

**Tradename:** AC AlfalfaBoost

**Code:** 20988

**CAS #:** 84082-36-0 & 68333-16-4 (or) 92128-79-5

**Test Request Form #:** 10170

**Lot #:** N230119B

**Sponsor:** *Active Concepts, LLC; 107 Technology Drive Lincolnton, NC 28092*

**Study Director:** *Maureen Drumwright*

**Principle Investigator:** *Kayla Patterson*

**Test Performed:**

Moisturization Assay

Pigmentation Assay

## Introduction

An in-vivo study was conducted over the course of 2 weeks to evaluate the scalp care benefits of **AC AlfalfaBoost**. In order to determine if **AC AlfalfaBoost** is suitable for scalp care, panelists participated in a salon study combined with a moisturization assay, a pigmentation assay, and a panelist survey evaluating hydration and scalp condition. Twenty panelists were recruited to use test shampoos and conditioners 3 times per week for 2 weeks after a 1-week washout phase.

The moisturization assay was conducted to assess the hydrating ability of **AC AlfalfaBoost** in a shampoo and conditioner formulation.

The pigmentation assay was conducted to assess the ability of **AC AlfalfaBoost** to reduce redness caused by erythema.

The panelist sensory assessment was conducted to collect subjective data on parameters such as scalp cleansing, moisturization, tightness, flaking, and itching.

## Materials

- A. Equipment:** DermaLab Skin Combo (Hydration/ Moisture Pin Probe); DermaLab Skin Combo (Pigmentation Probe); Dino-lite Pro Digital Microscope
- B. Controls:** Control Shampoo and Conditioner (Table 1)

**Table 1.** Ingredient List (INCI Names) of Base Shampoo and Base Conditioner

Base Shampoo	Base Conditioner
Water	Water
Guar Hydroxypropyltrimonium Chloride	Polyquaternium-10
Sodium Methyl 2-Sulfolaurate (and) Disodium 2-Sulfolaurate	Glycerin
Cocamidopropyl Betaine	Water & Centrimonium Chloride
Lactobacillus Ferment & Lactobacillus & Cocos Nucifera (Coconut) Fruit Extract	Behentrimonium Methosulfate & Cetearyl Alcohol & Butylene Glycol
Polysorbate 20	Hydrogenated Ethylhexyl Oliviate (and) Hydrogenated Olive Oil Unsaponifiables
Fragrance	Lactobacillus Ferment
	Fragrance

## Methods

A salon study was conducted to determine the scalp care benefits of 5.0% **AC AlfalfaBoost** in a shampoo and conditioner vs. the control. The study was conducted using 20 M/F panelists. Each panelist had a baseline photo taken of his or her scalp prior to beginning the study with the Dino-lite Pro Digital Microscope and again after the third wash on Week 2. The objective was set to 65x. Images were taken at three locations on the scalp (front, middle, and back) to provide a full understanding of scalp health.

Panelist's heads were treated with either the control shampoo and conditioner or the test product containing 5.0% **AC AlfalfaBoost** in the base shampoo and base conditioner. Each panelist had their hair washed and blow dried 3 times per week for 2 weeks. After the 3rd wash of the week, panelists had scalp moisturization and pigmentation values recorded. Measurements were taken at three locations on the scalp—(front, middle, and back)—and all values were averaged to understand overall scalp conditions.

A Dermalab Corneometer was used to measure the moisture levels on the subject's scalp. The Corneometer is an instrument that measures the amount of water within the skin. The presence of moisture in the skin improves conductance resulting in higher readings. The higher the levels of moisture, the higher the readings from the Corneometer will be. This method is referred to as a conductance measurement and the output is presented in the unit of uSiemens (uS). Baseline moisturization readings were taken on day one of the study. Panelists had moisturization readings taken of the scalp after the 3rd wash of each week.

The pigmentation measurement of the DermaLab Combo is performed using a handheld probe. This probe accommodates the color sensor, filters, optics, and light source. The light source is composed of two high intensity white LEDs, as well as a guiding light, which illuminates the target during positioning of the probe. Once the probe is in place, the LEDs flash at full power to illuminate the target area. Erythema levels were then measured and recorded. Baseline pigmentation readings were taken on day one of the study. Panelists had pigmentation readings taken of the scalp after the 3rd wash of each week.

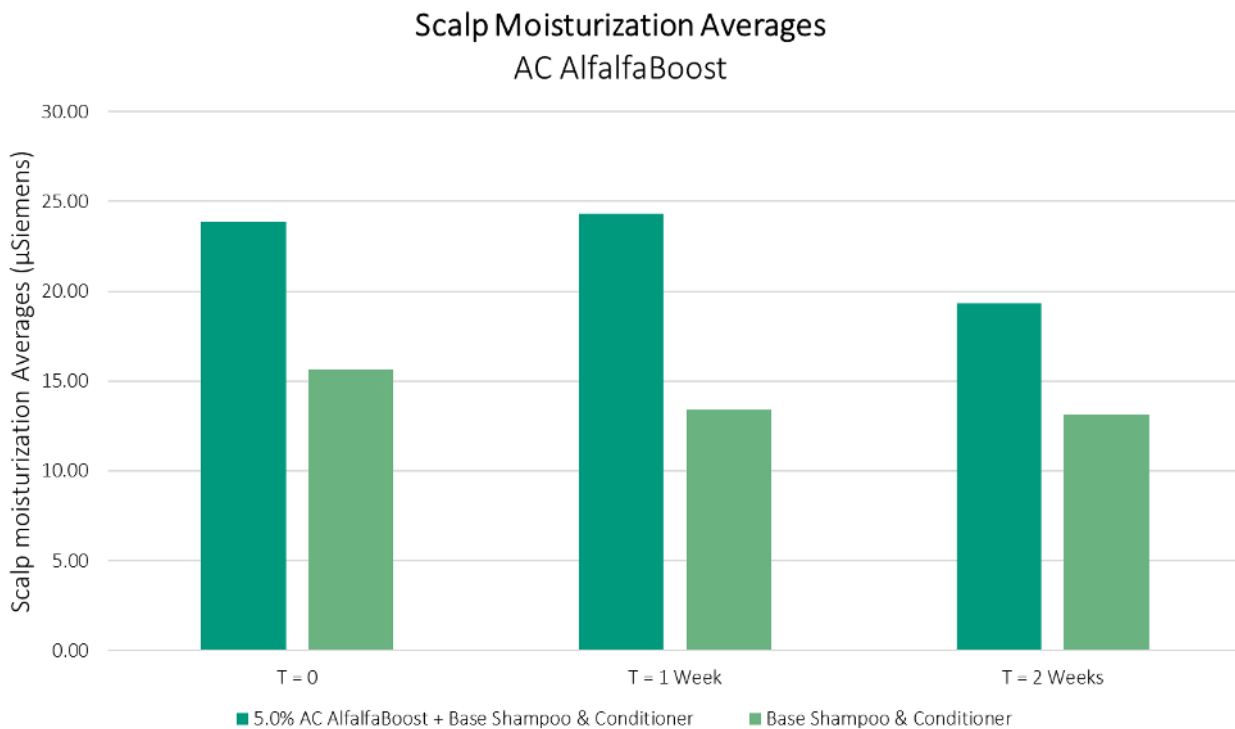
## Results

### Moisturization Assay

AC AlfalfaBoost showed improvements in scalp hydration during the study. Please note that three consecutive readings were taken at each location and an average was recorded. The value presented is an average of all three locations.

Percent change in moisturization is calculated by the following formula:

$$\text{Percent (\%) Change} = \frac{\text{Average Moisture Value}_{T=1\text{Week.etc}} - \text{Average Baseline Value}_{T=0}}{\text{Average Baseline Value}_{T=0}} \times 100$$



**Figure 1.** Overall (Front, Middle, Back) Scalp Moisturization Averages at Each Time Point

**Table 2.** Comparative Moisturization of Experimental and Control Materials over Time

Percent Change (%)	T = 0 vs 1 Week	T = 0 vs 2 Weeks
Experimental (5.0% AC AlfalfaBoost in Base Shampoo and Conditioner)	2.0	-19
Base Shampoo and Conditioner	-14	-16

**Table 3.** Moisturization Difference between Experimental and Control Materials at Each Time Point

Percent Difference (%)	T = 0	T = 1 Week	T = 2 Weeks
Experimental (5.0% AC AlfalfaBoost in Base Shampoo and Conditioner) vs Base Shampoo and Conditioner	41	58	38

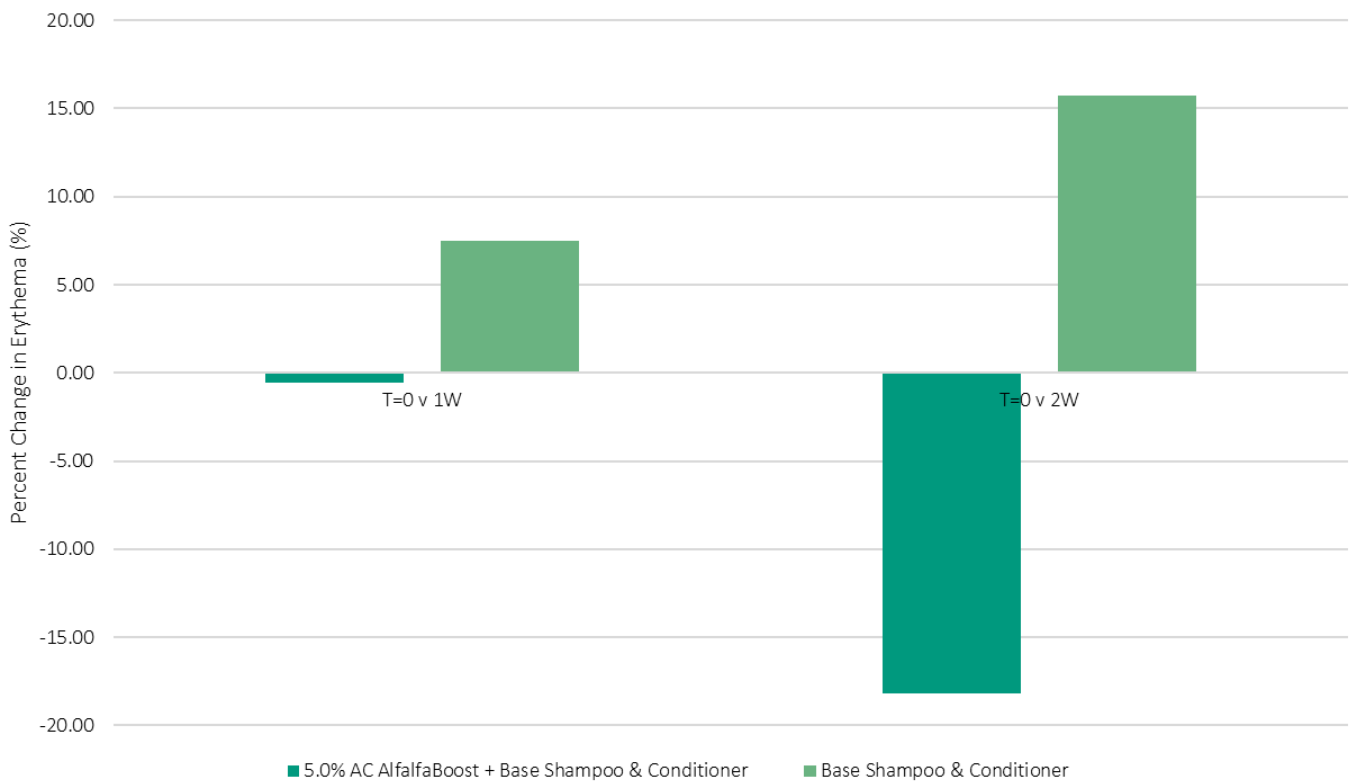
## Pigmentation Assay

AC AlfalfaBoost showed improvements in scalp redness during the study. Please note that each value is an average of three consecutive readings per test site.

**Table 4.** Average Overall Scalp Erythema (front, middle, back) at Each Time Point

Averages	T = 0	T = 1 Week	T = 2 Weeks
Experimental (5.0% AC AlfalfaBoost in Base Shampoo and Conditioner)	8.03	7.98	6.57
Base Shampoo and Conditioner	6.95	7.47	8.04

## Change in Erythema AC AlfalfaBoost

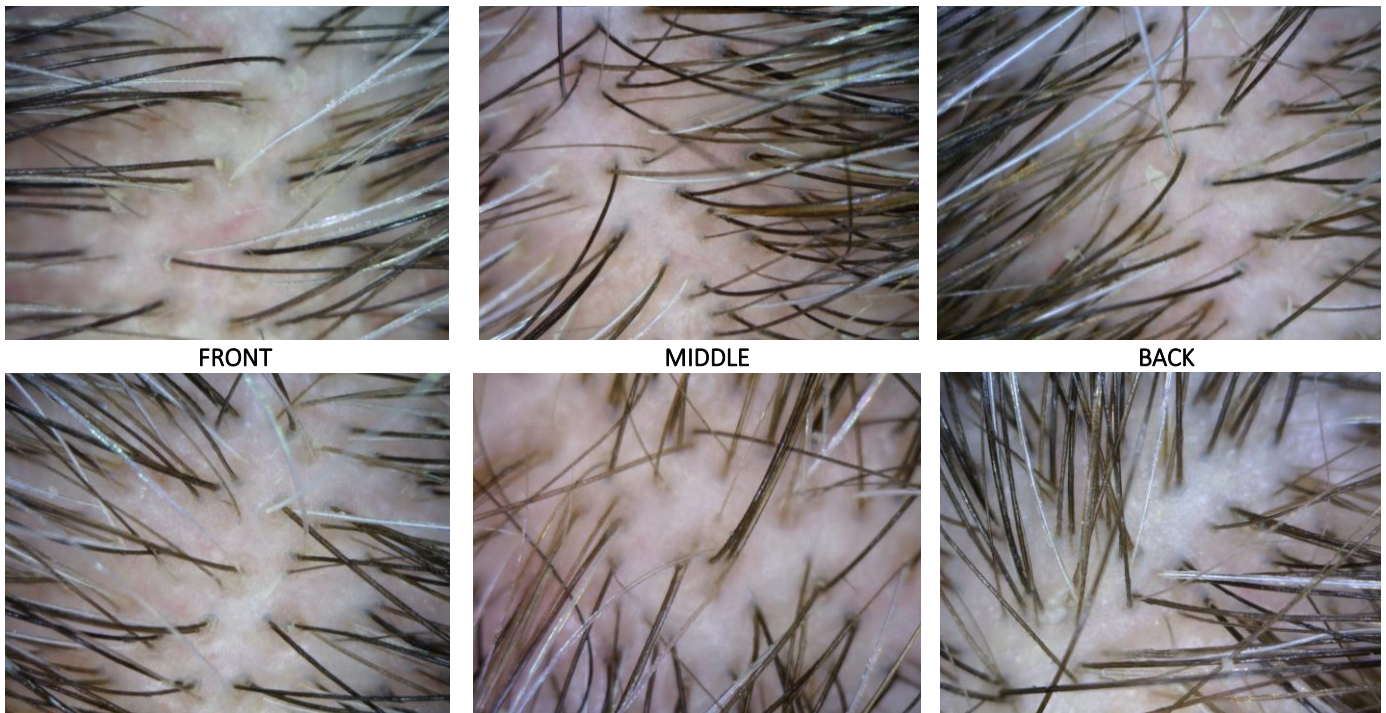


**Figure 2.** Change in Erythema of Experimental and Control Materials Over Time

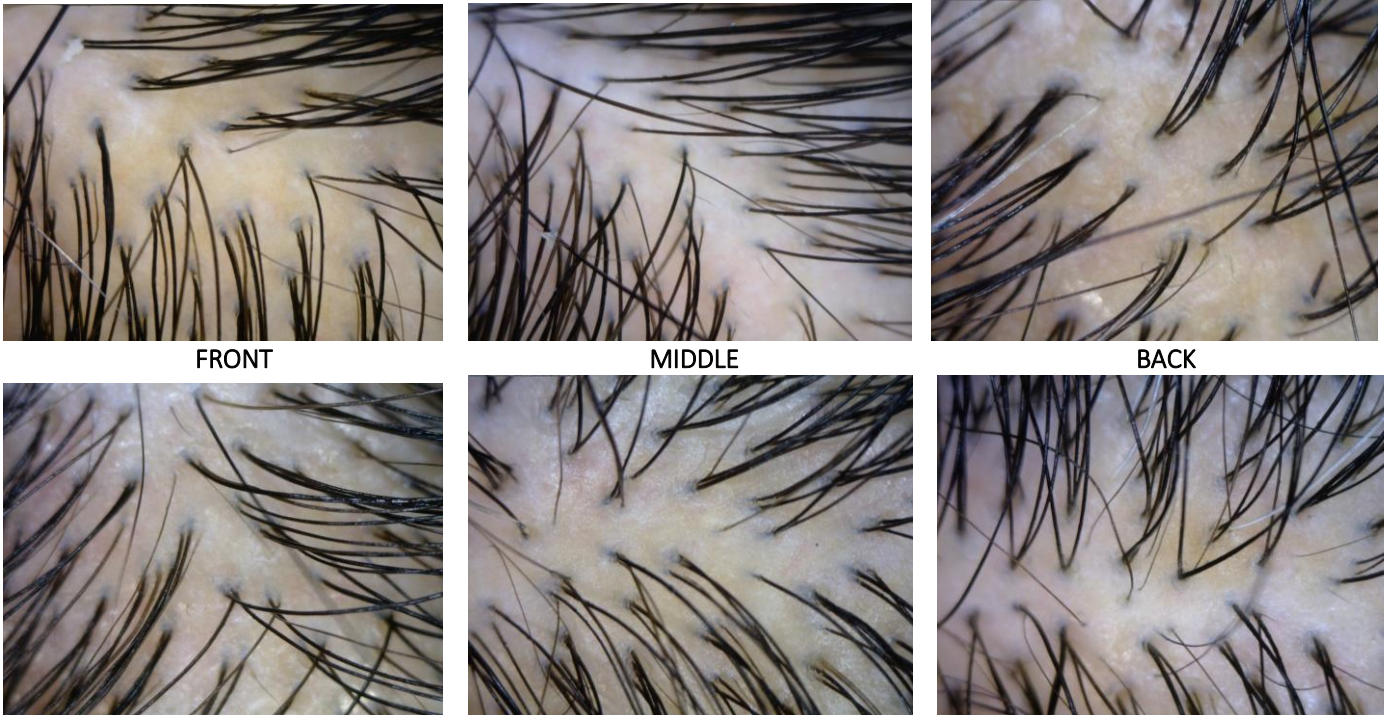
**Table 5.** Erythema Difference between Experimental and Control Materials at Each Time Point

Percent Difference (%)	T = 0	T = 1 Week	T = 2 Weeks
Experimental (5.0% AC AlfalfaBoost in Base Shampoo and Conditioner) vs Base Shampoo and Conditioner	14	7	20

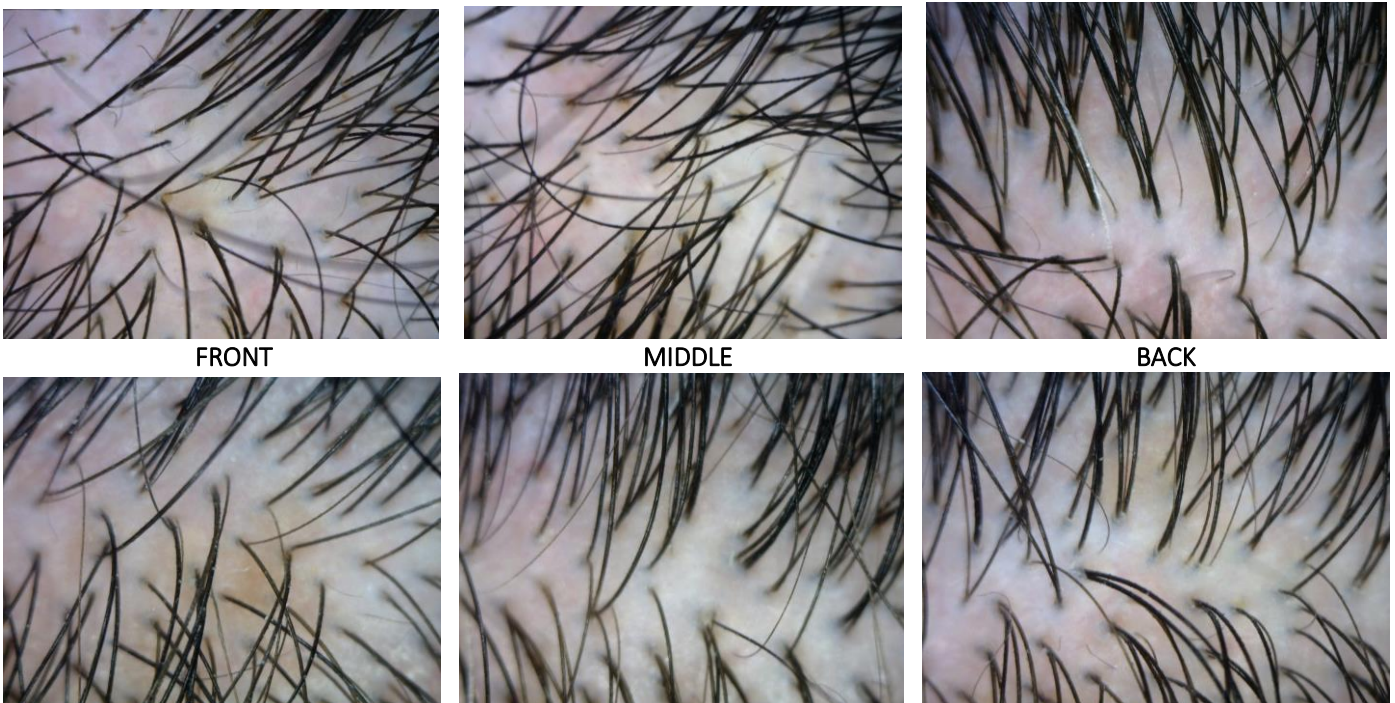
## Scalp Images



**Image 1.** Initial and T=2 Week Images of a Participant 3 using Experimental Product containing 5.0% AC AlfalfaBoost



**Image 2.** Initial and T=2 Week Images of a Participant 4 using Experimental Product containing 5.0% AC AlfalfaBoost



**Image 3.** Initial and T=2 Week Images of a Participant 9 using the Control Shampoo and Conditioner.

**Table 6.** T-test Analysis of the Pigmentation Percent Change (%) Between Baseline and T=2 Weeks of 5.0% **AC AlfalfaBoost** (n=30,  $\alpha=0.05$ , df=56)

	T = 0	T= 2 weeks
Mean	8.02	6.57
Variance	5.67	3.94
t Stat	2.57	
P(T<=t) two-tail	0.0125	
t Critical two-tail	2.003	

**Table 8.** T-test Analysis of the Pigmentation Percent Difference (%) Between 5.0% **AC AlfalfaBoost** and Base Shampoo and Conditioner at T = 2 weeks (n=30,  $\alpha=0.05$ , df=51)

	AC AlfalfaBoost	Base Shampoo and Conditioner
Mean	6.56	8.04
Variance	3.94	8.83
t Stat	-2.25	
P(T<=t) two-tail	0.0283	
t Critical two-tail	2.007	

**Table 7.** T-test Analysis of the Moisturization Percent Difference (%) Between 5.0% **AC AlfalfaBoost** and Base Shampoo and Conditioner at T = 2 weeks (n=30,  $\alpha=0.05$ , df=42)

	AC AlfalfaBoost	Base Shampoo and Conditioner
Mean	19.33	13.13
Variance	147.54	36.25
t Stat	2.504	
P(T<=t) two-tail	0.0162	
t Critical two-tail	2.018	

## Discussion

As evidenced in a 2-week salon scalp study of 5.0% **AC AlfalfaBoost**, moisture levels were improved by 19% after 2 weeks when compared to the baseline values taken on day 1 of the study. Comparisons of the control shampoo and conditioner to the experimental products containing 5.0% **AC AlfalfaBoost** demonstrate the experimental material moisturized the scalp 58% better after 1 week. After 2 weeks, the experimental material moisturized the scalp 38% better than the base shampoo and conditioner. Additionally, 80% of participants using the experimental material rated their scalps as feeling hydrated while only 60% of the participants using the control rated their scalps as hydrated.

Scalps of participants using the experimental shampoo and conditioner with 5.0% **AC AlfalfaBoost** showed a reduction of 1% in erythema after 1 week of the study. After 2 weeks, the same participants saw a reduction of 18% in erythema on their scalps. Compared to the control shampoo and conditioner, the experimental products reduced erythema by 7% more after 1 week and 20% more after 2 weeks. 80% of participants using the experimental product also reported less flaking on the scalp for the duration of the study while 40% of participants using the control notices more flaking after 2 weeks. Images 1 & 2 demonstrates the positive impacts on the scalp for two difference participants using the experimental products, while image 3 demonstrates how the control products interacted with a participant's scalp. Overall, 100% of participants using the products containing 5.0% **AC AlfalfaBoost** were happy with the condition of their scalps at the end of the study.

**AC AlfalfaBoost** provides exceptional moisturization and redness reduction in a wide array of formulations. The present study supports the use of **AC AlfalfaBoost** in scalp care applications. In conclusion, the use of **AC AlfalfaBoost** can help reduce itchiness, tightness, and dryness of the scalp leading to a more comfortable scalp feel.