sink was noted down as wetting time.

Surface tension measurements [9, 10].

Measurements were carried out with 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chronic acid and purified water was used for the study, as surface tension is highly affected with grease or other lubricants. The data was calculated by following equation:

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

$$[R_1 = 72.8 \text{ dynes/cm}]$$

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 number of drops of distilled water.

n_2 is number of drops of shampoo solution.

R_1 is surface tension of distilled water at room temperature.

R_2 is surface tension of shampoo solution.

Rheological evaluations

The viscosity of shampoos was determined by using Oswald's viscometer.

Foaming ability and Foam stability [9].

Cylinder shake method was most widely used for determining foaming ability. 50ml of 1% shampoo solution was put into a 250ml graduated cylinder and cylinder was covered with hand and shaken for 10 times. The total volume of the foam contents after 1min shaking was recorded. The foam volume was recorded immediately and after 1min interval for 4mins.

Results and Discussion

To evaluate the quality of marketed formulation of non-herbal and herbal formulations, several quality control tests including visual assessment, physicochemical controls tests were performed.

Physical Appearance

A shampoo like any other cosmetic preparation should have good appealing physical appearance. The marketed formulations were evaluated for the clarity, color, odor and foam producing ability. Table 1 presents the results of the visual inspection of the shampoos having different organoleptic properties. The color and odor of the tested shampoos were found to be acceptable with good characteristics to foaming.

Table 1: Evaluation of marketed shampoo formulations for physical appearance and dispersion of dirt

Sr. No.	Formulations	Color	Odour	Clarity	Foam producing ability	Dispersion of dirt (Amount of ink in foam)
1	F ₁	White	Good	Milky opaque	Dense, airy	Light
2	F ₂	White	Good	Milky opaque	Light, airy	Moderate
3	F ₃	White	Good	Milky	Very less, airy	Moderate
4	F ₄	White	Good	Milky opaque	Less, airy	Light
5	F ₅	Brown	Good	Opaque	Large, airy	Moderate
6	F ₆	White	Good	Milky opaque	Large, airy	Light
7	F ₇	Light brown	Good	Opaque	Less, airy	Light
8	F ₈	Light brown	Good	opaque	Less, airy	Light

F₁- F₄ are marketed synthetic shampoos: F₁ - Dove, F₂ - Tresemme, F₃ - Head and shoulder, F₄ Pantene.

F₅- F₈ are marketed herbal shampoos: F₅ - Indulekha, F₆ - Medicare, F₇ - Patanjali and F₈ - Shikakai.

Determination of pH

pH is one of the ways to minimize damage to the hair. The pH of shampoo also helps in minimizing irritation to the eyes, enhances the qualities of hair and maintain the ecological balance of the scalp [11]. The pH of tested commercial shampoos was found within the preferred range (between 7 and 5) and are represented in Table 2.

Mild acidity prevents swelling and promotes tightening of the scales, there by inducing shine. Thus, the current trend is to promote shampoos of lower ph is one of the ways to minimize the damage to the hair. All non-herbal and herbal shampoos were acid balanced and were ranged from 5.89 ± 0.01 to 6.59 ± 0.24 which is near to the skin pH.

Dispersion of dirt

Dirt dispersion is an important criterion for evaluation of cleansing action of shampoo. Shampoos that cause the ink to concentrate in the foam are considered of poor quality because ink or dirt that stays in foam is difficult to rinse away and gets re-deposited on the hair [12]. Therefore, dirt should remain in the water portion to achieve better cleansing action. All shampoos (Table 1) concentrated the ink in the water portion, ensuring their satisfactory cleaning ability and actual effectiveness.

Determination of percentage solid content

Shampoo containing 20-30% of solid content enables it to be

easily applied and rinsed out from the hair. Presence of very low solid content in shampoo makes it too watery result in wash away quickly, while too many solids make it hard to work into the hair or too hard to wash out. The percent solid contents of all the tested shampoo was found within the range of 22.17 ± 0.50 to 24.48 ± 0.67 and are expected to wash out easily (Table 2).

Wetting Time

The wetting ability of a surfactant depends on its concentration in the formulation and the test is commonly performed to test the efficacy of the surfactant. The wetting time test was performed by measuring the time taken for the disc to sink in the shampoo solution. Wetting efficiency is considered to be higher if the disc takes less time for sinking [13]. All marketed shampoo formulations showed wetting time between 139 ± 0.00 to 183 ± 1.41 (Table 2). It can be concluded that marketed herbal shampoo formulation (F₅) contains maximum concentration of detergents as the least wetting time was recorded in contrast to other marketed formulations.

Surface tension

The term indicates the amount of surfactant present in

shampoo to reduce the surface tension. Lesser the surface tension stronger is the cleaning ability of the shampoo. A shampoo is considered of good quality if it decreases the surface tension of pure water from 72.28 dyn/cm to about 40 dyn/cm⁵. All the tested shampoo showed similar reduction in surface tension ranging from 30.1 ± 0.19 to 38.54 ± 1.18 dyn/cm (Table 2). The lowest surface tension indicating that it has the strongest cleaning ability. The non-herbal shampoos may contain excessive detergents, which can strip the hair of up to 80% of the oil and thus damage the hair.

Rheological evaluations

It plays an important role in defining and controlling many attributes such as shelf life stability and product aesthetics such as clarity ease of flow on removal from packing and spreading on application to hair and product consistency in the package. The results of rheological evaluation showed that the viscosity of the samples changes gradually with the increase in rpm. At low rpm the sample showed high viscosity and increase in the shear rate the viscosity of the shampoos drops, which is a favourable property which eases the spreading of the shampoos on hair. The results obtained are showed in Table 2.

Table 2: Physicochemical evaluation of marketed synthetic and herbal shampoos

Sr. No.	Formulations	pH \pm SD	% Solid content \pm SD	Wetting time \pm SD (Sec)	Surface tension \pm SD (dynes/cm)	Rheological evaluations
1	F ₁	6.10 \pm 0.26	22.38 \pm 0.89	147 \pm 1.41	32.61 \pm 1.30	0.9903
2	F ₂	6.16 \pm 0.70	24.48 \pm 0.67	183 \pm 1.41	30.1 \pm 0.19	1.0811
3	F ₃	6.50 \pm 0.09	22.8 \pm 0.53	197 \pm 2.82	33.23 \pm 2.31	0.924
4	F ₄	6.42 \pm 0.14	22.17 \pm 0.50	162 \pm 1.41	33.21 \pm 2.50	1.042
5	F ₅	6.59 \pm 0.24	24.85 \pm 1.23	139 \pm 0.00	38.54 \pm 1.18	0.974
6	F ₆	5.89 \pm 0.01	22.78 \pm 1.42	152 \pm 1.41	33.94 \pm 1.98	0.8804
7	F ₇	5.89 \pm 0.07	24.24 \pm 0.70	149 \pm 0.70	33.85 \pm 1.88	1.525
8	F ₈	6.06 \pm 0.10	22.26 \pm 1.94	182 \pm 0.00	38.39 \pm 2.79	0.9925

F₁- F₄ are marketed synthetic shampoos: F₁ - Dove, F₂ - Tresemme, F₃ - Head and shoulder, F₄ Pantene.

F₅- F₈ are marketed herbal shampoos: F₅ - Indulekha, F₆ - Medicare, F₇ - Patanjali and F₈ - Shikakai.

SD is the standard deviation for n=2 observations.

Foaming ability and foam stability

Foaming or lathering is very important to the consumer and therefore, it is considered as an important parameter in evaluation of shampoo. All the marketed non-herbal and herbal shampoo formulations produced the foam volume above 100 mL. The foam stability of herbal shampoos is listed in table 3. The foams generated by all tested shampoos were small, compact, uniform, denser and stable. There does not seem to be any direct correlation between detergency and foaming, which only confirms the fact that a shampoo that foams well need not clean well.

Table 3: Foam stability of marketed synthetic and herbal shampoos

Sr. No.	Formulations	Time (min)				
		1	2	3	4	5
1	F ₁	142	139	136	134	132
2	F ₂	137	136	134	133	131
3	F ₃	154	152	151	150	149
4	F ₄	152	150	148	146	145
5	F ₅	127	125	124	123	122
6	F ₆	122	120	118	117	116
7	F ₇	133	131	129	128	127
8	F ₈	132	130	128	127	125

F₁- F₄ are marketed synthetic shampoos: F₁ - Dove, F₂ - Tresemme, F₃ - Head and shoulder, F₄ Pantene.

F₅- F₈ are marketed herbal shampoos: F₅ - Indulekha, F₆ - Medicare, F₇ - Patanjali and F₈ - Shikakai.

Conclusion

In today's era, the whole world is declining towards mother nature for safe and effective health care products. Since there is dissatisfaction with conventional treatment, past good experience, positive aspects and family traditions associated with herbal cosmetics are the most common reason of preferring herbal products over synthetic one. In this study, quality of different marketed synthetic and herbal shampoos were evaluated and compared in terms of their pH levels, foam formation, foam stability, viscosity wetting time, surface tension, solid content and dirt dispersion. Marketed herbal shampoo formulations showed comparable result with that of synthetic shampoos for quality control tests. Thus, all tested herbal shampoos can also be good alternatives for each other since they had comparable results for the different tests.

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