

Tradename: AC Biopolymer Chia PF

Code: 21005PF

CAS #: 61788-47-4 & 93384-40-8

Test Request Form #: 10030

Lot#: 9237700

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

Study Director: *Maureen Drumwright*

Principle Investigator: *Hannah Duckett*

Test Performed:

DermaLab Combo & Sebum Collecting Strips

Introduction

Sebum is the oily secretion of the sebaceous glands, which can make skin look visibly shiny throughout the day. Decreasing shine on the skin is an important attribute in many cosmetic applications including color cosmetics such as foundations. An *in-vivo* study was conducted to evaluate the ability of **AC Biopolymer Chia PF** to reduce facial sebum when incorporated into a base foundation. Results indicate that this material is capable of decreasing sebum production throughout the day, and subsequently decreasing visible shine on the skin.

Materials

- A. **Equipment:** DermaLab Skin Combo & Sebum Collecting Strips; VISIA Complexion Analysis System (Canfield Scientific., Fairfield, NJ, USA)
- B. **Product:** Maybelline Fit Me, Matte + Poreless Foundation Shade #220 (base foundation)

Methods

The DermaLab Skin Combo & Sebum Collecting Strips provide information about the skin's sebum which can be directly linked to shine perceived on the skin. Additionally, photographic assessments were performed using the VISIA Complexion Analysis System (Canfield Scientific., Fairfield, NJ, USA). The VISIA System, with a configurable head support, ensured consistent positioning of each subject's head. The photographic images were captured with standard, cross-polarized, parallel polarized, and ultraviolet light. Images were analyzed for luminosity using ImageJ software.

Fourteen female volunteers between the ages of 24 and 36 who were known to be free of any skin pathologies and had Fitzpatrick skin types II to IV participated in this study (Table 1). The base foundation was placed on the one side of the face as the control while the other side was treated with the base foundation containing 1.0% **AC Biopolymer Chia PF**, this was determined randomly. A Dermalab skin combo with sebum collecting strips was used to measure the sebum levels on the subject's forehead, nose, and chin at baseline and after 6 hours. The sebum collecting strips were applied for 15 seconds to collect surface sebum from the participants tested areas in which the Dermalab Skin Combo then measured the amount of sebum and assigned a value. Each location was measured twice, and an average was recorded.

The presence of sebum on the skin results in higher readings than sebum lacking skin. Therefore, the higher the levels of sebum, the higher the readings from the DermaLab will be and the more shine we expect to see on the skin. Baseline sebum readings were taken at the start of the study. Each participant was asked to classify their skin type on a scale of 1 (extremely dry) -10 (extremely oily).

Table 1. The Fitzpatrick Classification of Skin Types Chart¹

Fitzpatrick Skin Type Descriptions*	
Skin Type	Description
I	Always burns, never tans
II	Burns easily, tans minimally
III	Burns moderately, tans to light brown
IV	Burns minimally, tans to moderate brown
V	Rarely burns, tans to dark
VI	Never burns, least sensitive to changes

*Adapted from The Surgeon General's Call to Action to Prevent Skin Cancer

Results

AC Biopolymer Chia PF exhibited sebum-reducing results alone at a 1.0% concentration.

Percent change in sebum is calculated by the following formula:

$$\text{Percent (\%) Change} = \frac{\text{Average Sebum Value}_{T=6 \text{ hours}} - \text{Average Baseline Value}_{T=0}}{\text{Average Baseline Value}_{T=0}} \times 100$$

Table 2. Self-Assessment of Each Participants Skin Type

Participant	Skin Type Rating 1 (very dry) – 10 (very oily)
One	3
Two	5
Three	6
Four	6
Five	7
Six	6
Seven	6
Eight	5
Nine	8
Ten	6
Eleven	5
Twelve	6
Thirteen	4
Fourteen	7

Table 3. Average Sebum Readings for Individual Test Sites

Averages	Forehead		Nose		Chin	
	T = 0	T = 6 Hours	T = 0	T = 6 Hours	T = 0	T = 6 Hours
Experimental (1.0% AC Biopolymer Chia PF + Base Foundation)	29.83	19.55	30.86	26.57	27.71	20.71
Base Foundation		25.74		30.21		24.93

Percent Change in Sebum

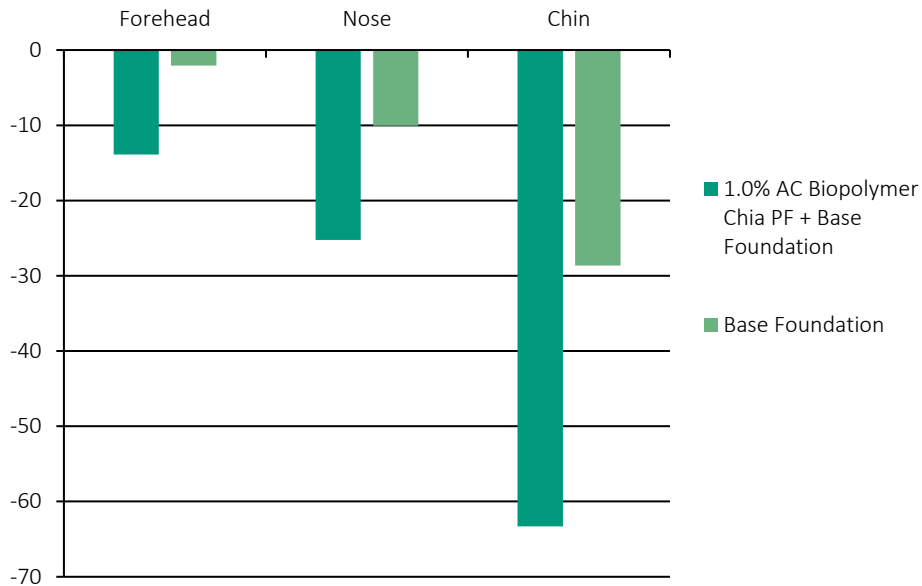


Figure 1. Change in Sebum over Time at Each Test Site for Each Test Material

Table 4. Comparison in Sebum Readings between Test Materials after 6 Hours at Each Test Site

Percent (%) Difference	Forehead	Nose	Chin
Experimental (1.0% AC Biopolymer Chia PF + Base Foundation) vs Base Foundation	12.83	18.47	64.10

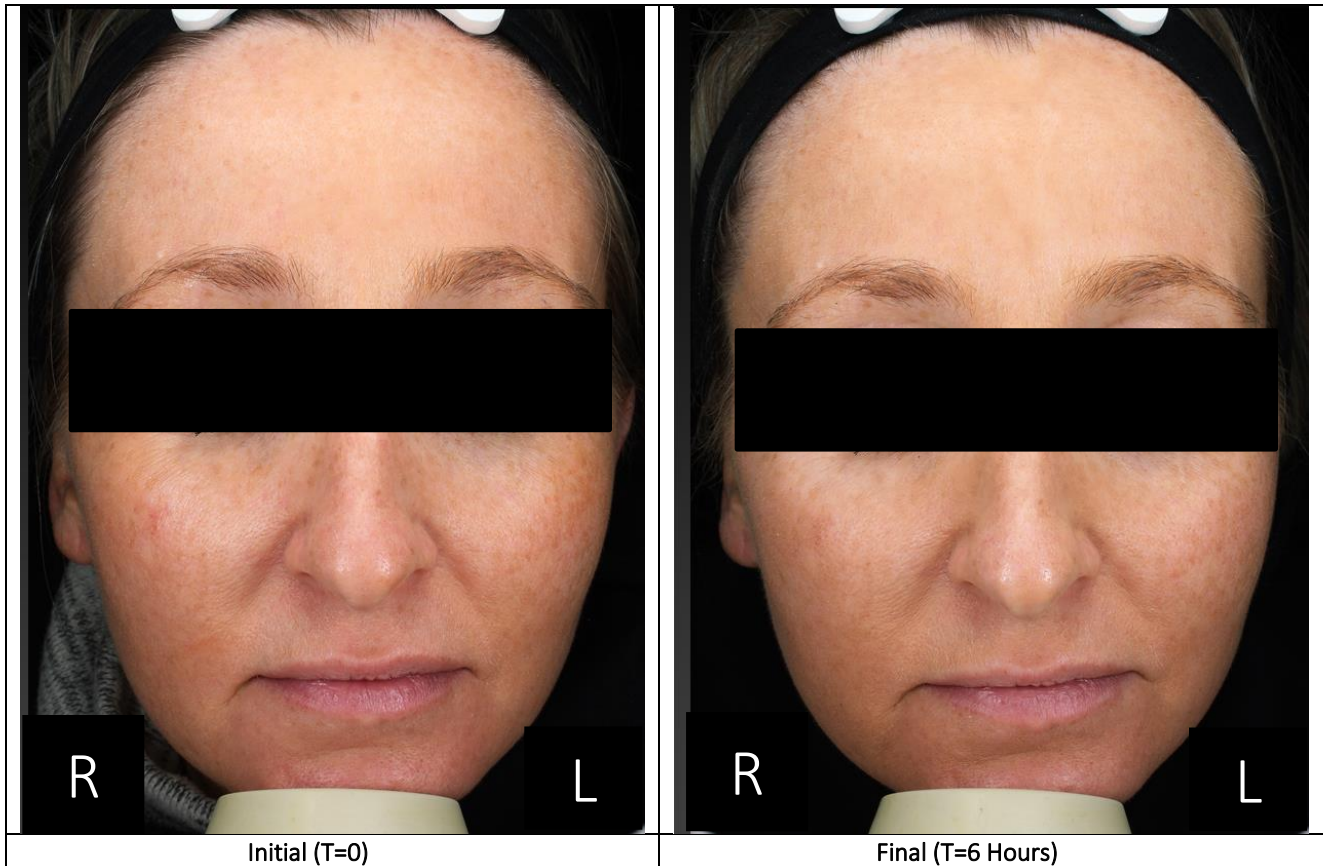


Figure 2. VISIA Images of Participant 1 Over Time (Right Side (R) = 1.0% AC Biopolymer Chia PF + Base Foundation, Left Side (L) = Base Foundation)

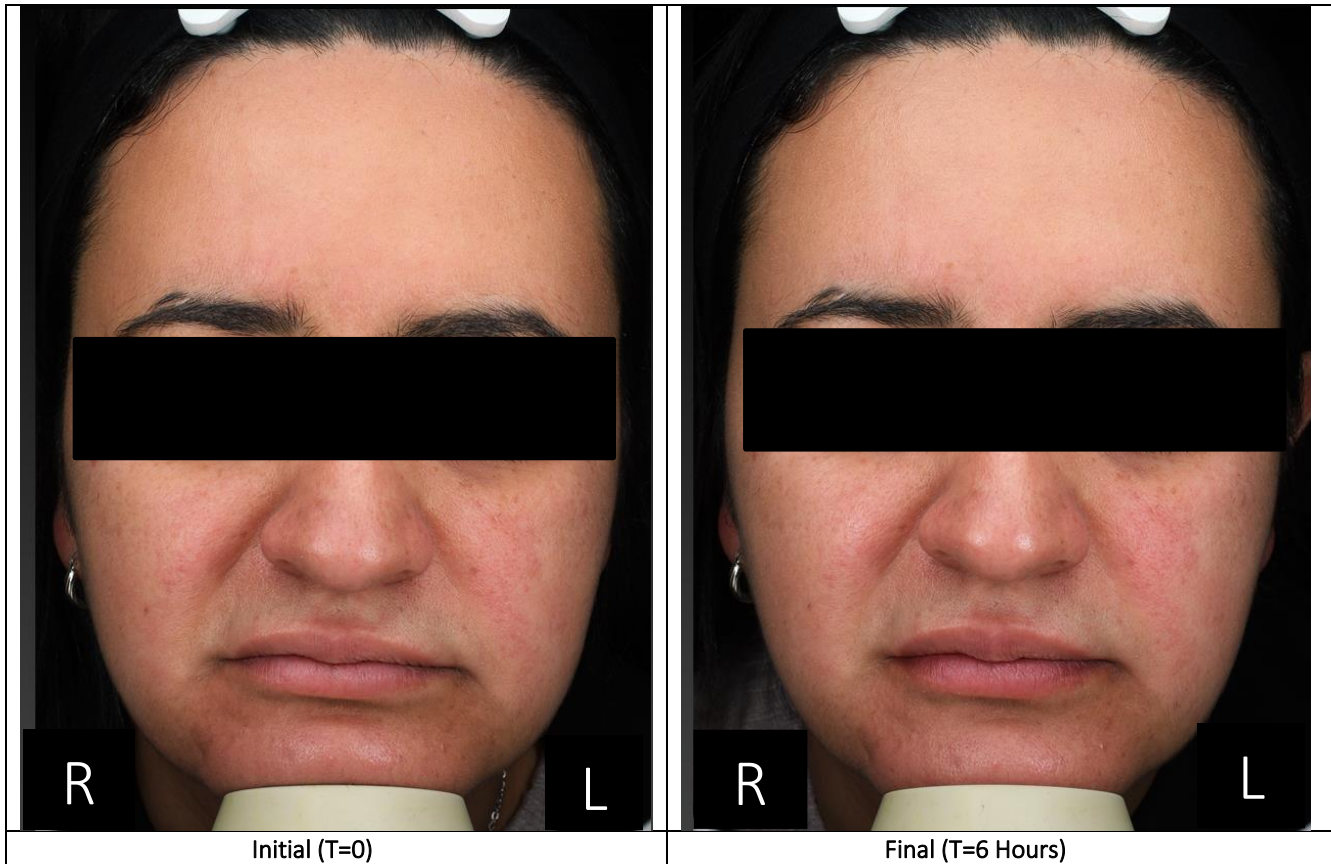


Figure 3. VISIA Images of Participant 6 Over Time (Right Side (R) = Base Foundation, Left Side (L) = 1.0% AC Biopolymer Chia PF + Base Foundation

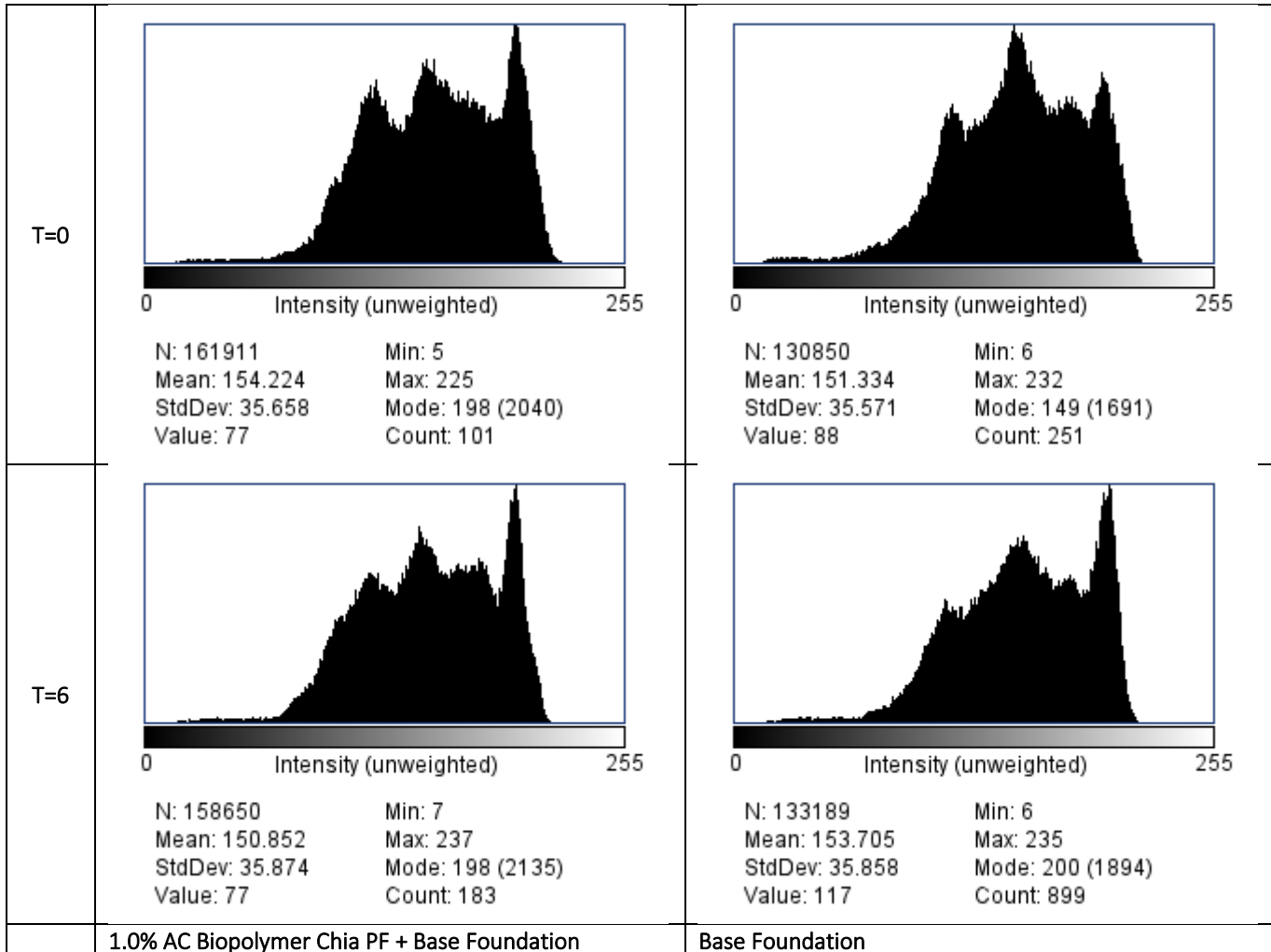


Figure 4. Histograms of Participant 1 Whole Face Images

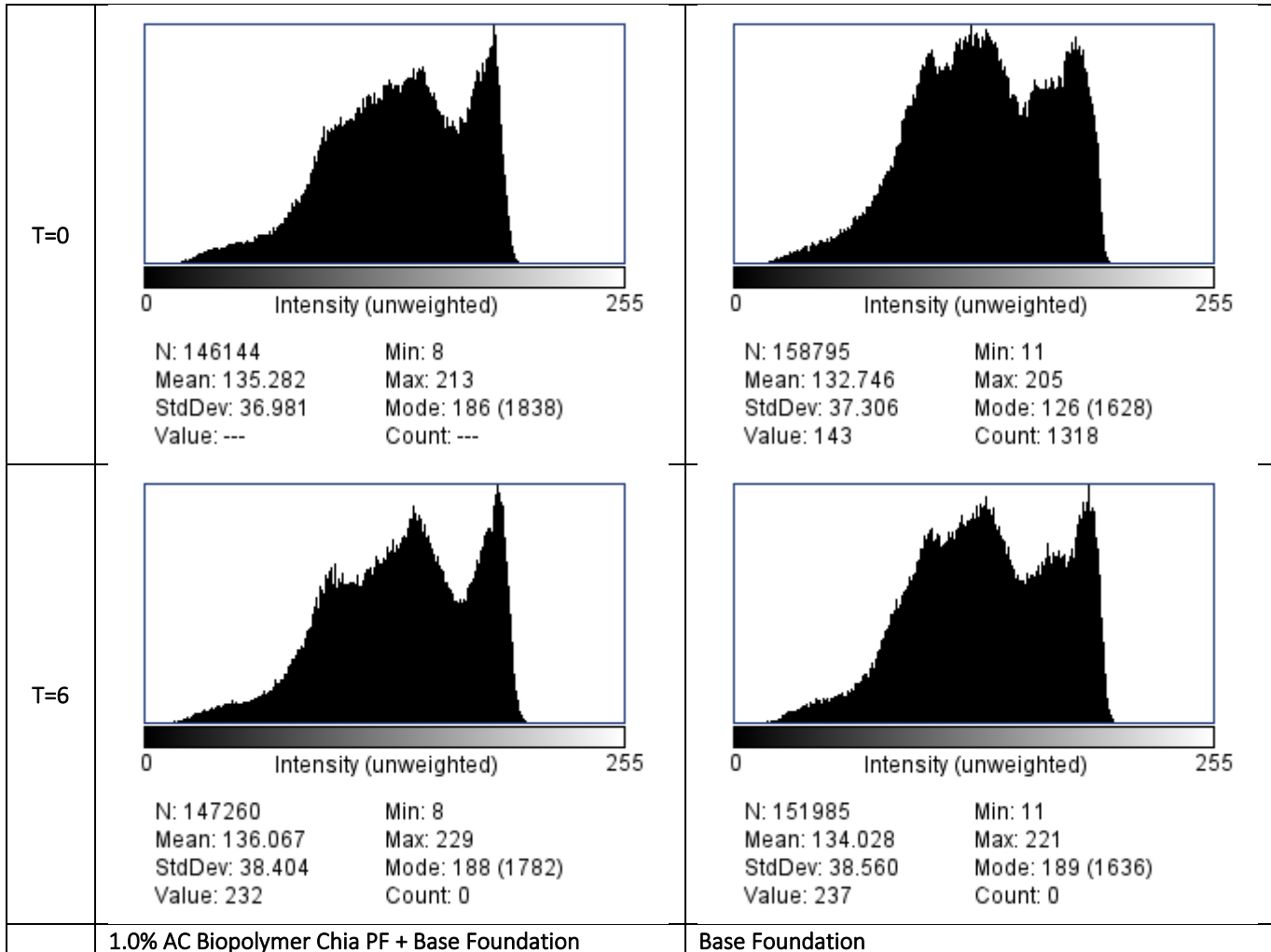


Figure 5. Histograms of Participant 6 Whole Face Images

Table 5. T-test Analysis of Sebum Percent Change on the Chin between Baseline and T=6 Hours of 1.0% AC Biopolymer Chia PF (n=14, $\alpha=0.05$, df=26)

	T = 0	T= 6 Hours
Mean	30.93	11.36
Variance	254.07	221.48
t Stat	3.36	
P(T<=t) two-tail	0.0024	
t Critical two-tail	2.06	

Table 6. T-test Analysis of Sebum Percent Change of Overall Face between Baseline and T=6 Hours of 1.0% **AC Biopolymer Chia PF** (n=42, $\alpha=0.05$, df=82)

	T = 0	T= 6 Hours
Mean	29.83	19.55
Variance	308.83	346.99
t Stat	2.60	
P(T<=t) two-tail	0.01	
t Critical two-tail	1.99	

Discussion

The foundation containing 1.0% **AC Biopolymer Chia PF** was able to reduce sebum production and decrease visible shine on the skin. As shown in Table 3, the side of the face containing 1.0% **AC Biopolymer Chia PF** in a base foundation had lower average sebum levels than the base alone over the course of the day in all areas (forehead, nose, and chin). On the foreheads of participants, test sites treated with the experimental foundation displayed a 13.89% decrease in sebum after 6 hours, whereas the same site treated with the control only had a decrease of 2.08%. Similarly, the nose and chin areas exhibited decreased sebum levels of 25.26% and 63.28% ($p=0.0024$), respectively, on the side where **AC Biopolymer Chia PF** was applied (Table 5). The same areas containing the base foundation alone saw 10.05% and 28.64% decreases in sebum after 6 hours, respectively (Figure 1). Additionally when compared to the base foundation alone after 6 hours, the experimental product containing 1.0% **AC Biopolymer Chia PF** had 12.83%, 18.47% and 64.10% lower sebum levels on the forehead, nose, and chin, respectively (Table 4). After six hours, the side containing the experimental product saw an overall significant decrease in sebum levels of 34.48% ($p=0.01$) (Table 6).

Furthermore, the VISIA images of participants demonstrated visually less shine after 6 hours of wear on the side of the face containing the experimental product (Figures 2 & 3). Histogram analysis of the images quantified the difference between the sides of the face as shown in Figures 4 and 5.

Overall, 1.0% **AC Biopolymer Chia PF** in a base foundation was more effective at decreasing sebum levels as compared to the base foundation alone as evidenced by this six-hour efficacy study. When used at appropriate levels, **AC Biopolymer Chia PF** may be capable of decreasing sebum production and ultimately reduce shine on the skin.

References

1. Sharma AN, Patel BC. Laser Fitzpatrick Skin Type Recommendations. [Updated 2022 Mar 9]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557626/>