UPCYCLED COFFEE SILVERSKIN FOR DEEP SKIN COMFORT

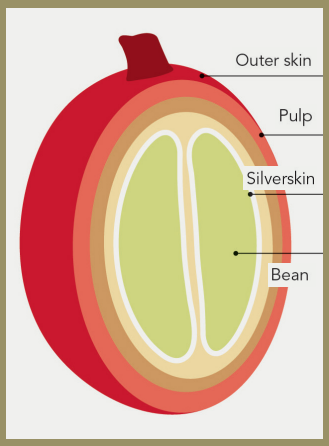
SLVR'Coffee™ is the first upcycled ingredient that is based on coffee silverskin, the main by-product of the coffee roasting process. Efficacy studies have shown that SLVR'Coffee™ improves skin resilience by increasing the functionality of the skin barrier. As a result, the skin is more hydrated and protected from different types of irritation. Therefore, choosing SLVR'Coffee™ will comfort the skin and additionally benefit the environment.

COFFEE AND COFFEE SILVERSKIN

Coffee is consumed worldwide and has become more than just a hot beverage. Drinking coffee provides energy, conviviality as well as comfort and therefore has a strong wellbeing and mood-boosting effect. It is prepared from roasted coffee beans, the seeds of the fruits from the coffee plant. The fruits of the coffee plant, also referred to as coffee cherries, consist of several layers. The direct contact layer of the coffee seeds is the coffee silverskin, a very thin, silver-shining envelope protecting the coffee seeds. During the coffee roasting process, the coffee silverskin falls off the roasted coffee bean and represents the main by-product accumulating in the coffee roasters.

UPCYCLING FROM COFFEE SILVERSKIN TO SLVR'COFFEE™

Upcycling is a form of recycling waste materials to create products that are of higher quality than the original material. Sustainable waste management is of global interest to avoid negative impacts on our environment. Due to the high consumption of coffee worldwide, 200-400 million kg of coffee silverskin is generated annually. Coffee silverskin is mostly thrown away, burned, or used as fertilizer. Reusing coffee silverskin as an active ingredient for cosmetics offers consumers a simple solution to reduce their carbon footprint. To recover valuable molecules that are beneficial for the skin, coffee silverskin extract is generated though a supercritical CO_2 extraction. Analytical molecular profiling of this extract



confirmed the presence of the potent molecules cafestol and kahweol fatty acid esters. Skin enzymes found in the epidermis are able to convert these precursor molecules into the diterpenes kahweol, cafestol and free fatty acids. Kahweol and cafestol are naturally occurring in the coffee plant and exhibit antioxidant, anti-inflammatory and moisturizing properties. In addition, free fatty acids are important for maintaining the permeability of the skin barrier. Finally, the coffee silverskin extract is dissolved in organic and Union for Ethical Biotrade (UEBT)-certified shea butter, yielding our active ingredient SLVR'Coffee™.

BIO-INSPIRED SOLUTION FOR SKIN BARRIER FUNCTION

The outermost layer of the skin is the stratum corneum, which is in frequent contact with the outside world and is therefore the most important mediator of the skin barrier. Main functions of the skin barrier are protection against external aggressors, retention of water and transportation of nutrients. A disturbed skin barrier is manifested by scaly and dry skin, which causes uncomfortable sensations. SLVR'Coffee™ is Mibelle Biochemistry's bio-inspired solution to comfort and improve skin barrier function. Noteworthy, the coffee silverskin is the direct contact layer of the coffee bean to protect it from stress. Therefore, SLVR'Coffee™ mimics this natural strategy developed by the coffee plant to improve the epidermal barrier. In particular, the valuable repertoire of molecules detected in the coffee silverskin extract have stimulatory effects on skin functionality.

COFFEE SILVERSKIN EXTRACT IMPROVES SKIN-BARRIER RESILIENCE

To investigate the effect of the molecules recovered from the coffee silverskin, keratinocytes were treated with 0.04% coffee silverskin extract for 24 hours or left untreated. Subsequently, gene expression of candidates that are important for skin physiology were analyzed. Treatment with coffee silverskin CO_2 extract upregulated the expression of HMOX1 (encoding heme oxygenase 1) by 137%. HMOX1 is known to protect the cells from oxidative stress. Furthermore, the genes CALML5 (calmodulin-like protein 5), FLG (filaggrin) and SPRR1A (small protein-rich protein 1A) were stimulated by 124%, 150% and 125%, respectively. CALML5, FLG and SPRR1A are involved in the cornification process which is essential for the skin barrier. In addition, the degradation products of filaggrin have the ability to retain water and are therefore considered as natural

> "The outermost layer of the skin is the stratum corneum, which is in frequent contact with the outside world and is therefore the most important mediator of the skin barrier"

moisturizing factors of the stratum corneum. In conclusion, the valuable molecules from the coffee silverskin have a beneficial effect on skin-barrier functionality and antioxidant properties.

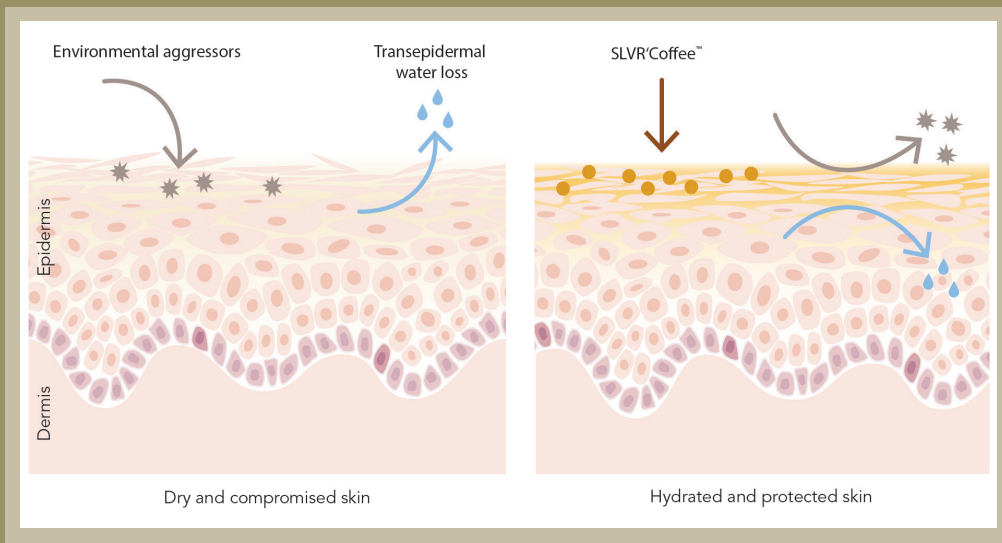
SLVR'COFFEE™ PROTECTS FROM EXTERNAL SKIN AGGRESSION

Since the CO_2 extract obtained from coffee silverskin showed improved regulation of genes involved in skin barrier, a randomized placebo-controlled clinical study was conducted to elucidate the protective impact of SLVR'Coffee™ against external skin aggressors. Twenty-four female and male volunteers aged from 19 to 64 years (average age: 40 years) applied a cream containing 2% SLVR'Coffee™ and a corresponding placebo twice daily on the inner side of the forearm. In addition to applying the products, a portion of the inside of the forearm was left untreated. After 7 days, either acute or long-term irritation was induced by capsaicin and SLS patches for 90 minutes and 1 day, respectively. Immediately after removal of the patches trans-epidermal water loss (TEWL) measurements were performed to evaluate water homeostasis after induced stress. Pretreatment with 2% SLVR'Coffee™ significantly decreased TEWL compared to the untreated condition after capsaicin application. Notably, after both short and long-term skin irritation, the increase in TEWL was lower in SLVR'Coffee™-treated conditions compared to placebo. The clinical data confirm that SLVR'Coffee™ protects the skin from external aggressors by strengthening our skin barrier.

SLVR'COFFEE™ REHYDRATES DRY SKIN

To investigate whether the improved skin-barrier function also results in increased skin hydration, a clinical study was conducted on volunteers with dry or very dry skin on their legs. Twenty women aged between 31 and 66 years (average age: 44 years) applied a cream containing 2% SLVR'Coffee™ and the corresponding placebo twice daily on each leg for 28 days. As expected, application of SLVR'Coffee™ improved skin hydration compared to the placebo. Furthermore, results showed that treatment with SLVR'Coffee™ significantly increased skin hydration by 26.8% and 33.1% after 14 and 28 days, respectively. Evaluation of the test products by the volunteers after 28 days of application confirmed the positive outcome. All volunteers (100%) reported that their skin is more hydrated and less dry after treatment with SLVR'Coffee™, highlighting that SLVR'Coffee™ has an intense moisturizing and rehydrating effect.

To summarize, SLVR'Coffee™ is a bio-inspired active ingredient based on upcycled coffee silverskin to moisturize and comfort delicate skin. Mibelle Biochemistry captures the emotional connection to coffee whilst providing the skin with beneficial molecules found in coffee beans. Just like the coffee sliverskin envelops and protects the coffee bean, SLVR'Coffee™ improves skin-barrier functionality resulting in protection against external aggressors and increased skin hydration. With SLVR'Coffee, eco-conscious consumers have the choice of an upcycled ingredient to promote circular economy and to soothe their dry skin.



Mibelle Biochemistry, Stand H30

mibelle GROUP biochemistry