

Cacao: The Unexpected Ally for Hair Health

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Citation: Leite Jr. AC. Cacao: The Unexpected Ally for Hair Health. Brazilian Journal of Hair Health. 2025;2:bjhh36.

doi: <https://doi.org/10.62742/2965-7911.2025.2.bjhh36>

Received: August, 10, 2025

Revised: August, 20, 2025

Accepted: August 20, 2025

Published: September 2, 2025



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“Cacao possesses properties that optimize hair follicle health and, consequently, hair quality.”

When we think of cacao, our minds immediately travel to chocolate and its irresistible flavors. However, what few know is that *Theobroma cacao*, whose name literally means "food of the gods", holds surprising secrets for hair health that go far beyond gastronomic pleasure.

The Scientific Foundation of Hair Benefits

Recent research has demonstrated that cacao (Figure 1) possesses scientifically documented properties for stimulating hair growth. In controlled studies, extracts from cacao pod husks demonstrated significant capacity for hair growth stimulation when formulated into creams, with the optimal concentration of 12.5% presenting statistically superior results compared to control groups¹.

Scientific interest in this field has grown due to promising results obtained in preliminary studies, although it should be noted that most evidence comes from in vitro studies and animal models, requiring additional validation through human clinical trials.



Figure 1: Cocoa beans and beverage obtained from their infusion

Bioactive Compounds of Cacao

Cacao is rich in various bioactive substances that demonstrate direct benefits for hair health:

Catechins and Epicatechins: These flavonoids demonstrated superior binding affinity (-8.0 kcal/mol) compared to established pharmacological controls in combating alopecia, acting through specific inhibition of key enzymes related to hair loss².

Theobromine: This methylxanthine alkaloid can positively modulate hair follicle activity through mechanisms that promote a favorable microenvironment for hair growth³.

Polyphenols: Quantitative analyses demonstrate elevated concentrations of these compounds - studies report levels of 13,500 mg/L in Venezuelan extracts, offering robust antioxidant protection against follicular oxidative stress⁴.

Molecular Mechanisms of Action

Cacao exerts its beneficial effects through multiple molecular mechanisms:

Enzymatic Inhibition: Cacao compounds effectively block the formation of enzymes that can cause dermatophyte infections, one of the causes of localized alopecia².

Receptor Modulation: Molecular studies suggest that cacao shell compounds may interact with androgenic receptors, potentially addressing androgenetic alopecia mechanisms⁵.

Antioxidant Protection: Cacao polyphenols protect hair follicles from oxidative damage, maintaining a healthy environment for hair growth³.

Scalp Benefits: The anti-inflammatory properties of cacao contribute to overall scalp health, creating ideal conditions for strong and healthy hair⁶.

Synergism with Other Bioactive Compounds

The scientific literature also documents beneficial hair properties in other natural compounds that demonstrate potential synergism with cacao:

Camellia sinensis (Green Tea): Rich in catechins structurally similar to those found in cacao, it offers complementary antioxidant protection and demonstrates capacity for inhibiting 5 α -reductase, an enzyme implicated in androgenetic alopecia⁷.

Coffea arabica (Coffee): Caffeine demonstrates proven capacity to inhibit 5 α -reductase and counteract testosterone-induced follicular suppression, while stimulating microcirculation via VEGF and exerting antioxidant action.

Curcuma longa (Turmeric): Curcumin present in this spice demonstrates documented anti-inflammatory properties that can optimize scalp circulation and reduce inflammatory processes that compromise hair growth.

Piper nigrum (Black Pepper): Piperine, the main alkaloid of this spice, in addition to enhancing the bioavailability of other compounds, can stimulate peripheral circulation, favoring nutritional supply to hair follicles.

Cocos nucifera (Coconut Milk): A source of medium-chain triglycerides, particularly lauric acid, which exhibits anti-inflammatory and antimicrobial effects. Its lipid profile supports metabolic health and may contribute to improved nutrient absorption and systemic conditions favorable to hair growth.

This multi-compound approach represents a promising therapeutic strategy for optimizing hair health through complementary mechanisms. A practical example of this synergy can be observed in the Functional Coffee developed by TrichoRES (Figure 2), which combines cacao, green tea, turmeric, and black pepper in a single formulation. Although the product is primarily intended for improving physical and mental performance through daily consumption, the presence of these bioactive compounds in combination may potentially offer additional benefits for hair health, demonstrating how functional nutrition can transcend its primary objectives and contribute to multiple aspects of well-being.

Technological Developments and Sustainability

A relevant discovery from a biotechnological perspective is that the greatest therapeutic benefits derive precisely from cacao processing by-products - the husks and films traditionally

discarded¹. This observation represents not only an opportunity for sustainable valorization of agro-industrial waste but also a concentrated source of bioactive compounds with pharmacological potential.

Recent developments in formulation technology have already demonstrated the viability of incorporating these extracts into stable cosmetic preparations, including creams, tonics, and hair gels, maintaining physicochemical stability and adequate safety profiles for topical use^{8,9}.



Figure 2: Functional Coffee TrichoRES - Powdered dietary supplement formulated with coffee, cacao, coconut milk, black pepper, turmeric, and green tea.

Perspectives and Limitations of Current Research

Although preliminary results are scientifically promising, it is essential to recognize the methodological limitations of the current evidence base. Most studies consist of in vitro analyses and animal models, with a scarcity of controlled clinical trials in human populations. Additionally, many discoveries derive from molecular docking studies that, while informative, require validation through biological assays.

Significant gaps remain regarding long-term safety, determination of optimal dosages for different applications, and comparative studies with established alopecia therapies. These limitations highlight the need for investment in more robust clinical research to validate the therapeutic potential of cacao-derived compounds.

Scientific and Translational Implications

Current findings suggest that *Theobroma cacao* represents a promising source of bioactive compounds for applications in trichology. The convergence between environmental sustainability, utilization of agro-industrial by-products, and development of natural therapeutics positions this research line in alignment with contemporary trends in pharmaceutical and cosmetic product development.

The observation that multiple natural compounds - including those derived from *Camellia sinensis*, *Curcuma longa*, and *Piper nigrum* - demonstrate complementary properties for hair health suggests opportunities for developing synergistic formulations. This multi-compound approach can optimize therapeutic efficacy through complementary mechanisms of action, representing an innovative strategy in the field of trichology.

Interestingly, functional nutrition products such as TrichoRES functional coffee already demonstrate the commercial viability of this integrative approach, where compounds traditionally used for cognitive and physical performance can simultaneously contribute to multiple aspects of health, including potential hair benefits through systemic administration routes.

The elegance of this discovery lies in demonstrating how compounds traditionally associated with nutrition and gastronomic pleasure can present unexpected therapeutic applications, exemplifying the potential of natural compounds in integrated biomedical applications.

Keywords: Theobroma cacao, Bioactive compounds, Hair Growth, Functional Coffee.

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