

Evaluation of Herbal Henna Based Hair Colour Retention Study through Chromo Meter

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ABSTRACT

Colour retention is main key parameters in selection of good hair colour product. Consumers selected the hair colour from shelf based on the colour retention claim on the back, advertisement and their previous experience or association with the brand. Most of the hair colour consumers having the high expectations on colour fastness and colour protection. Present study have aimed to develop the method for the herbal hair dye colour retention through instrumental evaluation, the study protocol mimic to the user regular routine life. Overall study will help to claim the new numerical claim for the henna based hair colour and it help to confident to the end user for the purchase. Chromometer used for checking the colour uptake and retention property of henna based herbal hair dyes. Colour fading was measured after every three consecutive washes with leading market samples of shampoo and soap. In rural segment peoples are used the soap for the hair cleansing purpose, soaps are having the higher pH i.e. greater than 9.0, the higher pH open the cuticles easily and it cause the colour fading. One set of dyed hair swatches washed with leading shampoo and another one set washed with soap samples, Delta E values. The result indicates that there is no significant color wash due to soap and shampoo washes. ΔE values varied between 0.213 and 0.435 for shampoo washes and 0.259 and 0.644 for the Soap washes. Cationic guar molecule having the positive charge in the side chain and it easily form the ionic bond with the negative charged hair and it provided the shield to the hair and maintain the hydrophobic nature and minimize the colour leach outs. Overall instrumental data revealed that there is no significant colour loss due to daily wash with shampoo or soaps. It clearly indicates that the delta E value is less than 2 unit with respect to 31 washes with shampoo or soap washes. There is no significant visual difference in hair swatches also. The entire study data support to claims the developed "Herbal Powder hair colour "Long lasting colour and lasts upto one month". Current developed herbal based hair dyes delivers the 100% grey coverage and provide the long lasting hair colour retention similar to the cr me hair colour; developed formula performance are equal to the premium nature.

Keywords: Herbal hair colour; Colour fade; Colour retention; Delta E; Cationic guar

INTRODUCTION

Recent days, dyeing a hair is a regular practice to maintain their external beauty and maintain the social image on wellness. Ancient days various blend of herbal powders used for the colouring purpose, among them Henna and Indigo are very much pronounced in recent days also. Many henna based hair colour products available in mass and premium range segment,

it satisfy the consumer need for the colouring and grey coverage with lower cost [1]. Since henna alone delivers the orange henna, the combination of henna and Indigo delivers the dull bluish black shade, however many consumer need to cover the greys and look like an earlier hair look black. So many market products launched with fusion technology of chemical concept through henna base. Combination of dyes along with henna powder delivers the 100% grey coverage is familiar one in India

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and product called as 'Kali Mehendi' or 'Henna hair colour' or 'Black henna'. Combination of Para Phenylene Diamine (PPD) along with oxidising agent delivers the suitable colour shade to the end user. Protecting coloured hair strand is a big concern for the consumer across the globe. Even though the all the permanent hair colours faded due to the regular shampoo, soap application and environmental stress like UV and sun exposure [2]. Many market leaders and hair colour players exclusively focused and launched the many products with respect to minimise the colour fade by shampooing and exposure to ultra violet. Consumers selected the hair colour from shelf based on the colour retention claim on the back, advertisement and their previous experience or association with the brand. Many premium crème hair colour market leaders L'Oréal, Godrej, offered the permanent hair colour with long lasting numerical claim like long lasting colour, last upto X number of washes, Last upto X number of weeks etc. However there is no authentic documents for the mass market products like Herbal based hair dyes. Improper hair colour application, improper time, improper mixing, density of the hair, grey hair pattern, damaged hair, excessive wash of harsh chemicals like soap, shampoo, continue sun/UV rays exposure etc leads the colour fading. However among them daily wash or rinse with surfactant based shampoo and high alkali soap leads the more colour fading and it is very much associated to the consumer day to day practice also. So we have aimed to document the consumer regular practice and included the study protocol. Many scientist proved that incorporation of silicone and modified cationic quat molecule helps to improve the colour retention and reduce the colour fading, however there is no authentic documents on herbal powder hair colour with respect to fading. Active colour protection ingredients are meagre in powder and water soluble form. Many actives are available in liquid form, the incorporation of liquid actives in herbal based powder influence of stability of the product. The present study aimed to develop the unique combination of herbal hair colour powder formula with stand colour against the regular washing with shampoo or soap. Present study have aimed to develop the method for the herbal hair dye colour retention through instrumental evaluation, the study protocol mimic to the user regular routine life. So the study results directly correlated to claim on the pack. Overall study will help to claim the new numerical claim for the henna based hair colour and it help to confident to the end user for the purchase. Colour retention property scientifically measured through the instrument with proper statistical analysis; it will be an authentic document on hair colour retention for herbal base hair dyes [3].

METHODS AND MATERIALS

Henna base powder hair dye preparation

Initially heat the henna powder, thickener heated upto 80–90°C for 2-3 hours for complete removal of moisture. The removal of moisture prevent the oxidation of dye material during the shelf life period. After moisture removal the henna powder kept aside to reach the room condition and then add the natural conditioner, buffer, oxidising agent and dye material and blend

together for 30 minutes for uniform mixing [4]. The skeleton henna base herbal hair dye furnished in (Table 1).

S.No	Material name	%	Function
1	Henna powder	QS	Conditioning agent
2	Herbal conditioner	1-5%	Hair soft and conditioner
3	Quat conditioner	1-2%	Conditioner and shine
4	Oxidising agent	15-22%	Helps to oxidise the dye materials
5	Dye material	10-15%	For colouring
6	Thickener	1-5 %	Thickening the paste
7	Buffering agent	1-5%	Maintain the product pH around 7.00 to 9.00

Table 1: Henna base herbal hair dye.

After batch completion the prepared dye material tested the basic properties and the results are furnished in the (Table 2) [5].

S.NO	Test	Standard/ Requirement	Results
1	Appearance	Olive green powder	Green colour powder
2	Odour	Characteristic, to match control	Match to the henna odour
3	pH (5% solution) @ 25°C	7.0 to 9.5	8.5
4	Viscosity by brookfield viscometer available at MBL (Model-LVDV1Prime) Spindle 63, 30 rpm at 25°C.	1800-3000 cps	2000 cps
5	Moisture content (Halogen lamp balance)	Not more than 1.5%	0.012
6	Dye content (By UV method)-Initial	NLT 10%	0.115

7	Swatch test	To match reference standard	Deliver the 100% grey coverage and shade match with black shade
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Table 2: Physico chemical analysis of Henna based herbal hair dye.

Colour retention study

Chromometer used for checking the colour uptake and retention property of henna based herbal hair dyes. Make chromometer used for the study. Every day before analysing any sample, the instrument calibrated with the black and white tile, the calibration will helps to nullify the instrumental error [6].

Colour uptake measurement

In general take from the single bundle swatches for the complete study to avoid the inconsistency results and cleaned with water. Take the three freshly prepared swatch for the study; swatch pre-reading was taken by Chroma meter; average of six reading are carried out per hair swatches, among six readings three readings in front side and 3 readings in back side [7]. The same pre-reading swatches are used for the colouring process. Take 10 gm of cleaned and pre-reading completed hair swatches for the study, the swatches are labelled properly with study details, batch number details etc. Take 2 gm powder hair colour and add 10 gm water in non-metallic bowl and make a uniform paste. Apply the above mixture on the hair swatch with the help of brush. After 30 minute, wash the hair swatches with normal tap water until water runs clear. Dry the washed swatches with normal air dryer and kept the swatches aside for 2-3 hours and take the colour uptake readings. Then colour reading was taken for initial coloured swatches by Chromameter, 6 reading carried out per hair swatch and take average of 6 for final reading for the calculation. Dye uptake was calculated based on the below formula.

L1 scale: Light vs dark, where a low number (0-50) indicates dark and a high number (51-100) indicates light for initial colour uptake.

L2 scale: Light vs dark, where a low number (0-50) indicates dark and a high number (51-100) indicates light for after wash cycle.

a1 scale: Red vs Green, where a positive number indicates red and negative number indicates green for initial colour uptake.

a2 scale: Red vs Green, where a positive number indicates red and negative number indicates green for after wash cycle.

b1 scale: Yellow vs Blue, where a positive number indicates yellow and negative number indicates blue for initial colour uptake.

b2 scale: Yellow vs Blue, where a positive number indicates yellow and negative number indicates blue for after wash cycle [8].

Open the tap fully and wet the hair swatch under tap water. Apply the measured quantity of shampoo or soap from top to bottom of the hair swatch. Rub the hair swatches 5 times on each side in back and forth motion to distribute the shampoo evenly. Hang the hair swatch using a clip and give 20 strokes on each side of the swatch back and forth motion. Remove the hair swatch from the stand, open the tap fully and hold it under tap water [9]. Rinse off the hair swatch with water at room temperature by rubbing it 10 times on each side in back and forth motion (1 minute). Dry using a hair drier at ambient temperature. Colour reading were taken by Chromo meter; 6 reading per hair swatch and take average of 6 for final calculation. Dye content loss was calculated subtract from the initial pre-reading swatches. Delta E value calculated for every three washes; the difference in the initial uptake and every washes (delta E) value indicates the colourloss values.

Statistical design

100% grey swatch each swatch 6 data points recorded in different portion of hair swatches for statistical analysis. Dye uptake and retention pattern calculated based on the average of eighteen data points. The standard deviation calculated based on three hair swatches delta E values [10].

RESULTS AND DISCUSSION

Regular hair washing practice leads the colour fading. Very few people only rarely use the shampoo and conditioners on daily practice, however most of the people regularly or daily basis use the shampoo or soap for the hair cleansing purpose. Majorly used shampoo containing the sulfates and its salt act as a surfactant and it harm to the hair colour. Surfactant molecule easily solubilised the dye molecules and cause the severe colour fading. Oxidative dyeing process lead to remove the hydrophobic protective layer from the hair surface, with the loss of hydrophobic surface dye molecules wash out faster from the hair during washing with the surfactant molecules (Table 3) [11].

Herbal powder hair colour-natural black wash pattern	ΔE (delta E values)							
	3r d	9th wash	12th wash	18th wash	21st wash	24th wash	27th wash	31st wash
With sunsilk	0.2	0.568	0.292	0.532	0.552	0.366	0.485	0.435
	13	(0.29)	(0.20)	(0.40)	(0.52)	(0.10)	(0.33)	(0.13)
shampoo wash	(0.08)							
With lux soap wash	0.2	0.454	0.357	0.437	0.715	0.815	0.468	0.644
	59	(0.13)	(0.20)	(0.08)	(0.07)	(0.29)	(0.14)	(0.30)
	(0.08)							

Table 3: Delta E values on white hair with respect to shampoo and soap washes.

segment peoples are used the soap for the hair cleansing purpose, soaps are having the higher pH i.e. greater than 9.0, the higher pH open the cuticles easily and it cause the colour fading. One set of dyed hair swatches washed with leading shampoo and another one set washed with soap samples, Delta E values are furnished in (Table 3). The results indicates that there is no significant color wash due to soap and shampoo washes. ΔE values varied between 0.213 and 0.435 for shampoo washes and 0.259 and 0.644 for the Soap washes.

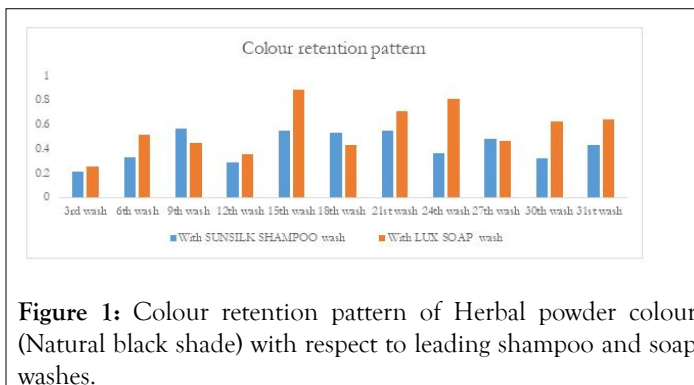


Figure 1: Colour retention pattern of Herbal powder colour (Natural black shade) with respect to leading shampoo and soap washes.

Developed herbal hair dye containing the natural cationic conditioner, it helps to restore and shield hydrophobic action [12]. In general during the colouring process, the hydrophobic layer removed by the chemical treatment and it cause the hair dry and roughness, so to overcome the issue many hair colour products developed with cationic derivative polymers or guar derivative for maintain the moisture to the hair. Incorporation of cationic conditioner molecules restores a hydrophobic shield, aiding in the preservation of colour vibrancy and significantly reducing leakage of colour molecules. Cationic guar molecule having the positive charge in the side chain and it easily form the ionic bond with the negative charged hair. It provided the shield to the hair and maintain the hydrophobic nature and minimize the colour leach outs. Many researches proved that guar or cationic molecule retention the hair colour activity in crème or lotion format. However it is a first authentic study report for guar molecule helps to minimize the colour fading and maintain the long lasting hair colour in herbal powder based hair colour [13].

CONCLUSION

Overall instrumental data revealed that there is no significant colour loss due to daily wash with shampoo or soaps. It clearly

indicates that the delta E value are less than 2 unit with respect to 31 washes with shampoo or soap washes. There is no significant visual difference in hair swatches also. The entire study data support to claims the developed "Herbal Powder hair colour-(shade Natural black)" "Long lasting colour and lasts upto one month". Current developed herbal based hair dyes delivers the 100% grey coverage and provide the long lasting hair colour retention similar to the crème hair colour; developed formula performance are equal to the premium nature.

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