



AC Pina Colloida

INCI: Water & Ananas Sativus (Pineapple) Fiber Crosspolymer & Lactobacillus Ferment



Warning Attention

Record temperatures are being observed worldwide, altering our clothing and grooming habits. The increasing **heat** and worsening **pollution** are influencing trends in the fashion and beauty industries.

The market for skincare products with **anti-pollution** properties is projected to reach \$1.4 billion by the close of 2031¹, and consumers are turning to **more technologically advanced** products for sun protection.





Under Attack

The aging and quality of skin and hair can be directly influenced by global warming. Presently, the risk of skin damage induced by UV rays is progressively rising due to climate change, and the skin and hair lack inherent mechanisms to shield themselves adequately from the sun and environmental stress.

As the beauty industry undergoes an eco-conscious transformation, consumers are becoming more aware of the environmental impact of their daily routines and are actively seeking high performance products without causing harm to the planet.²

Addressing the global necessity to mitigate harm from petrochemical pollutants, eco-friendly and biodegradable solutions have become imperative.



The Eco-Conscious Transformation



How can we counteract the impacts on our skin and hair resulting from the constantly shifting and tumultuous climate of the planet with a sustainable impact?

Our responsibility

is to initiate the cosmetic industry's supply chain with natural and sustainable solutions. As biotechnology progresses, we can offer innovative approaches to obtain biopolymers and enhance their performance.



Our objective

Develop an innovative eco-solution for safeguarding hair & skin.

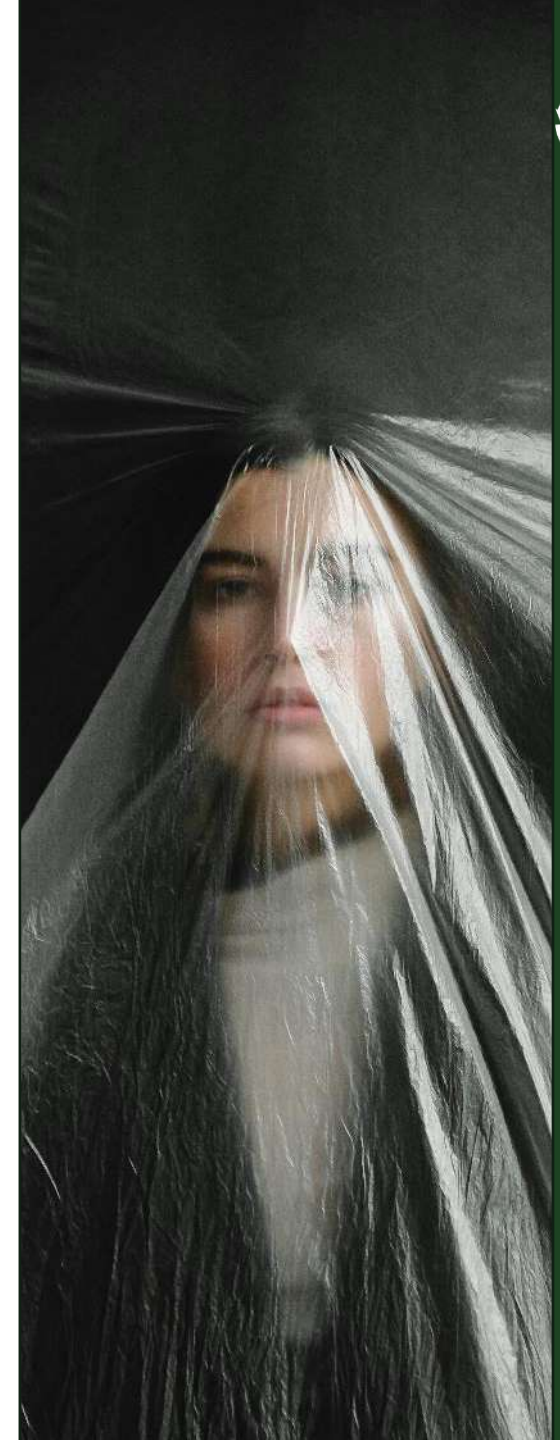
- ✓ Creating a novel natural polymer
- ✓ Acting as a shield against environmental factors
- ✓ Promoting eco-friendliness through sustainable sourcing



Polymers, large molecules with repeating structural units connected by covalent chemical bonds, include natural polymers like cellulose found in nature.

Biodegradable polymers offer eco-friendly choices, but unmodified types may lack strength and water resistance. Researchers explore enhancement techniques.³

Enhancement methods for biodegradable polymers may raise complexity and carbon footprint by demanding more materials and energy. Reevaluating both the techniques and aspects involved in ingredient modification is crucial for the sustainable development of polymers.



Biomaterials Science



The environmental challenges linked to the energy crisis, production, disposal, and recycling of synthetic fiber-based polymer composites have inspired the exploration of **eco-friendly natural fibers**, with the aim of introducing innovative biopolymers and eco-textiles.

At Active Concepts, we embrace diverse realms of science and industry. Exploring solutions from food to fashion, we identify **potential alternatives** in technology and fiber sources that could contribute to **sustainable practices** for the creation of our novel ingredient.

Ecoalf



Source: Ecoalf Website

Piñayarn®

offers a 100% plant-based, recyclable, and biodegradable textile solution for a world otherwise dominated by petroleum-based textiles and resource intense virgin fibres.



Source: Anans Anam Website

Pineapple leaf fiber (PALF) is valued for its high cellulose content and strength. Processing pineapple crown leaves (PCL) contributes to pollution and agricultural issues. PALF finds use in textiles, paper, and polymers, but burning leaves harms the environment. Repurposing PCL waste as a cellulose source addresses pollution, leveraging its renewable nature. This strategy tackles environmental challenges by utilizing pineapple crown leaves sustainably.

Pina-Appeal

Pineapple, a non-climacteric fruit, ranks third globally in cultivation after banana and citrus, being consumed worldwide. Major producers include Costa Rica, the Philippines, and Brazil. Each plant yields 40-60 tonnes per hectare, generating about 40-50 leaves or 2.3 kg of pineapple leaves per shoot. This abundance results in substantial **by-products**, especially pineapple leaves, totaling approximately 3 billion tons annually⁴.



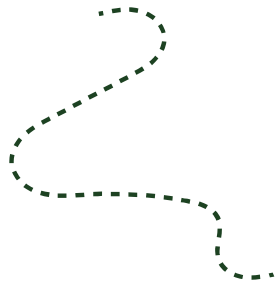
Global agricultural post-harvest waste poses a pressing issue, often being burned, discarded, or used solely as organic fertilizer without generating additional income and contributing to pollution. These wastes are rich in cellulose, hemicellulose, and lignin.

Goal is repurpose

Repurposing a portion of this waste offers a promising solution to minimize waste and introduce a beneficial sourcing strategy for producing new biopolymers.



Agricultural waste is a major contributor to pollution, with millions of tons of crops either abandoned or burned annually, releasing harmful greenhouse gases. However, there's a sustainable alternative in PALF, which transforms this waste into valuable products, effectively reducing pollution and promoting a closed-loop system in the circular economy.



For our sourcing, we strategically identified three local methods to acquire pineapple crowns, meeting the requirements of our production sites.



Recycled Sourcing



Pineapple crowns are utilized from a local grocery store in the United States that would have otherwise been discarded as waste, saving approximately 2.6 metric tons. These crowns are sustainably used to extract fibers and are sourced from a certified Costa Rican supplier practicing sustainable cultivation.

US



In Italy's Piemonte region, our European pineapple crown supplier prioritizes quality, health, and sustainability. They annually discard 8,500 Costa Rican pineapple crowns, repurposing them in line with their commitment to innovation and eco-conscious practices.

EU



In Taiwan, a local family farm partners with us to supply pineapple crowns. Focusing on pineapple, our supplier creates culturally significant pineapple cakes, with most fruit sourced locally. Emphasizing non-toxic, pesticide-free practices, they distribute fresh produce in community markets, ensuring fruit freshness and consumer healthiness.

Asia

Acquiring discarded pineapple crowns



Mechanical crushing of crowns and treatment resulting in pineapple leaf fiber (PALF) extract



Fermentation of yeast with PALF solution



AC Pina Colloida

Extraction under specific conditions of yeast polysaccharides/PALF cross-linked polymer



Addition of *Lactobacillus* ferment.



Manufacturing Process



Pina

[Piña] . pineapple in Spanish

Colloida

[Colloid] . is a dispersion of polymer particles in a continuous liquid phase.

Representing the idea of the PALF solution & polymer functionality

Pina Colloida

similarity to [Pina Collada] cocktail

Idea of enjoying time & sun

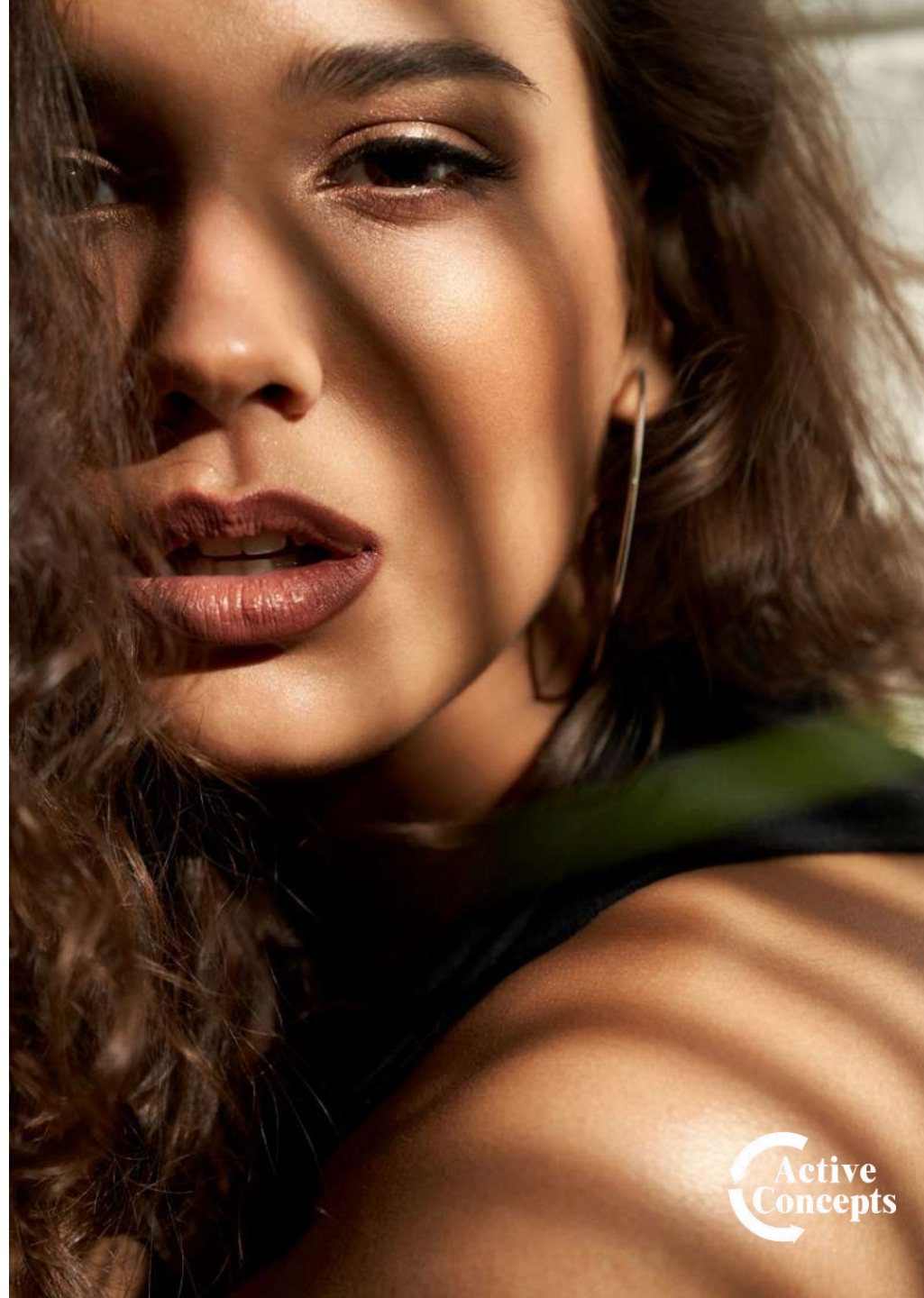
The Name

AC Pina Colloida

New beauty protection against global warming: a film-forming pineapple biopolymer, safeguarding both skin and hair while promoting environmental sustainability. AC Pina Colloida repurposes pineapple crown leaf waste to create a shield against environmental factors with a cross-linking technology based on yeast, addressing environmental pollution and contributing to a greener future.



Natural Biopolymer | Environmental Protection | Moisturization

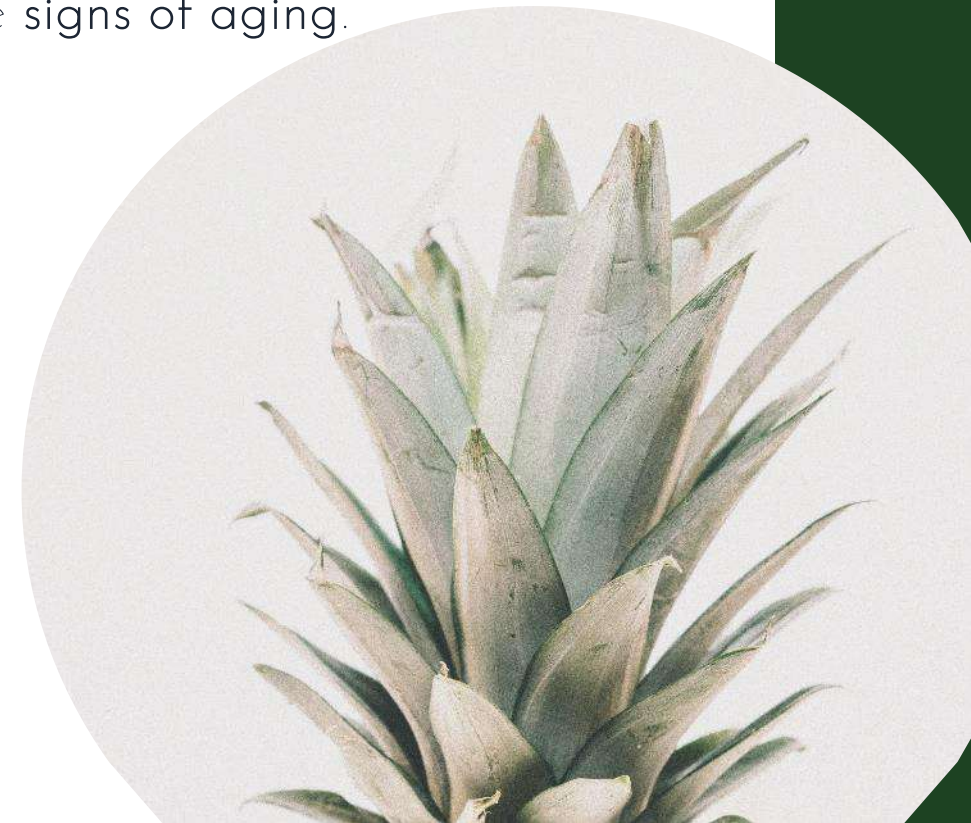


Benefits

+ AC Pina Colloida is a new biopolymer that improves the skin's protective barrier function, helping to lock in moisture and prevent micro-pollution attacks. By working on the dermal-epidermal junction integrity, it could prevent visible signs of aging.

+ AC Pina Colloida enhances the structural integrity of hair by preventing the harmful effects of UV irradiation resulting in healthier hair.

+ AC Pina Colloida demonstrates effective pigment dispersing properties which improves overall skin coverage and product appearance.



Available Efficacy Studies



In Vitro .

- Total Cellular Protein in Response to UV-B Irradiation Assay
- Color Pigment Dispersion Assay
- SPF Pigment Dispersion Assay
- Sunscreen Sensory Analysis /Triangle Test

In Vivo .

- Carbon Pollution Protection Study
- TEWL 24 Hour Assay
- 24 Hour Moisturization Assay
- UV Hair Protection Assay-Report

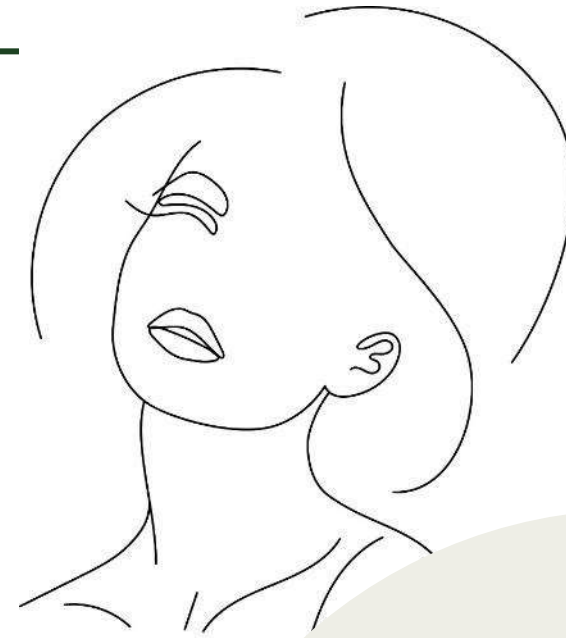
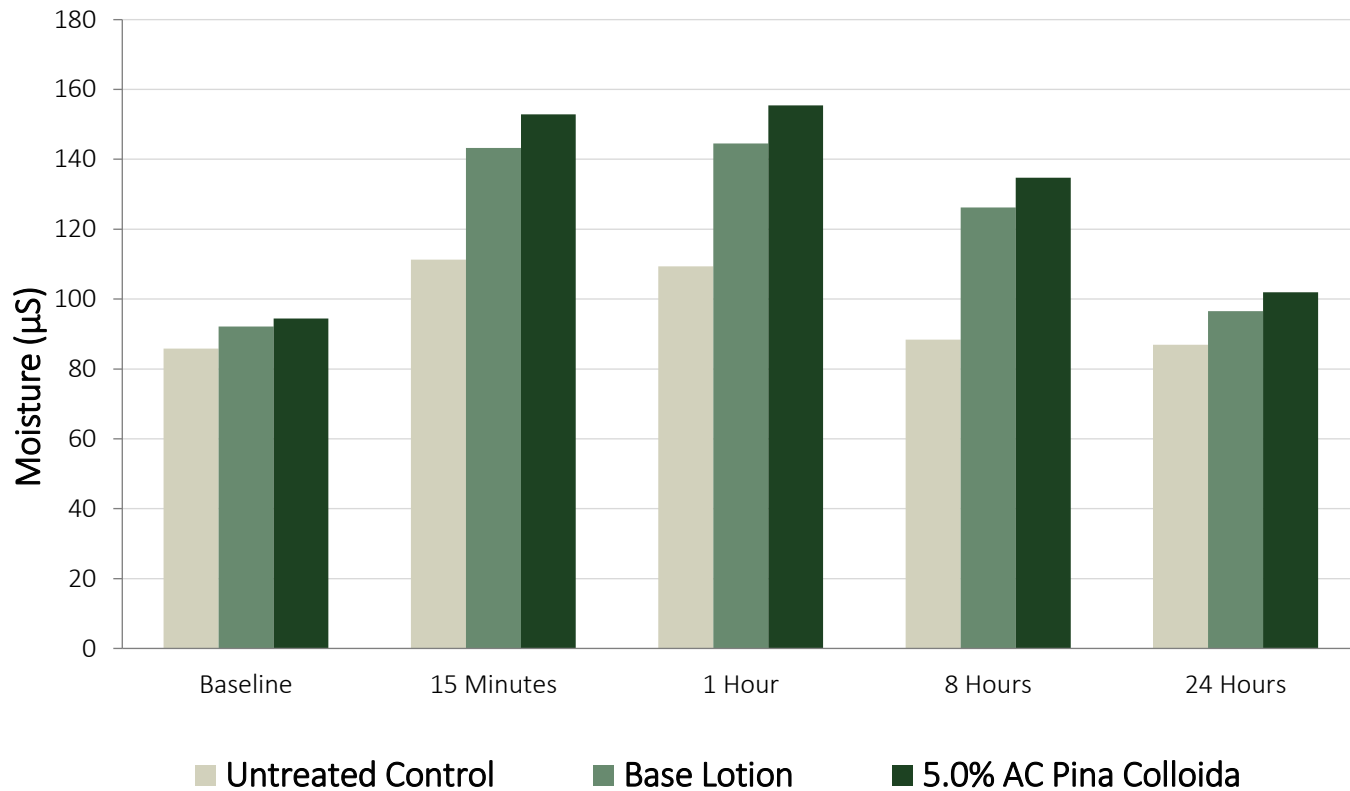
Pending

- Salon Half Head Study - 2%

Tox & Safety

- AMES
- Cellular Viability
- Dermal & Ocular Irritation
- Phototoxicity Assay
- OECD 201 Fresh Water Algae Growth Inhibition
- OECD 301B Ready Biodegradability Assay
- OECD TG 442C - Direct Peptide Reactivity Assay
- OECD TG 442D - In Vitro Skin Sensitization Report

24-Hour Moisturization Assay



Proper hydration maintains the skin's structural and functional integrity and contributes to the appearance of healthier-looking skin.

Accordingly, a moisturization study was conducted to evaluate the immediate and short-term skin hydrating properties of AC Pina Colloida.

Figure 1. Skin Hydration Overtime

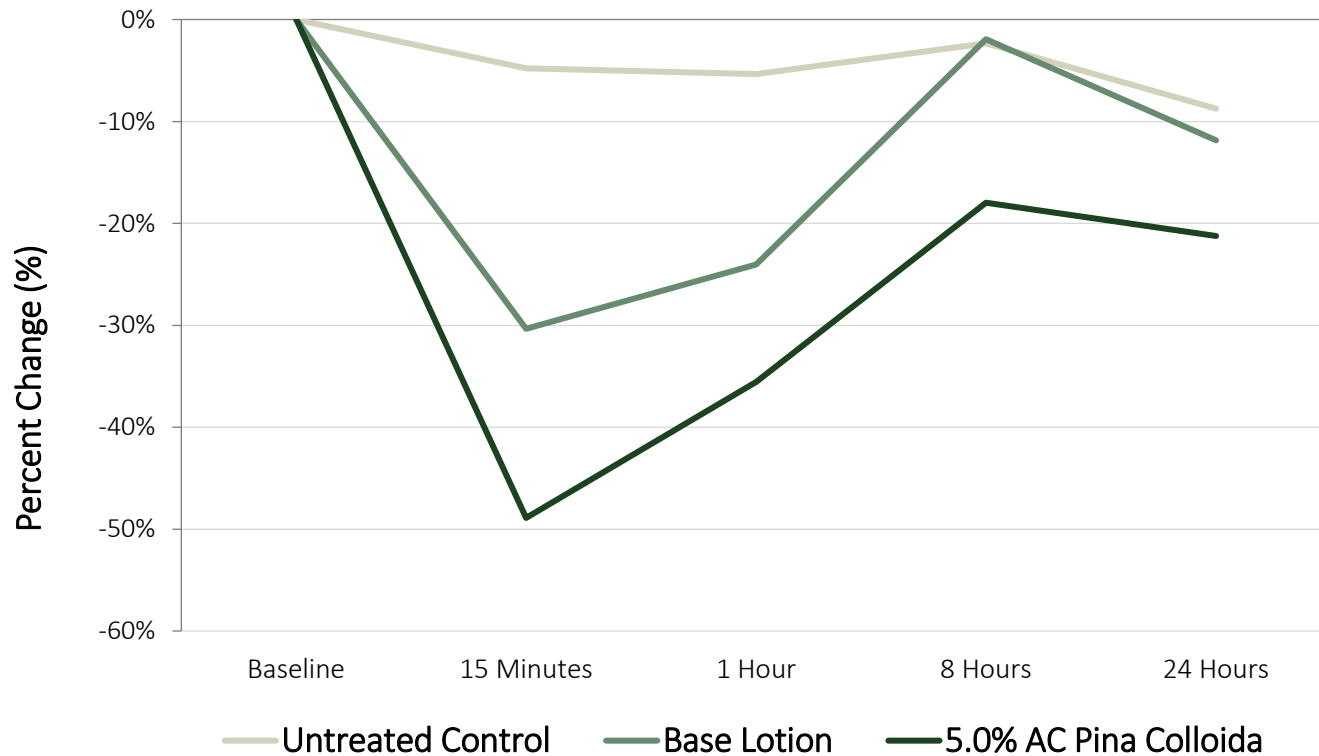
Applying 5.0% AC Pina Colloida significantly augmented skin moisturization one hour after application by

Benefits

+65%

AC Pina Colloida showcases immediate and short-term skin hydration attributes, thereby enhancing the skin's protective barrier function and contributing to the appearance of healthier-looking skin.

24-Hour Transepidermal Water Loss Study



Moderating excessive TEWL improves the skin's protective barrier function and contributes to the appearance of healthier-looking skin.

Accordingly, a transepidermal water loss study was conducted to evaluate the immediate and short-term moisture retention properties of AC Pina Colloida.

Figure 2. Percent Change in Transepidermal Water Loss Relative to Baseline Values.

Applying 5.0% AC Pina Colloida significantly reduced TEWL one hour after application by

Benefits

-36%

AC Pina Colloida exhibits immediate and short-term moisture retention capabilities, enhancing the skin's protective barrier function and promoting a visibly healthier complexion.

Carbon Pollution Protection Study

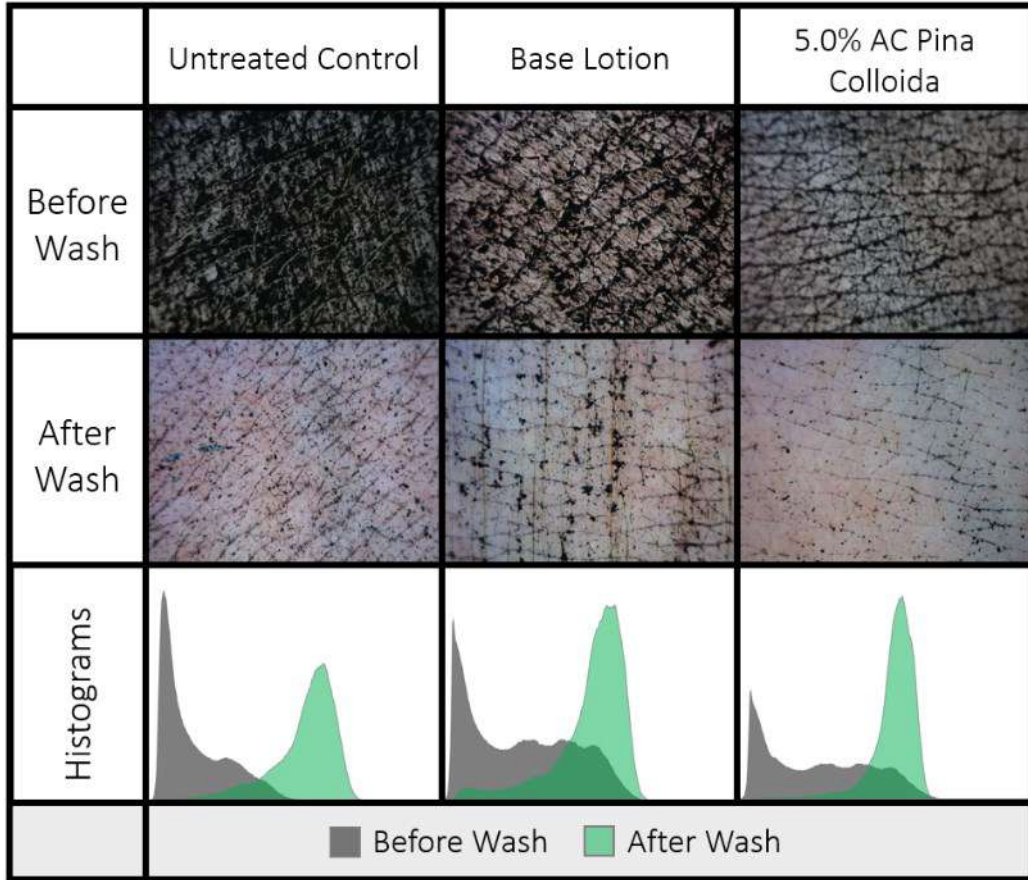
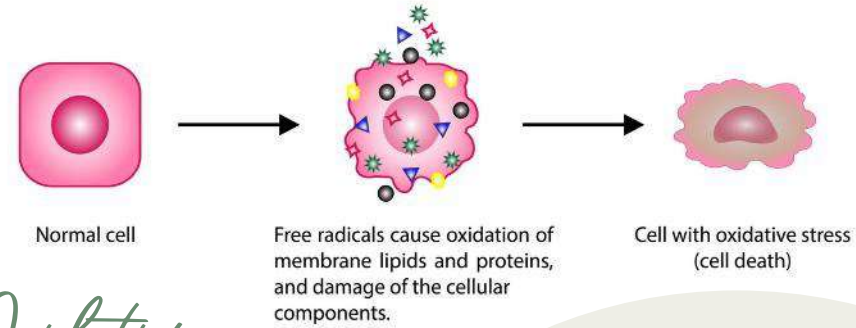


Figure 3. Images of each treatment site before and after washing with light intensity histograms of each site before and after washing



Oxidative Stress

New research indicates air pollution plays a detrimental role in extrinsic aging. Carbon and metal micro-particles found in polluted air embedded in the dermis cause oxidative stress, initiating inflammatory cascade leading to the breakdown of collagen, elastin, and other structural components in the skin. Providing a physical barrier will prevent embedment of carbon particles, thus reducing the signs of extrinsic aging.

Applying 5.0% AC Pina Colloida reduced carbon on the skin after wash by

Benefits

-64%

AC Pina Colloida diminishes carbon buildup on the skin while aiding in its removal, thereby enhancing the skin's protective barrier function and promoting a healthier, more radiant complexion.

Total Cellular Protein in Response to UV

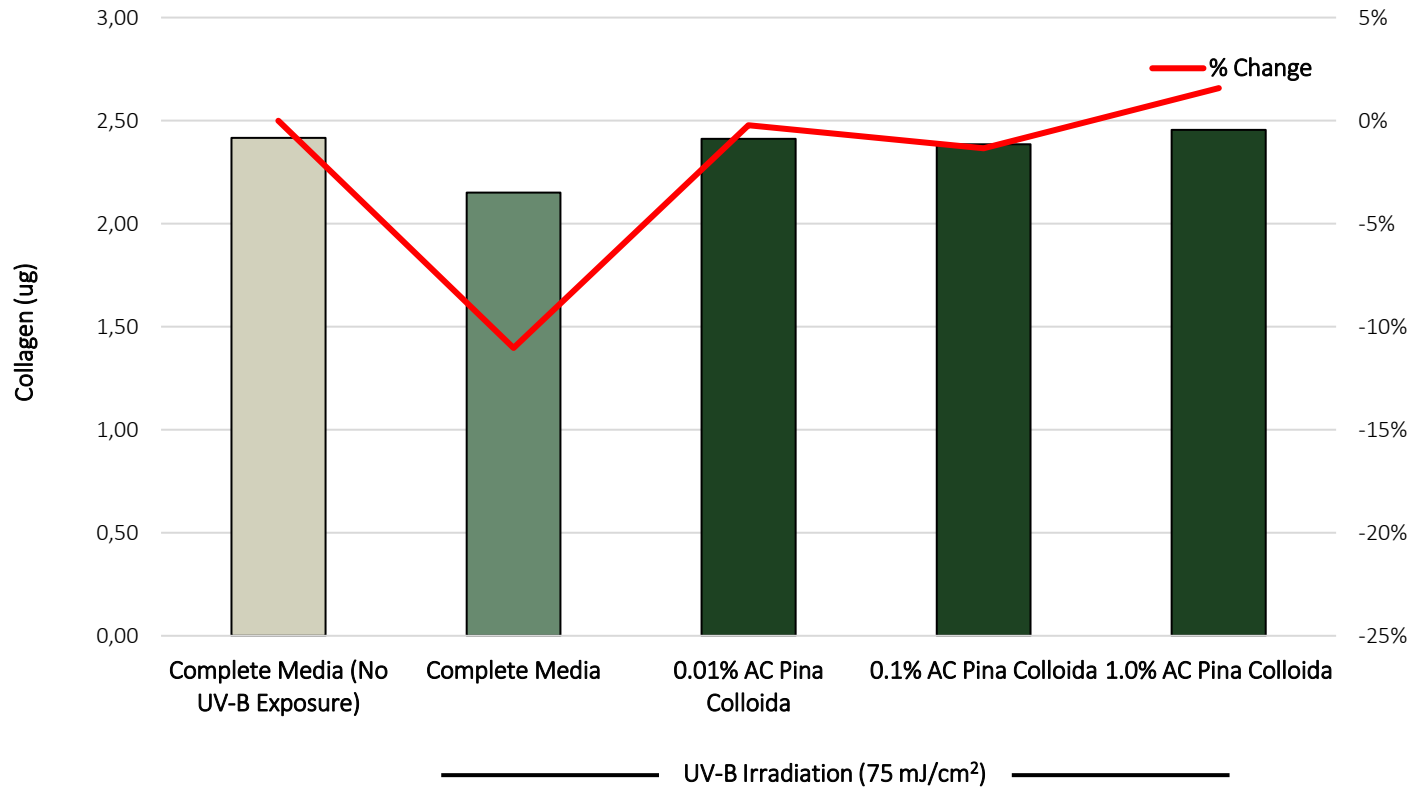
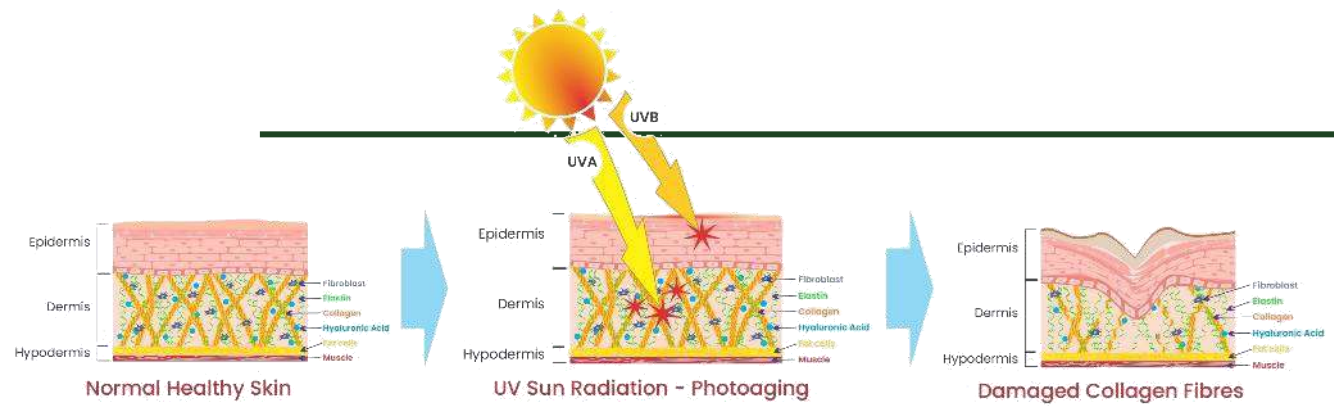


Figure 4. The effect of UV-B irradiation on collagen.

A Sirius Red/Fast Green Collagen Assay was conducted to assess the *in vitro* protective effect of AC Pina Colloida against reductions in collagen synthesis and non-collagenous protein levels caused by UVB irradiation. Excessive exposure to UVB light stimulates inflammation, reactive oxygen species, DNA mutations, and disruptions in dermal-epidermal junction integrity, which can exacerbate skin wrinkling and aging.

0.01% of AC Pina Colloida
blunted the negative
effects of UVB irradiation
compared to untreated
fibroblasts by

Benefits

-0.2%

AC Pina Colloida reduces the adverse effects of UV-B radiation on collagen synthesis. This may enhance the integrity of the dermal-epidermal junction and reinforce the scaffolding matrix, thus aiding in the prevention of visible signs of aging.

UV Hair Protection Assay

Tryptophan Degredation After 48 Hours of UV Exposure

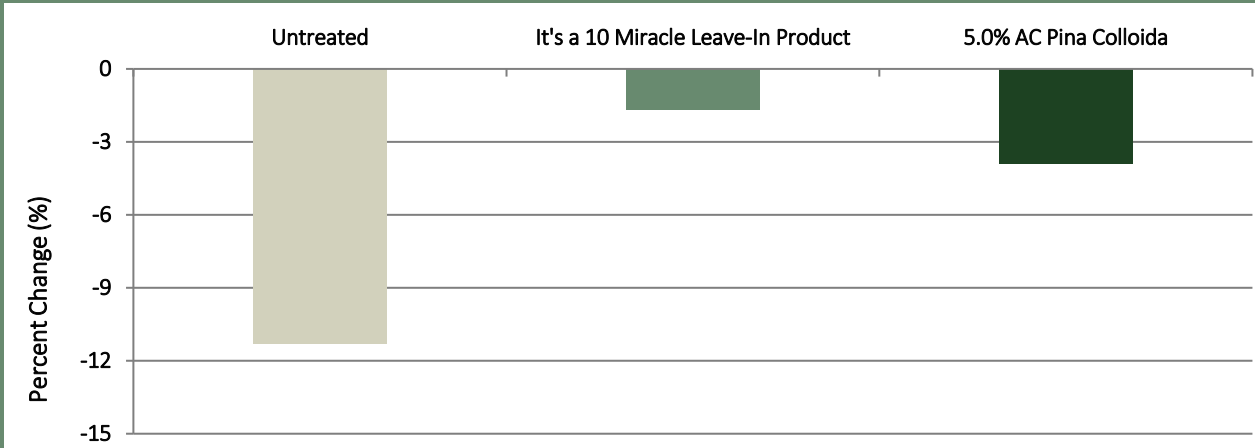
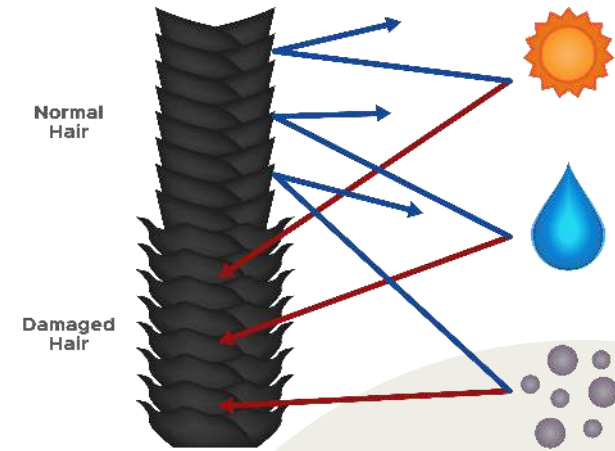


Figure 5. Percent Change in Tryptophan after 48 Hours of UV Exposure Compared to Hair without UV Exposure. Positive Control: it's a 10 Miracle Leave-In Product.

Lipid Peroxidation After 48 Hours of UV Exposure



Figure 6. Percent Change in MDA Concentration after 48 Hours of UV Exposure Compared to Hair without UV Exposure. Positive Control: it's a 10 Miracle Leave-In Product.



The deleterious effects of UV exposure in hair care are a new frontier for active ingredients given the vulnerability of hair and lack of protective mechanisms against the sun. A multiparameter approach was used to determine the UV protection capabilities of cosmetic hair applications. The ability of AC Pina Colloida to protect hair from UV irradiation was assessed via determination of amino acid and lipid degradation.

5% of AC Pina Colloida helped maintain hair shaft structural integrity by protecting amino acids and reducing lipid peroxidation in hair compared to control by

Benefits

-10%

AC Pina Colloida enhances the structural integrity of hair by preventing the harmful effects of UV irradiation, resulting in healthier hair.

Color Pigment Dispersion Assay

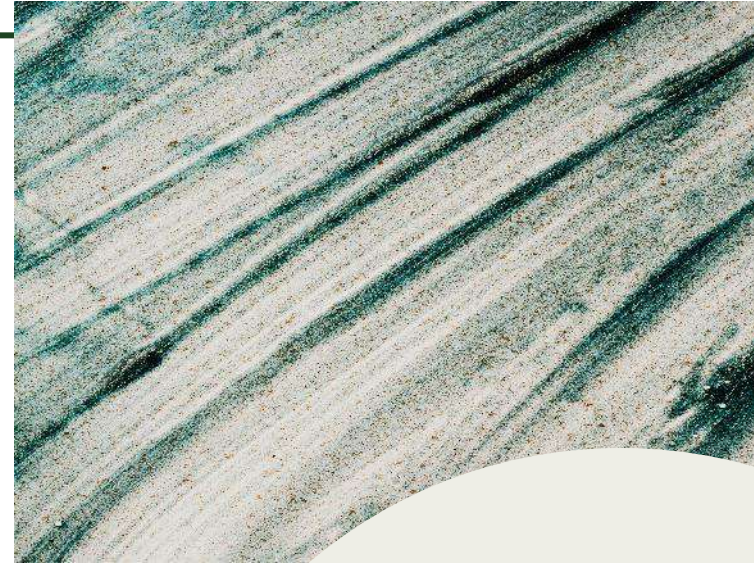
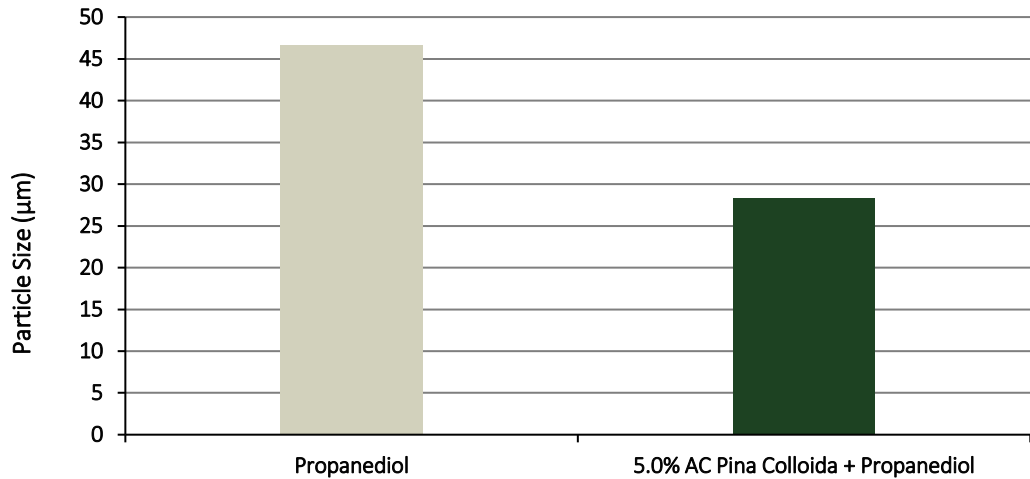


Figure 7. Grind Gauge Particle Size (μm) of a Four-Pigment Blend in Propanediol and 5.0% AC Pina Colloida Immediately After Homogenization.

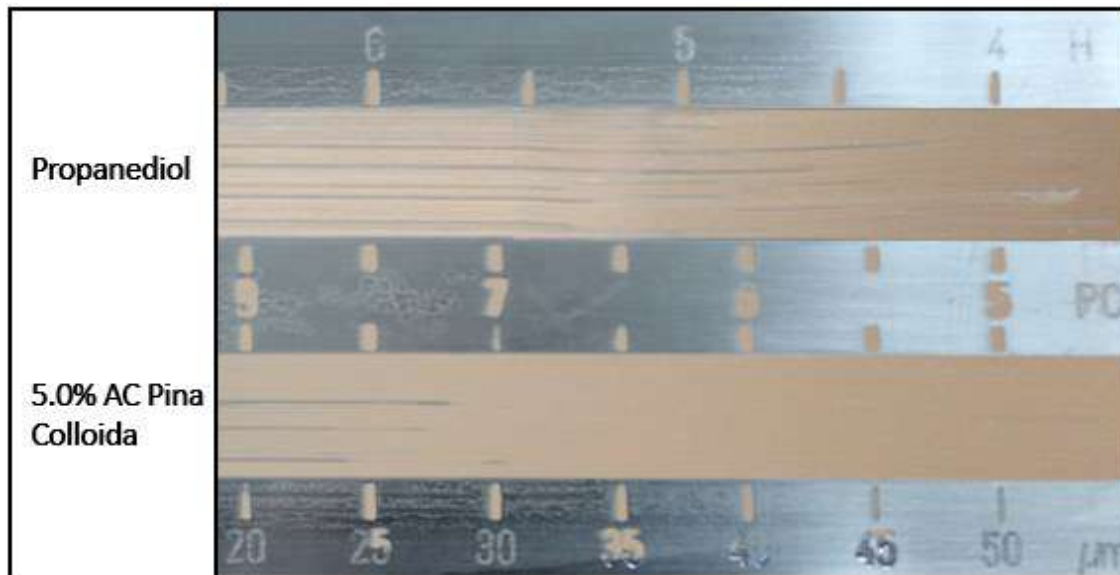


Figure 8. Grind Gauge Image of Each Pigment Dispersion

A product that disperses pigments evenly will provide better overall coverage and can improve the product's appearance on the skin. A well-dispersed product will consist of small pigment particles that are not agglomerated together and will stay dispersed over time. Improving pigment dispersion can also positively impact color intensity of a product as well, such as in foundations, blushes, or eyeshadows.

Color Pigment Dispersion Assay

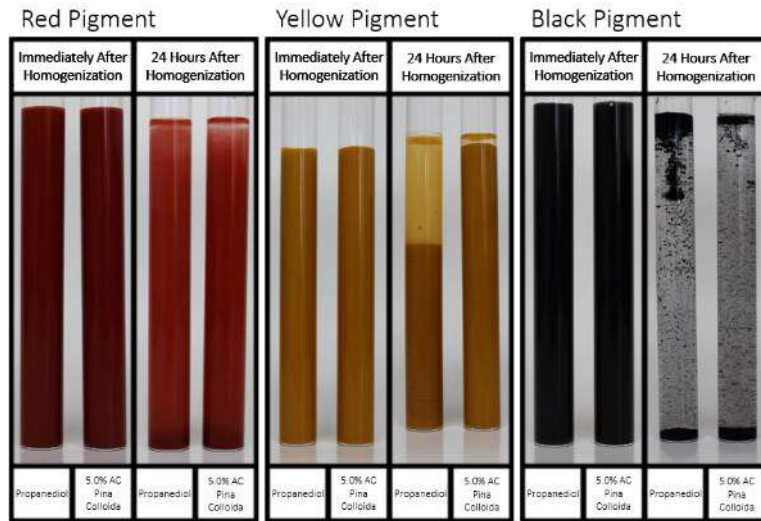


Figure 9. Pigment Sedimentation in Propanediol and 5.0% AC Pina Colloida Immediately and 24 hours After Homogenization

AC Pina Colloida reduced sedimentation and improved stability with red, yellow, and black pigment dispersions 24 hours after homogenization: maintains a uniform pigment dispersion with little to no precipitation or color change following homogenization.

AC Pina Colloida augments the color intensity of pigment dispersions in color cosmetics.

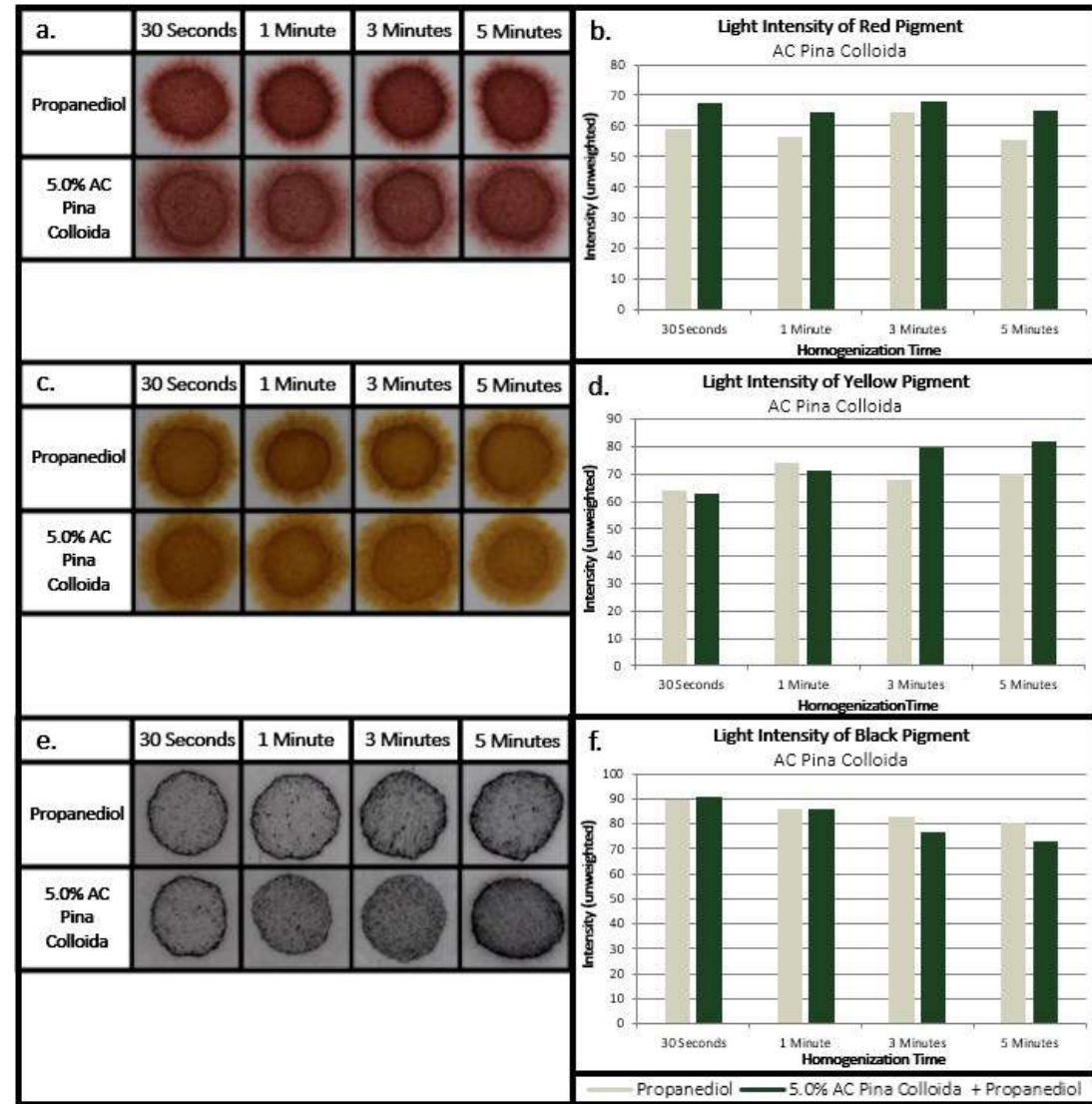


Figure 10. Color Intensity Analysis for 1.0% Unipure Red LC 381 BA (a-b), 2.0% Unipure Yellow LC 182 BA (c-d), & 0.5% Unipure Black LC 989 BA (e-f) in Propanediol and 5.0% AC Pina Colloida Over Time

5.0% AC Pina Colloida
reduced particle
agglomeration in the
four-pigment blend,
compared to propanediol by

Benefits

-39%

AC Pina Colloida demonstrates effective pigment dispersing properties which improves overall skin coverage and product appearance.

SPT Pigment Dispersion Assay

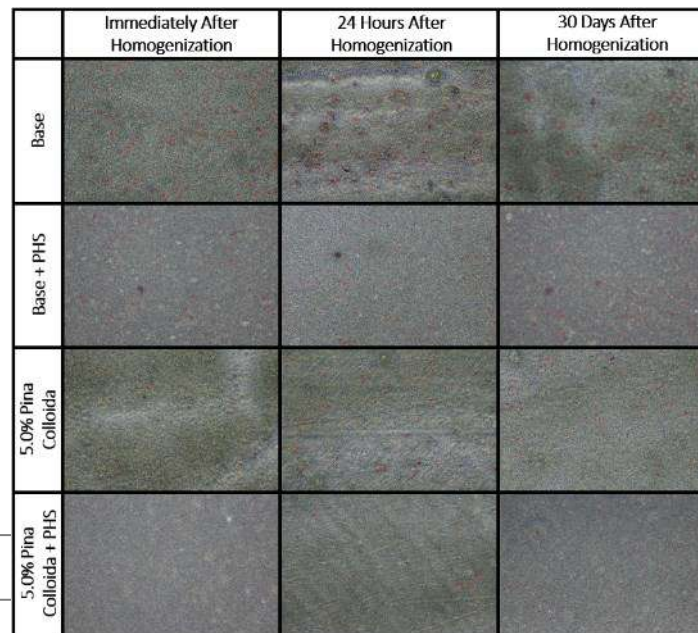


Figure 11. Images of pigment dispersions over time; agglomerates are indicated by red circles

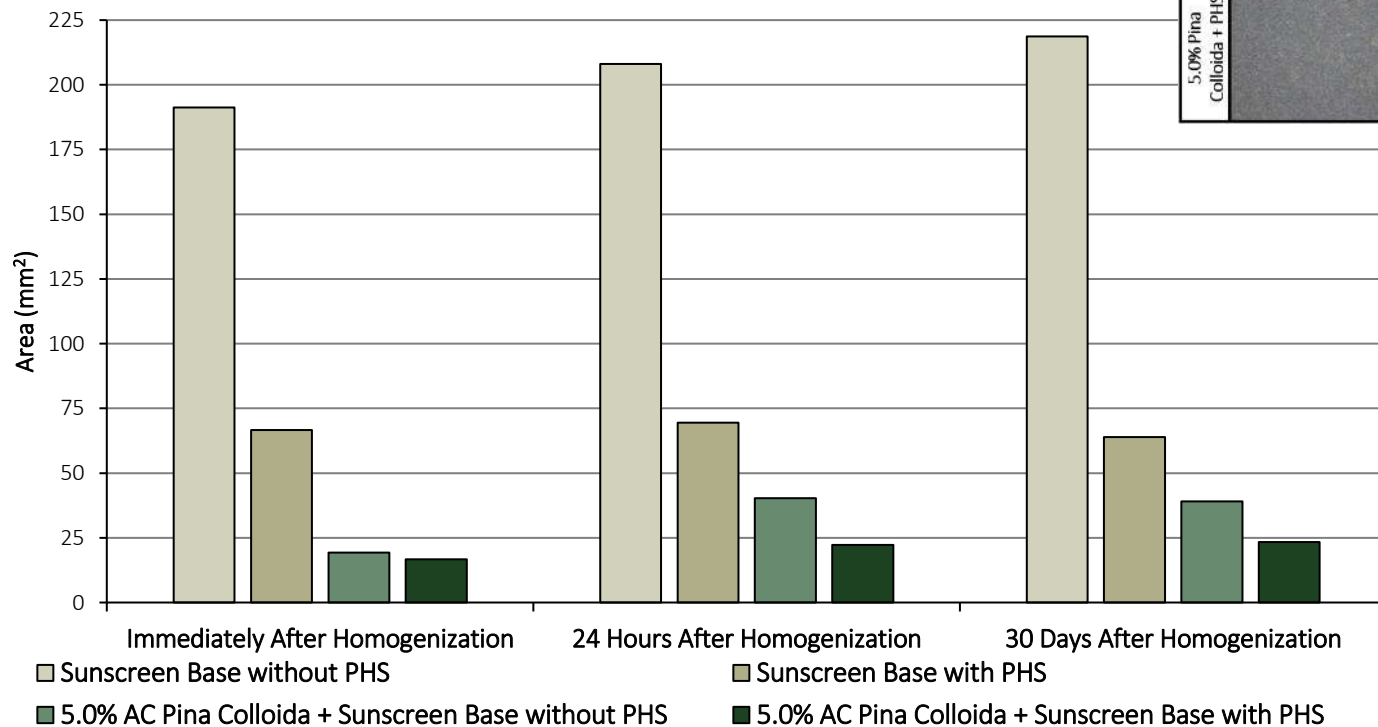


Figure 12. Area of Pigment Agglomerates (mm²) Over Time

Mineral sunscreens containing zinc oxide are known to leave a chalky or bluish finish on the skin which is undesirable to consumers. Pigment size and dispersion play a key role in the appearance of a product on the skin. An evenly dispersed product contains small pigments and appears more natural on the skin. Reducing particle size and agglomeration increases pigment transparency, resulting in a more desirable finish on the skin.

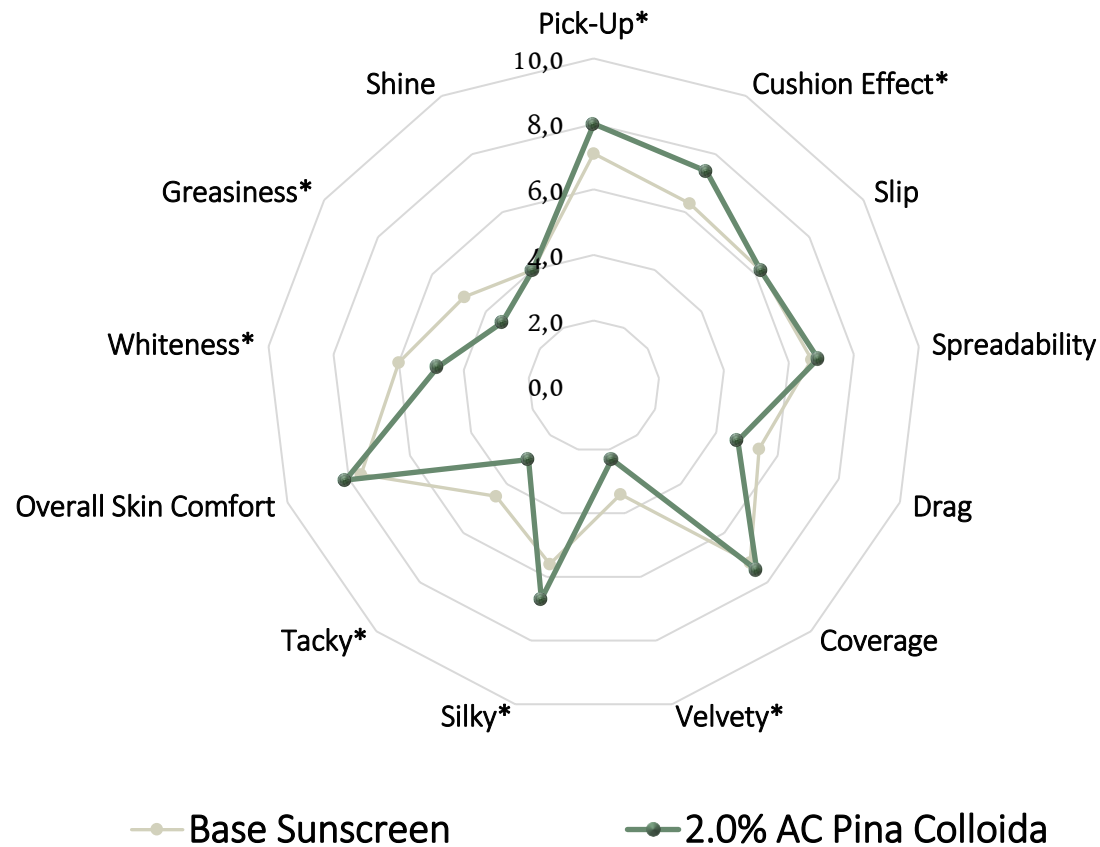
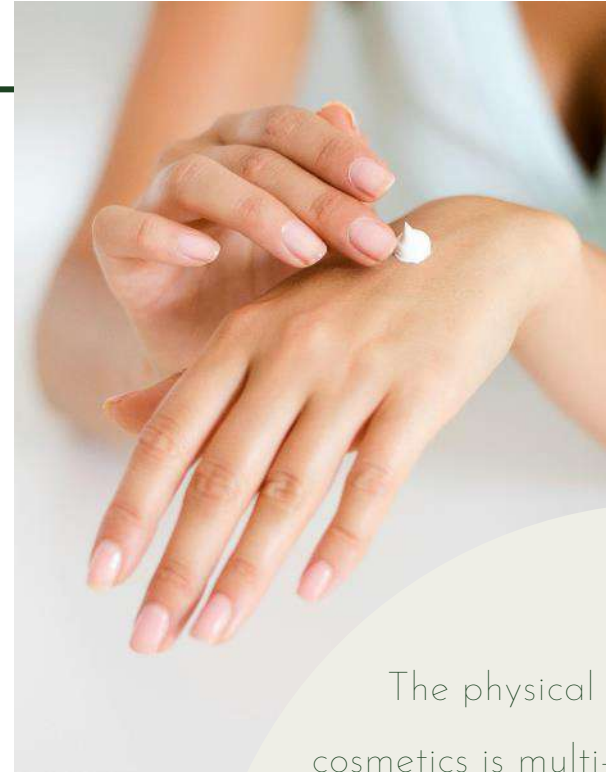
5.0% AC Pina Colloida significantly reduced pigment agglomeration area compared to the Base after 30 days by

-82%

Benefits

AC Pina Colloida provides improved zinc oxide pigment dispersion by reducing individual pigment size which improves overall skin coverage and product appearance.

Triangle Test



The physical experience of applying cosmetics is multi-dimensional and influences how consumers perceive products, demonstrating the importance of quantifying the sensory effects of a cosmetic product during application. This study was conducted to determine if there is a detectable difference when AC Pina Colloida is added to a personal care product.

2.0% AC Pina Colloida in a sunscreen is easier to pickup and moves easily across skin, leaving behind less whiteness and greasiness, without a sticky or powdery after-feel when compared to the base sunscreen.

Benefits

+ pickup
+ cushion effect
+ silky skin feel

AC Pina Colloida augments the physical experience and elicits positive sensory effects during application.



Compatibility

Xanthan Gum

Compatible at 5% - increases viscosity (by 45% in our trial)

Guar Hydroxypropyltrimonium Chloride

Clear/slightly hazy at 5% - decreases viscosity (by 23% in our trial, may be partially due to dilution effect)

Carbopol (Ultrez 10)

Slightly hazy at 5% - decreases viscosity (by 31%, may be more partial incompatibility effect due to hazy appearance)

SDA-40

We successfully added approximately 40% alcohol into a 10% Pina Colloida solution.

Hyaluronic Acid

We successfully added approximately 10% of a 1% HYA solution to a 10% Pina Colloida solution.

Formulation



Summary

WHAT.

Cosmetic formulations utilize diverse raw materials, including **biopolymers**, to shield the body from environmental factors. Our aim was to develop an **eco-friendly solution** using **natural polymers** sourced sustainably.

WHY.

The rise in **global temperatures**, leading to record highs, directly impacts skin and hair quality as well as aging. **Pollution** and **waste reduction** are increasingly crucial concerns in our daily management.

MADE OF.

Inspired by **cellulose-based** polymers and PALF technologies, our focus on **waste reduction** led to exploring **pineapple crowns**, resulting in AC Pina Colloida. Our **biofermentation** expertise helped us in crafting this upcycled natural active delicately.

ACTION.

AC Pina Colloida **prevents** visible **signs of aging** by enhancing dermal-epidermal junction integrity and providing **moisturizing** benefits. It also **protects** hair from UV damage, improving hair health, and disperses pigment effectively, **enhancing** skin coverage and **product appearance**.



AC Pina Colloida

Code: 12053

INCI US- Water & Ananas Sativus (Pineapple) Fiber Crosspolymer & Lactobacillus Ferment

- INCI EU/China- Water & Ananas Sativus (Pineapple) Fruit & Yeast Polysaccharides & Lactobacillus Ferment

Appearance: Clear to Slightly Hazy Liquid - Colorless to Yellow

Suggested Use Level: 1-10%

Suggested Applications: Antipollution . Anti-Aging . Skin & Hair Protection . Moisturization . Dispersant



In Vitro



In Vivo



ISO 16128
NI & NOI



Vegan
Compliant



COSMOS
Compliant



Product
Passport





Active Concepts



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