

## **Evaluation of Marketed Shampoo (Synthetic and Natural) for Their Hair Cleansing, Dirt Dispersion, Wetting Time, Solid Content and Foaming Capacity Properties**

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**Abstract:** Background shampoos are getting more attention by the consumers as compared to soaps. Shampooing is an art by which sebum or grease produced by sebaceous gland are rinsed off from hairs making them dirt/oil free. Aim of the present study was to evaluate synthetic and natural shampoo with their cleansing action, wetting time, % solid content and dirt dispersion. Material and method natural shampoos (Vatika, Kesh Kanti, Superia, Chik, Nyle, Kesh King, Satreetha), synthetic shampoos (Pantene and Conaderm) were evaluated based on different parameters such as physical appearance, pH, viscosity, surface tension, % solid content, wetting time, foaming capacity, dirt dispersion and cleansing action and were compared. Result all formulations were within the pH range of 7.21-8.01. Evaluation parameters revealed that Chik and Kesh King were of good foaming and Pantene was of good wetting ability as compared with other formulations. Cleansing action of Nyle shampoo was good and removed grease from hair easily. Conclusion all the shampoo formulations were of good quality and could be used safely and effectively.

**Key words:** Cleansing Action • Dirt Dispersion • Evaluation • Formulation • Hair Growth • Solid Content

### **INTRODUCTION**

In the early days a shampoo could be defined as an effective cleansing agent for hair and scalp, but in the present scenario the shampoo must do much more functions. It must leave the hair easy to comb, lustrous, radiant and controllable whilst being convenient and easy to use. For the removal of oils, dirt, environmental pollutants, skin particles, dandruff and other contaminant particles that gradually grow up in hair, shampoo is used as a cleaning aid and to be known as hair care product. The main focus is on the removal of unwanted build-up without any stripping of sebum so as to make hair unmanageable [1-3]. Previously soap-based shampoos were of special interest but studies proved that soaps did not have capability to produce good lathering and left a unwanted residual layer on hairs which could not be easy to rinse off. With the advancement in technology, modern shampoos replace soap-based shampoos with the ability of cleansing, conditioning and with their medicinal activity [4].

Sebum produced on hair and scalp excreted from sebaceous gland located within hair follicles. Sebum cannot be removed by water as oil and water cannot be mixed well [5, 6]. Therefore, cleansing agents are used for its removal. Cleansing agents are the most important part of the shampoo and produces lather, removes dirt and grease, stabilizes the mixture and helps in keeping ingredient together in a network and in maintaining the thickness of shampoo of desired viscosity. Primary cleansing agents are anionic surfactants with great lathering power and rinsed off easily [4]. Mostly used surfactant is sodium lauryl sulfate with varying concentration from brand to brand and/or within a product range of manufacturer. High concentration of surfactants possessed within cheap shampoos while very little amount in expensive shampoos. Shampoo for oily hair consists of the same detergent at the same concentration as contained in dry hair shampoo. The difference is only in reduced amount of oil/conditioning agent and in packaging [7, 8].

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This study deals with the comparative study of different marketed formulations for their cleansing ability.

$$\eta_{sol} = \eta_{H_2O} \times \frac{t_{sol} \rho_{sol}}{t_{H_2O} \rho_{H_2O}} \quad \text{equation 1}$$

## MATERIALS AND METHODS

**Specimen Collection:** Different marketed shampoos were collected from local market of Mathura, Uttar Pradesh, India i.e. Natural Shampoos [Vatika Premium Naturals (Henna & Olive) Shampoo (B. No: 6RU0070, Mfg Date: 10/13, Exp Date: 10/14, Mfg By: Dabur India Ltd., Uttarakhand), Kesh Kanti Natural Hair Cleanser (B. No: P178, Mfg Date: 3/14, Exp Date: 3/16, Mfg By: Patanjali Ayurved Ltd., Haridwar), Superia Strong & Healthy Shampoo (Amla & Arnica) (B. No: B012612A, Mfg Date: 7/13, Exp Date: 12/14, Mfg By: ITC Ltd., Haridwar, Uttarakhand), Chik Advanced Shampoo Hairfall Prevent (Badam & Amla) (B. No: LI9, Mfg Date: 3/13, Exp Date: 8/15, Mfg By: Cavin Kare, Haridwar, Uttarakhand), Nyle Natural Shampoo (Amla & Tulsi) (B. No: 22L1, Mfg Date: 1/14, Exp Date: 12/15, Mfg By: Cavin Kare Pvt. Ltd., Haridwar), Dr. Juneja Kesh King Aloe Vera Herbal Shampoo (B. No: KK575, Mfg Date: 11/13, Exp Date: 10/16, Mfg By: Indo Herbal Products, Haridwar, Uttarakhand), Denajee Satreetha Shampoo Herbal (B. No: SH01, Mfg Date: 4/13, Exp Date: 4/16, Mfg By: Health Care Products, Uttarakhand)], Synthetic Shampoos [Pantene Pro-V Shampoo Hairfall Protection (B. No: B01222C, Mfg Date: 6/13, Exp Date: 11/14, Mfg By: Procter & Gamble Home Products Ltd., Solan, HP) and Conaderm with ZPTO (B. No: R17213, Mfg Date: 4/13, Exp Date: 9/14, Mfg By: Rexcin Pharmaceuticals Pvt Ltd., Baddi, HP (Croslands))].

**Evaluation of Different Marketed Formulation:** Different formulations of shampoo were evaluated using different parameters such as

**Physical Appearance/visual Inspection:** The formulations prepared were evaluated in terms of their clarity, foam producing ability and fluidity [1].

**The pH Measurement:** The pH was measured using a pH-meter on 10% shampoo solution. Three determinations were done for each shampoo [1].

**Viscosity Measurement:** Viscosity of 10% shampoo solution was measured by using a Ostwald viscometer as per equation 1 and measurements were performed three times for each shampoo [1]:

$\eta$  = Viscosity of solution,  $t$  = Time,  $\rho$  = Density

**Determination of Solid Contents:** Percent solid content was measured by taking a weighed clean dry evaporating dish in which 4 g of shampoo was added. Then the dish and shampoo was weighed again. The exact weight of the shampoo was calculated and the evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of shampoo only (solids) after drying was calculated [1].

**Dirt Dispersion:** To a large test tube containing 10 mL of distilled water, two drops of shampoo were added. One drop of ink was added in the test tube, fitted with a stopcork and shake for ten times. The amount of ink in the foam was estimated as none, light, moderate or heavy [1].

**Wetting Time:** The canvas was cut into 3.5 cm diameter disc having an average weight of 0.34 g. The disc was floated on the surface of shampoo solution (1% w/v) and stopwatch was started. The time required for the disc to begin to sink was measured accurately and noted as wetting time [1].

**Foam Volume:** About 20 mL shampoo solution was taken in a measuring cylinder fitted with stopcork and was shaken for 10 sec. Foam volume was then calculated immediately, after 3 min and after 6 min [1].

**Surface Tension Measurement:** The surface tension of 10% shampoo solution was determined by drop weight method, using a stalagmometer as per equation 2 [9]:

$$\sigma_{sol} = \sigma_{H_2O} \times \frac{m_{sol}}{m_{H_2O}} \quad \text{equation 2}$$

where,  $\sigma_{sol}$  = Surface tension of solution,  $\sigma_{H_2O}$  = Surface tension of water,  $m_{sol}$  = Weight of drops of solution,  $m_{H_2O}$  = Weight of drops of water

**Cleansing Ability:** Wool yarn (5 g) was placed in grease, after that it was placed a flask containing 200 ml of water with 1 g of shampoo. Temperature of water was maintained at 35°C. The flask was shaken for 4 minutes at the rate of 50 times a minute. The solution

was removed and sample was taken out, dried and weighed. The amount of grease removed was calculated as per equation 3:

$$DP = 100 \left( 1 - \frac{r}{c} \right) \quad \text{equation 3}$$

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 [10].

### RESULT AND DISCUSSION

Different marketed formulations of shampoos were evaluated for its physical appearance visually for consistency. The evaluation studies revealed that all the formulation having pH range within 7.21-8.01 i.e. nearly neutral pH. It influenced the hair quality and the tolerance at skin and eye level. A substance that was too alkaline causing the hair cuticle to open, while a substance that was too acidic causing the cuticle to contract which was prone to infection so, pH was adjusted to neutral. Viscosity of all the formulation was such that it could be easily pourable when shaken due to their pseudoplastic nature.

Foam quality of Chik and Kesh King was found to be of high quality as it had produced thick foam amongst all formulations. The result was shown in Fig. 1. Shampoo that cause the ink to concentrate in the foam was considered of poor quality. The dirt should stay in water not in foam but if the dirt stayed in foam, it would be difficult to rinse away and would redeposit on the hair. All the formulations except Nyle and Kkesh Kanti were found to be of good quality as ink was not concentrated in the foam as compared to other formulations. These results indicate that no dirt would stays in the foam; so all these formulations except Nyle and Kkesh Kanti were satisfactory. If the shampoo has too many solids it will be hard to work into the hair or too hard to wash out. The result of percent of solid contents was tabulated in Table 1 and was found between 10.97-19.22%. As a result, they were easy to wash out. Surface tension measurement was done to find out the cleansing ability of shampoo. If the surface tension was reduced, the cleansing ability of the shampoo was affected in two ways either by facilitating the spread of the aqueous solution and increasing its wetting ability for the surface or by the removal of environmental dirt from hair by keeping it in suspension. So, Pantene shampoo was of good wetting ability due to its reduced surface

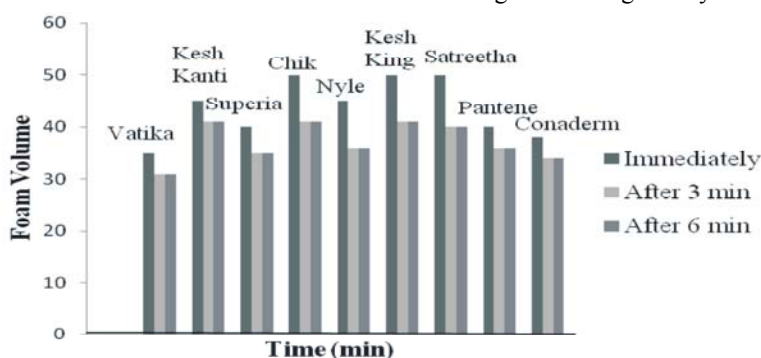


Fig. 1: Foaming capacity of different marketed formulation of shampoo

Table 1: Comparison of evaluation parameters of different marketed shampoo formulations

| Product Name  | Evaluation Parameters |      |                |                           |                 |                    |                   |
|---|-----------------------|------|----------------|---------------------------|-----------------|--------------------|-------------------|
|   | Physical Appearance   | pH   | Viscosity (cP) | Surface tension (dyne/cm) | Dirt Dispersion | Wetting Time (sec) | Solid Content (%) |
| Vatika Premium Naturals (Henna & Olive) Shampoo       | Light green           | 7.77 | 1.2±0.138      | 25.78±2.30                | Light foam      | 14                 | 12.71             |
| Kesh Kanti Natural Hair Cleanser                      | Light brown           | 8.01 | 1.02±0.035     | 31.25±3.16                | Moderate foam   | 3                  | 18.20             |
| Superia Strong & Healthy Shampoo (Amla & Arnica)      | Light green           | 7.75 | 1.09±0.041     | 27.36±2.75                | Light foam      | 10                 | 18.64             |
| Chik Advanced Shampoo Hairfall Prevent (Badam & Amla) | Black shiny           | 7.49 | 1.17±0.185     | 28.61±2.40                | Light foam      | 5                  | 19.22             |
| Nyle Natural Shampoo                                  | Light green           | 7.57 | 1.07±0.066     | 25.28±2.94                | Moderate foam   | 10                 | 15.48             |
| Dr. Juneja Kesh King Aloe vera Herbal Shampoo         | Green                 | 7.90 | 0.95±0.034     | 26.85±2.39                | Light foam      | 2                  | 10.97             |
| Denajee Satreetha Shampoo Herbal                      | Brown                 | 7.49 | 0.94±0.030     | 26.43±1.01                | Light foam      | 2                  | 17.60             |
| Pantene Pro-V Shampoo Hairfall Protection             | White                 | 7.35 | 0.84±0.030     | 25.94±1.02                | Light foam      | 4                  | 15.34             |
| Conaderm with ZPTO                                    | Light pink            | 7.21 | 1.27±0.032     | 26.74±2.07                | Light foam      | 3                  | 17.77             |

Table 2: Cleansing Action of Shampoos

| S. No. | Shampoo Formulation                                   | Cleansing Action (%) |
|--------|---|----------------------|
| 1.     | Vatika Premium Naturals (Henna & Olive) Shampoo       | 5                    |
| 2.     | Kesh Kanti Natural Hair Cleanser                      | 12                   |
| 3.     | Superia Strong & Healthy Shampoo (Amla & Arnica)      | 15                   |
| 4.     | Chik Advanced Shampoo Hairfall Prevent (Badam & Amla) | 20                   |
| 5.     | Nyle Natural Shampoo                                  | 38                   |
| 6.     | Dr. Juneja Kesh King Aloevera Herbal Shampoo          | 18                   |
| 7.     | Denajee Satreetha Shampoo Herbal                      | 28                   |
| 8.     | Pantene Pro-V Shampoo Hairfall Protection             | 15                   |
| 9.     | Conaderm with ZPTO                                    | 34                   |

tension. Wetting time of all the formulations was found to be within 2-14 sec. When wetting time was reduced, wettability was increased. So, Kesh King and Satreetha had good wetting power whereas Vatika had low wetting power. Cleansing ability was performed on all the formulations and results were shown in Table 2. Cleansing ability was good if it removed dirt and grease from hair easily. So, Nyle had good cleansing action.

### CONCLUSION

Now a day, consumers are alluring towards shampoos due to their ease in handling and effectiveness in cleansing. The present study showed that all the marketed formulations of good quality as indicated by result. Shampoo also helped in hair growth. In future, there are more chances of development in the field of shampoo.

### REFERENCES

- Deeksha, R. Malviya and P.K. Sharma, 2014. Advancement in shampoo (a dermal care product): preparation methods, patents and commercial utility. *Recent Patents on Inflammation and Allergy Drug Discovery*, 8: 48-58.
- Anitha, A., P. Sreedevi and D.A. Kumar, 2013. *In vitro* Evaluation of Indigenous Medicinal Plants for Their Antidandruff Hair Oil Preparation. *Global Journal of Pharmacology*, 7(4): 429-435.

- Shampoo, 2014. Available at: <http://medlibrary.org/medwiki/Shampoo> (accessed 25 April).
- Bhushan, B., 2010. Introduction—Human Hair, Skin and Hair Care Products, *Biophysics of Human Hair, Biological and Medical Physics, Biomedical Engineering*. Springer-Verlag, pp: 192.
- Tanford, C., 1980. *The Hydrophobic Effect: Formation of Micelles and Biological Membranes*. Wiley Interscience, pp: 1-24.
- Frank, H.S. and M.W. Evans, 1945. Free volume and entropy in condensed systems: iii. Entropy in binary liquid mixtures; partial molal entropy in dilute solutions; structure and thermodynamics in aqueous electrolytes. *Journal of Chemical Physics*, 13: 507-533.
- Kumar, A. and R.R. Mali, 2010. Evaluation of prepared shampoo formulations and to compare formulated shampoo with marketed shampoos. *International Journal of Pharmaceutical Sciences Review and Research*, 3: 120-126.
- Eldridge, J.M., 1997. *Surfactant*. Science Series, 68: 83-104.
- The surface tension of liquids measured with the stalagmometer. Available at: [https://www.fpharm.uniba.sk/fileadmin/user\\_upload/english/Fyzika/The\\_surface\\_tension\\_of\\_liquids\\_measured\\_with\\_the\\_stalagmometer.pdf](https://www.fpharm.uniba.sk/fileadmin/user_upload/english/Fyzika/The_surface_tension_of_liquids_measured_with_the_stalagmometer.pdf) (accessed 10 April 2014).
- Sharma, P.P., 2002. *Cosmetic Formulation Manufacturing and Quality Control*. Vandana Publication, pp: 644-647.