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Evaluation of leave-on hair serum containing higher amount of silicones.

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ABSTRACT

Serums are more commonly used in styling to create a specific look, like smoothing or straightening. Serums are prepared with silicone based and coat the surface of the hair to lock in curl pattern and smoothness to each individual hair strand. Silicone based serum technology of personal care products widely used to make the cosmetically formulation.   Leave on serums prepared with various combinations of silicones received from the Dow Corning Corporation USA.   pH of the serum is important for improving and enhancing the qualities of hair, minimizing irritation to the eyes and stabilizing the ecological balance of the scalp. The lower pH is one of the ways to minimize damage to the hair. Most of the volunteers selected (82%) that the tress treated with T-3 options followed by T-2 options. Control hair tress shows the less conditioning property and noticed by 82 % volunteers.   Among the treatment T-2 and T-3 are preferred by the volunteers, and T-3 is very much pronounced and T-2 makes slightly stickiness to the hair tress.   Study concluded that combination of cyclopentasilaxane and cyclopentasilaxane and dimethiconal deliver the superior conditioning property when compared to other treatment.   Cyclopentasilaxane alone treated swatches make the powdery feel and course feel, cyclopentasilaxane and dimethiconal treated swatches makes the stickyness. Dimethicone alone treated hair tress shows the stickiness and less conditioning the hair tresses
Keywords: Leave on serum, conditioning, Cyclopentasilaxane, cyclopentasilaxane and dimethiconal, Poly dimethylsiloxane

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INTRODUCTION

Silicone fluids, also called silicone oils, or simple silicone are sold by their viscosity and range from 0.65 cs to 1,000,000 cs. If the product is not made by blending two different viscosity fluids the viscosity is related to molecular weight. Silicones were initially incorporated into hair care formulations for their conditioning and perception of moisturaisation properties [1] [2]. Today, a variety of silicone materials are recognized for their essential sensory and functional benefits in a range of shampoos, conditioners, styling, and fixative products for hair. These versatile raw materials can be used to give a soft and smooth feel, aid detangling and combing, add shine, enhance straightening or encourage curl formation, provide bodifying effects, and act as anti-frizz agents. Leave-on serums are more commonly used in styling to create a specific look, like smoothing or shine/conditioning *etc.* Serums are silicone based and it coats the surface of the hair to lock in curl pattern and smoothness to each individual hair strand. Silicone based serum technology of personal care products widely used to make the cosmetically formulation. Because silicones coat the hair to make it appear sleeker, frizz free and healthier. For example, silicones found in conditioners, hair polishers and frizz taming products coat the strands to make them "appear" sleeker and more polished. They also add a bit of weight to give fine, fragile hair substance [1] [2]. Various types of silicones are available in market; we have aimed to create the emulsion based silicone products for leave on application as serum. In market so many products are available like pure silicone base products and it causes the stickiness to the hair and the viscosity is very low; it cause difficult to application and dripping also noticed during application and leave on time also. We have tried out with various silicone options in emulsion form to overcome with dripping and ease of application format. We have using self emulsifier thickener and it reduce the stickiness of the product and improve the ease of application due to the higher viscosity of the product. Various studies was done by many researches with respect to silicone and conditioner in shampoo and conditioner format [2][3][4][5][6]. Literatures are meager with respect to emulsion based serum type and this article deals about the emulsion based serum and also identified the suitable silicone for conditioning property.

MATERIALS AND METHODS

Leave on conditioner prepared with various combinations of silicones received from the Dow Corning Corporation USA. Cross linked acrylate copolymer is a powder polymer with excellent stabilizing properties at a low level and in presence of a high percentage oily phase. It produces translucent formulas without electrolytes. Lauryl glucoside is used as a surfactant and Phenoxy ethanol act as a preservative. All chemicals were pharmaceutical grade /cosmetical grade. Various treatments are summarized in table 1.

Table 1. Formulation details of developed hair serum

Ingredients	T1	T2	T3	T4	T5
	(%) w/w				
Cyclopentasilaxane	80.00	0.0	15.00	0.00	0.00
Cyclopentasiloxane(and) Dimethiconol	0.00	80.00	65.00	0.00	0.00
Polydimethylsiloxane	0.00	0.00	0.00	80.00	0.00
Amido methicone	0.00	0.00	0.00	0.00	80.00
Thickener**	0.2	0.2	0.2	0.2	0.2
Lauryl Glucoside	2	2	2	2	2
Phenoxy ethanol	0.5	0.5	0.5	0.5	0.5
Perfume	0.5	0.5	0.5	0.5	0.5
Water	QS	QS	QS	QS	QS

** - cross linked acrylate copolymer

Preparation of serum:

Pour the cross linked acrylate copolymer with water and sock for 10 minutes and then disperse the thickener using the stirrer for 30 minutes. After complete dispersion of thickener slowly add the selected silicones and mix for another 30 minutes to form a uniform emulsion. After completion of emulsion formation, preservative and surfactant (Lauryl glucoside) added and stir for another 15 minutes. Finally add the perfume and check the chemical and physical test of the product.

Estimation of serum:

Determination of pH:

The pH of 10% serum solution was prepared with distilled water was determined at room temperature 25°C .

Determination of Viscosity / Rheological parameters:

The viscosity of the serum was determined by using Brookfield Viscometer (Model - RVDV 1+; 2014) at 10 rpm speeds. The viscosity of the serum was measured by using the spindle RV # 92 and temperature of the product was maintained at 25°C.

Testing procedure:

A hair tress of Indian women was obtained from the India vendor. Approximately 15 cm length of hair swatches was prepared with weight of 5 gm. Hair tress washed with surfactant solution to remove the foreign material. Similarly prepared the six hair tress for the study purpose and one hair tress kept aside as a control and remaining hair tress are treated with different treatment like T1, T2, T3, T4 and T5 and the exclusive treatment details are summarized in Table 1.

5 gm of hair serum milk uniformly applied on each hair tress to top to bottom with 25 strokes. Force of serum milk application was constantly maintained throughout the study. Each hair tress and kept for air drying for 60 minutes. After 60 minutes combing the hair tress to top to bottom stroke and uniformly give the 10 stroke per hair tress.

Five treatment and one control hair tress are labeled with random codes. About 50 volunteers invited for the testing the hair tress with respect to shine, conditioning, soft and smooth feel etc. Volunteers rated and scored for conditioning performance of the tresses after contacting from 5 to 0 according to the best to the worst respectively.

RESULTS AND DISCUSSION

All samples were viscous liquid type and good odour behaviors. Because of addition to perfume is immense helpful to mask the odour of silicone in the final formula. The values of pH and viscosity are summarized in Table 2.

Table 2. Analytical data compilation of hair serum

Sample code	pH	Viscosity (CPS) RV92 @ RPM12
T1	5.10 ± 0.02	13780 ± 231
T2	4.96 ± 0.07	13650 ± 402
T3	4.78 ± 0.04	12950 ± 250
T4	4.84 ± 0.07	14100 ± 350
T5	4.92 ± 0.03	13650 ± 300

pH of the serum is important for improving and enhancing the qualities of hair, minimizing irritation to the eyes and stabilizing the ecological balance of the scalp. The lower pH is one of the ways to minimize damage to the hair. Mild acidity prevents swelling and promotes tightening of the scales, there by inducing shine. As seen from Table 1, all the serums were acid balanced and were ranged between 4.5 and 5.5, which is near to the scalp skin pH. Hair consists of tiny shafts which are made up of scales, called as cuticles. Water and alkaline based hair products cause these scales to open, exposing the interior of hair shafts and ideally to close this cuticle to protect it from harmful elements [7] [8]. To do this chooses a slightly acidic product to close the cuticle and help the hair shaft retain moisture. Alkaline pH increases the negative electrical charge of the hair fiber surface and it cause the increase friction between the fibers. Friction may leads to cuticle damage and fiber breakage [9] [10].

Normally many scientists proved that addition of silicone affect the viscosity of the product [2] [3]; because the composition in silicone micro emulsion may cause the splitting of the polymers in the formulation into the building blocks [11]. However in our formula we have added the suitable self emulsified thicker to maintain the viscosity, all the hair serum viscosity ranged between 12000 and 15000 cps ranges.

Figure 1 represents the hair tress with and without treatments, T-0 act as control sample, i.e., no treatment with hair serum milk.

Figure. 1. Appearance of hair tresses treated with diffferent leave on silicone treatment

Table 3 summarizes the ratings and scores of the volunteers with respect to the conditioning property. Most of the volunteers selected (82%) that the tress treated with T-3 options followed by T-2 options. Control hair tress shows the less conditioning property and noticed by 82 % volunteers. Among the treatment T-2 and T-3 are preferred by the volunteers, and T-3 is very much pronounced and T-2 makes slightly stickiness to the hair tress. Treatment T-1 looks like the powdery feel of the hair and less conditioning and make the course to the hair. Dimethicone alone treated hair tress like T-4 and T-5 less conditioning when compared to cyclopentasilaxane & cyclopentasilaxane and dimethiconal combinations.

Table 3. Ratings of the volunteers opinion on the conditioning performance of the tresses (n=50)

Ratings*	T-0	T-1	T-2	T-3	T-4	T-5
1	41 (82)	4 (8)	4 (8)	1 (2)	2 (4)	5 (10)
2	3 (6)	7 (14)	3 (6)	1 (2)	2 (4)	2 (4)
3	1 (2)	6 (12)	2 (4)	2 (4)	26 (52)	20 (40)
4	3 (6)	8 (16)	5 (10)	5 (10)	10 (20)	13 (26)
5	2 (4)	25 (50)	36 (72)	41 (82)	10 (20)	10 (20)

`*-ratings are based on the conditioning property of hair tresses from 5 to 0 refereed to the best to the worst; i.e., Excellence (Score = 5); Very good (Score =4); Good (Score =3); Fair (Score = 2) and very poor (Score =1); Values in the parenthesis indicated the percentage of ratings

Silicone-based conditioners are one of the newest agents that aid in smoothing the cuticle and increasing hair smoothness and luster. Combing is main practice in hair care aspects and it increased hair friction snags the hair as the comb is drawn for grooming purposes, resulting in hair breakage [12]. Combability

of the hair can be increased by smoothing the cuticle and coating each individual hair shaft with an agent to decrease friction. Silicone fulfills this and act as a lubricant it reduce the friction of the hair [13] [14].
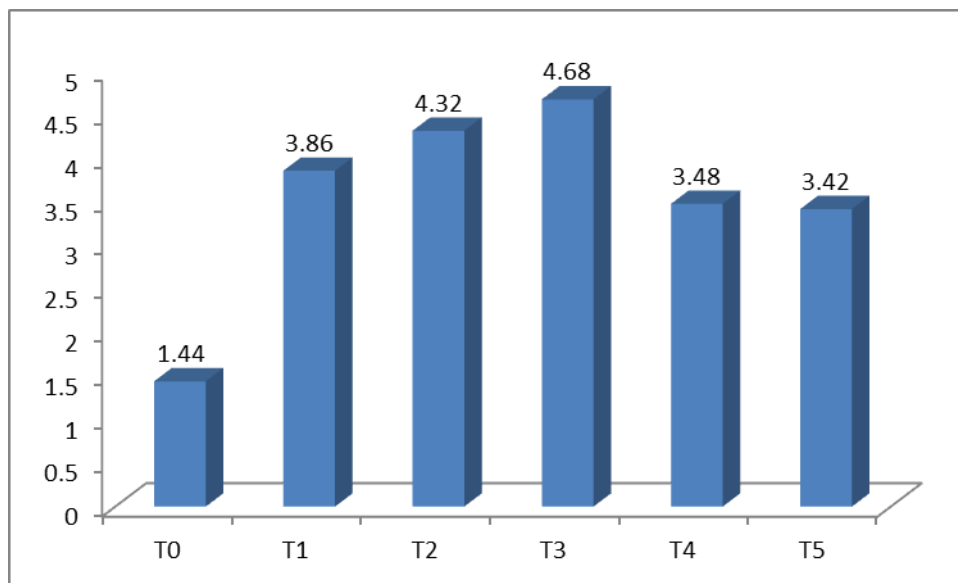

Figure 2. Average mean ratings of hair serum conditioning properties based on volunteers opinion (n=50)

Overall score of conditioning performance of the hair tress treated with T-3 are superior and the average value is 4.68; followed by the treatment T-2 and score is 4.32. Non –treated control hair tress average score is 1.44. (Figure 2) Overall conditioning property was superior in T-3 followed by T-2 and T-1. Cyclopentasilaxane and dimethiconal is a high viscosity silicone blend, it provides the excellent silky/velvet feel and superior film forming property. It is helpful to arrangement cuticles in proper and makes the surface uniform [13] [14] [15]. Therefore more number of volunteers are noticed the conditioning property in T-2 and T-3.

CONCLUSION

Emulsion based hair serum avoid the dripping issue during application and also produce the non-sticky nature. Study concluded that combination of cyclopentasilaxane and cyclopentasilaxane and dimethiconal deliver the superior conditioning property when compared to other treatment. Cyclopentasilaxane alone treated swatches make the powdery feel and course feel, cyclopentasilaxane and dimethiconal treated swatches makes the stickyness. Dimethicone alone treated hair tress shows the stickiness.

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