

Investigation of Formulation Induced Softness in Hair

Objective:

The objective of this study is to determine if the inclusion of FANCOR[®] Abyssinian Oil to a hair care formulation will affect the “softness” of the hair.

Research Facilities:

- I. Sample preparation (formulations) completed at
The Fanning Corporation
2450 West Hubbard Street
Chicago, Illinois 60612

Quantification of softness completed at TRI



CONTRACT RESEARCH PROJECT REPORT

To

**Fanning Corporation
Chicago, IL**

On

Investigation of Formulation Induced Softness in Hair Tresses

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Sample Preparation:

The formulation used to evaluate softness can best be described as a “conditioning serum” made according to the following formulas:

Hair Serum A (#68-64-1; D7219)

FANCORSIL® A (lot CW 8981)	dimethicone/cyclomethicone	61.80%
Cyclomethicone (DC 245 lot D 7252)	cyclomethicone	38.15%
FANCOR® Abyssinian oil (CW 7395)	crambe abyssinica seed oil	-----
Escalol 557	ethylhexyl methoxycinnamate	0.05%

Hair Serum B (#68-64-2; D7220)

FANCORSIL® A (lot CW 8981)	dimethicone/cyclomethicone	60.50%
Cyclomethicone (DC 245 lot D 7252)	cyclomethicone	37.45%
FANCOR® Abyssinian oil (CW 7395)	crambe abyssinica seed oil	2.00%
Escalol 557	ethylhexyl methoxycinnamate	0.05%

The hair serums were sent from Fanning to TRI using formula numbers. The quantitative formulas were never revealed to TRI. Fanning did not participate in the application of the products to the hair tresses or in the measurement of softness,

This was truly a “double-blind” study protocol.

Treatment of the Tresses:

Dark brown European hair supplied by De Meo Brothers, New York, was used in this study. The tresses used in this work were all randomized. Two serums that had been formulated by the sponsor were used. Each hair tress was pre-shaped to maintain a fluffed appearance by introducing light permanent waves into the tress by a method optimized at TRI since this work involves measuring the compression forces on each tress. The hair tresses to be treated with Serums A & B were first damped and treated with the respective product (of 0.3 mL/g of hair), using a syringe applicator from top to bottom of the tress. The products were then massaged into the hair evenly throughout the tress. The tress was allowed to equilibrate with the ambient air overnight at 21°C & 65% RH. The tresses were then slightly blow-dried and gently combed.

TRI/Princeton CRP #7303

Measurement

The ring compressibility method optimized at TRI was used in this study. Compression force measurements were made on each tress before and after the treatment. Five tresses were used for each formulation. Each tress equilibrated at 21°C & 65% RH was first gently combed and fluffed to the same level as seen by the eye. The tress was suspended from the load cell of Instron™, and was pulled up, root to tip through a ring attached to the crosshead of the Instron at a speed of 100mm/min. Two rings were used in separate measurements with diameters of 1.5 inches and 1.0 inch.

For evaluating the softness, the following measurement procedure was adopted. The tress was fluffed as described with a comb and passed through the 1.5" ring. This is termed P_1 . Without fluffing and any disturbance, the same tress is passed through the 1.5" ring again for the second measurement of the compression force. This is termed P_2 . Again without fluffing and any disturbance, the same tress is passed through the 1.5" ring again for the second measurement of the compression force. This is termed P_3 . The 1.5" ring is changed to 1" ring and the same tress is passed through the 1" ring without fluffing and disturbing. This is P_1 for the 1.0" ring. This entire procedure was carried out for a total of 3 runs per tress. The softening ability is denoted by $P_s = (P_1)_{1.0} - (P_3)_{1.5}$, where subscripts indicate the ring sizes. If P_s (after treatment) < P_s (before treatment), then it is indicative of the softening effect of that particular product. Some of the ring compression passes described above (for the 1.5" ring) are not needed for the softness measurements, but they are part of a general protocol for body and TRI/Princeton CRP #7303 softness measurements and hence were left intact. Only Pass 3 with the 1.5" ring and Pass 1 with the 1.0" ring were used in softness assessment.

Results:

Table 1 shows the reduced results ($P_s = (P_1)_{1.0} - (P_3)_{1.5}$ gf-mm before and after treatment with the serums.

Table 1. Softness of Hair Tresses Before and After Treatment
Compressibility Data gf-mm ($P_s = (P_1)_{1.0''} - (P_3)_{1.5''}$)

Tress ID	$P_s = P_1(1.0'') - P_3(1.5'') \text{ (gf-mm)}$					
	Run #1		Run #2		Run #3	
	Untreated	Treated	Untreated	Treated	Untreated	Treated
Serum A (69-64-1) Lot: D-7219						
A1	6780	3946	6345	4137	6615	3949
B2	5302	3251	5129	3502	4969	3360
B3	4659	2881	4677	2907	4406	2959
C1	5287	2632	5357	2693	5440	2781
C2	4732	3131	4816	3339	4801	3225
Hair Serum B (69-64-2) Lot: D-7220						
A2	5859	3173	5771	3202	5568	3147
A4	8759	3905	8796	3984	9025	4113
B5	5642	3016	5288	2953	5175	2866
C4	6269	2829	5976	3089	5762	2952
D5	5278	2885	5587	3020	5626	3198

Data Analysis:

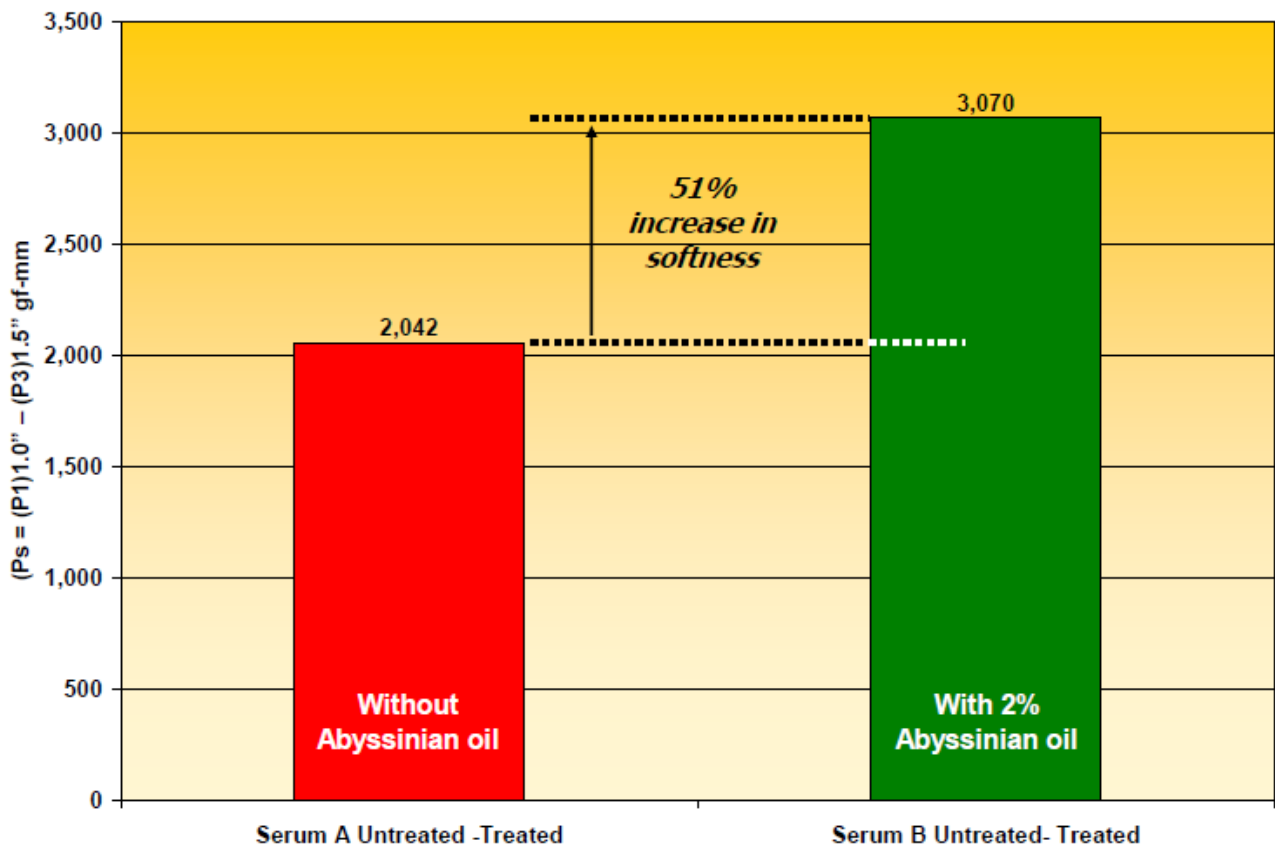
There were a total of 5 tresses with 3 measurements each for both the untreated and treated tresses or, a total of 30 measurements for each serum formulation; 15 before treatment and 15 after treatment. If one groups the data according to the formulations, the respective tresses appear as shown in Table 2.

Table 2. Degree of Softening for All Tresses in the Study (all data)

Serum A Untreated - Treated	Serum B Untreated - Treated
2,834	2,686
2,051	4,854
1,778	2,626
2,655	3,440
1,601	2,393
2,208	2,569
1,627	4,812
1,770	2,335
2,664	2,887
1,477	2,567
2,666	2,421
1,609	4,912
1,447	2,309
2,659	2,810
1,576	2,428
30,622	46,049
2,042	3,070

The results can be visualized graphically in Figure 1 below

Figure 1. The Softening Effect of Adding 2% Abyssinian Oil to a Hair Serum



The % increase in softness due to the addition of Abyssinian oil

$$= \frac{(\text{Serum B Untreated-Treated}) - (\text{Serum A Untreated-Treated})}{(\text{Serum A Untreated-Treated})} \times 100$$

$$= (3,070 - 2,052 / 2,052) \times 100 = (1,018 / 2,052) \times 100 = 51\%$$

Statistical Significance:

Using a Student t-test on all 15 values for the untreated and all 15 values for the treated tresses, the results are highly significant.

Using unpaired values, $p = 0.0011$

Using paired values, $p = 0.0036$

Conclusion:

The addition of 2% FANCOR[®] Abyssinian Oil to a silicone-based hair serum creates a statistically significant increase in the softness of the treated hair.

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