# Novel natural approaches to anti-aging skin care

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## Synopsis

Novel natural approaches to anti-aging skin care, targeting the root causes of skin damage and texture loss, are presented. Four proprietary extracts, Boswellin® (a natural extract derived from Indian frankincense), Umbelliferin® (a composition derived from coriander seeds), Lupeol 80% (a multifunctional natural extract from *Crataeva nurvula* (Varuna) and Cococin™ (a patent-pending composition derived from green coconut water) are highlighted. The use of these extracts in anti-aging skin care compositions is described.


## Introduction: the biology of skin aging

Aging results from cumulative damage to tissues that overwhelm the body's natural ability to repair them. The tell-tale signs of aging on the skin include discoloration, wrinkles, and texture loss. These effects result from structural and metabolic changes effected by biochemical reactions in the connective tissues that are accelerated by free radicals. Environmental agents such as UV rays exacerbate the effects of free radical reactions and oxidative stress.

About 25% of the lipids in the skin surface are unsaturated, and therefore more prone to attack by free radicals. These reactions in turn promote the action of inherent enzymes such as collagenase and elastase, and facilitate the proliferation of inflammatory mediators. Apparent deteriorative oxidative changes triggered by free radicals include wrinkling, hyperpigmentation (excessive tanning) and inflammation (sunburn).

Free radicals contribute to the ravages of chronological aging in two ways – they attack the skin's fibroblasts, leading to loss of collagen and elastin, and cause cross-linkage of connective tissue fibre. The result is dry, leathery skin, with a wrinkled appearance and poor tone.

Aged skin may be manifested in the form of actinic keratosis (rough, reddish warts on sun-exposed areas, a precursor to 'squamous cell carcinoma'), seborrehic keratosis (non-cancerous brown or black raised spots), cherry angiomas (small, bright red domes due to dilated blood vessels), and broken capillaries (bruising due to dilated blood vessels and loss of subcutaneous fat).

In recent years there has been an increased demand for 'anti-aging' cosmetic products, that potentially treat or delay the visible signs of chronoaging and photoaging, such as wrinkles, lines, sagging, hyperpigmentation and age spots.

## Principles of natural anti-aging skin care

Natural anti-aging skin care primarily targets approaches to slow or reverse the signs of aging. Ingredients for this purpose are prepared from botanicals with a long history of traditional use. It is interesting to note that 'cosmeceuticals' were used by ancient civilizations, although the term itself is of recent origin.

Natural antioxidants that quench free radicals are an essential component of anti-aging formulations. They potentially offer protection against damage to the tissues by environmental and other agents. Biochemical reactions that accelerate the progression of skin aging have their roots in inflammatory processes, as inflammation generates micro-scars that mature into blemishes or wrinkles. Various types of inflammatory mediators such as leukotrienes and prostaglandins, cytokines and growth factors may influence melanin synthesis by affecting the proliferation and functioning of melanocytes. Protein kinase C, the enzyme that phosphorylates proteins, may also influence the growth and differentiation of melanocytes. Cytokines such as endothelins (also known as vasoconstrictive peptides) are also reported to accelerate melanogenesis. Natural anti-inflammatory agents are therefore included in anti-aging formulations, and serve to soothe, heal and protect skin tone and integrity.

Lipids play an important role in maintaining the barrier functions of the skin. In general, unsaturated fatty acids reinforce the skin's barrier function, prevent moisture loss through the epidermis, provide structural integrity to the skin damaged by external influences and are anti-inflammatory. They also help to soften and smooth the skin by inhibiting the formation of corneous cells. Lipid compounds that provide an occlusive effect to prevent water loss, repair lipid layers and restore barrier functions are therefore an integral part of anti-aging formulations.

A wide range of botanicals is available for use in anti-aging topical formulations. It is important however that the ingredients selected are amenable to formulation, and do not damage the appearance, texture and general acceptability of conventional cosmetic compositions. These requirements often pose challenges, necessitating careful application-oriented research to facilitate the development of innovative extracts from traditionally used botanicals. A few examples are presented here.

## Innovating naturals

### 1. Targeting inflammation

Inhibiting inflammation is an effective approach to slow or reverse the signs of skin aging. Boswellin CG (INCI: *Boswellia serrata* Extract), a proprietary extract [A] developed from *Boswellia serrata* gum resin (Indian frankincense) is a safe and effective topical anti-inflammatory agent (1). Olibanum, the resin from the Boswellia species has been used as incense for centuries, and is currently used as fixative in perfumes, soaps, creams, lotions, and detergents. In India, the gum resin exudates of *Boswellia serrata*, known in the vernacular as 'Salai guggal', have been used in the Ayurvedic system of medicine as anti-inflammatory agents.

Boswellin CG can conveniently be used in conventional cosmetics and has a characteristic pleasant aroma that blends well into formulations. Additionally, its efficacy and safety in topical formulations is supported by clinical studies (1,2). Products containing 5% of Boswellin CG did not produce any irritation or sensitization in standard patch tests (3).

### 2. Strengthening the barrier properties of the skin

A specially prepared extract from coriander (Cilantro, Chinese parsley) seeds, helps in supporting skin barrier functions. Umbelliferin (INCI: *Coriandrum sativum* (coriander) Extract is a trademarked product containing petroselinic acid triglycerides obtained as a non-lauric fraction from coriander seed oil. These long chain fatty acids are potentially useful in anti-aging products for topical use, helping to restore the barrier properties of the epidermis and inhibiting moisture loss.

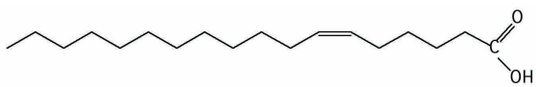
Ceramides, sphingolipids that provide barrier properties to

**Figure 1.**

Boswellia serrata *gum resin, the source of Boswellin CG.*

**Figure 2.**

*Coriander*




Petroselinic acid

*Petroselinic acid is chemically cis-6-octadecenoic acid or cis-omega-12-octadecenoic acid, and is an isomer of oleic acid.*

the stratum corneum of the epidermis, contain long chain fatty acids. Coriander seed oil may contain ceramides of petroselinic acid as well. The extract also functions as an anti-irritant and helps to maintain skin texture and tone.

Such fatty acids are reported to function as antimicrobial agents and skin permeation enhancers (4). Recent research findings confirm that long chain fatty acids are potential anti-aging agents as well. Topical application of essential fatty acids has been shown to improve hydration and elasticity, and help to prevent skin breakdown in individuals with poor nutritional status (5).

Additional evidence of the protective role of petroselinic acid is provided by research reports wherein orally administered petroselinic acid was found to counteract the overproduction of arachidonic acid (6). Arachidonic acid is the starting point for the synthesis of inflammatory mediators such as thromboxanes, leukotrienes and prostaglandins. Petroselinic acid is also reported to be a potent inhibitor of the enzyme topoisomerase (7). Topoisomerases alter the structure of DNA and are implicated in the progression of several proliferative diseases. Petroselinic acid is therefore potentially useful in conditions such as psoriasis (8).

Umbelliferin can be conveniently blended into cosmetic formulations and does not produce side effects such as irritation or sensitization.

**3. Effecting cutaneous antioxidant action and rejuvenation**

Naturally occurring pentacyclic triterpenes of plant origin have a wide range of biological effects that render them useful in anti-aging cosmetics. Lupeol is a naturally occurring triterpene isolated from *Crataeva nurvala* (Varuna) stem bark. In Ayurveda, *Crataeva nurvala* is recommended in the management of urinary disorders and as anti-inflammatory agent (9).

Recent studies reveal that lupeol and its derivatives are useful topically as an anti-inflammatory agent (10). Lupeol is reported to help replenish cutaneous antioxidant enzymes that have been depleted by environmental toxins (11). The compound and its derivatives are therefore potentially useful in anti-aging formulations and skin protectant compositions as well.

Lupeol is also reported to support epidermal regeneration, with potential applications in formulations that target skin texture and integrity. This finding was validated by researchers who used an *in vitro* model to investigate the effects of lupeol and lupeol esters on keratinocyte proliferation. Lupeol and lupeol esters were found to significantly improve keratinocyte proliferation (12).

By virtue of its antioxidant action and beneficial effects on inflammation and keratinocyte proliferation, Lupeol 80% [INCI: *Crateva nurvula* Extract] is thus useful in maintaining skin texture and integrity. Typical applications include anti-aging creams, lotions, gels, lip balms. Use levels are generally in the range of 0.2-3% w/w in skin/hair care formulations.

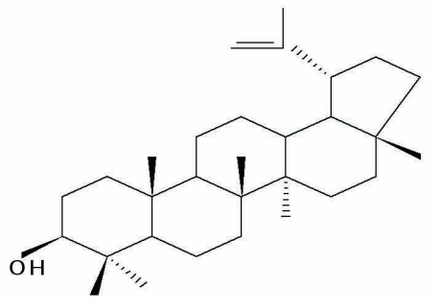
**4. Providing nourishment for skin cell renewal**

Cococi (The Nourishment Factor®) [C] [INCI: *Cocos nucifera* (coconut) fruit juice] is another innovative natural

**Figure 3.**

Crataeva nurvula *(Varuna).*

**Figure 4.**




*Lupeol, from Varuna stem bark.*

extract from green (immature) coconuts. Coconut water is often used as a supplement in media for the growth of plant tissue cultures. The endosperm nourishes the growing plant and abounds in proteins, amino acids, sugars, vitamins, minerals and growth hormones that are essential to promote tissue growth (13,14). This nutrient-rich liquid endosperm of green coconuts is freeze-dried using a special process that preserves the activity of nutrients, to produce Cococin.

The greatest amount of coconut water is found in young, green coconuts and provides nourishment for the growth of the solid endosperm (coconut meat) inside the hard shell of the fruit. When the fruit matures, both the solid endosperm and the remaining coconut water serve as nutrients for the developing embryo and seedling. Thus coconut water serves as a natural reservoir of nutrients to promote tissue growth (13). In view of this role of natural coconut water, Cococin may be used in applications to support the healthy growth of human tissues as well. The product is useful in hair care formulations and in rejuvenative topical preparations to nourish, condition, soothe, and moisturize the tissues. Its convenient powder form readily blends into all types of cosmetic preparations.

In laboratory studies, Cococin was found to have zero skin irritation potential and LD50 values greater than 2000 mg/kg.

**Formulation for an anti-aging skin cream.**

| Ingredient | Function | %W/W |
|---|---|---|
| **Phase A** | | |
| Deionized water | Solvent | QS |
| Glycerin | Denaturant/ humectant/solvent | 3.00 |
| Panthenol | Antistatic agent | 0.10 |
| Carbomer(2%) | Emulsion stabilizer | 18.00 |
| Disodium EDTA | Chelating agent | 0.10 |
| Uniphen-P 23 (Phenoxyethanol, Methylparaben, Propylparaben, Butylparaben) | Preservative | 0.50 |
| **Phase B** | | |
| Lipomulse 165 (Glyceryl stearate and PEG-100 stearate) | Emollient/ emulsifying agent | 3.00 |
| Cetearyl alcohol | Emollient/ emulsifying agent | 3.00 |
| Cetyl alcohol | Emollient/ emulsifying agent | 2.50 |
| *Coriandrum sativum* (Coriander) Extract Umbelliferin (Sabinsa Corp) | Active | 1.00 |
| PEG-100 Stearate | Emulsifying | 0.30 |
| *Boswellia serrata* Extract Boswellin CG (Sabinsa Corp) | Active | 3.00 |
| *Crataeva nurvula* Extract (Lupeol 80%, Sabinsa Corp) | Active | 0.5 |
| Tetrahydropiperine Cosmoperine [D] (Sabinsa Corp) | Adjunct | 0.1 |
| **Phase C** | | |
| Deionized water | Solvent | 1.00 |
| Triethanolamine | Buffering agent | 0.40 |
| **Phase D** | | |
| Coconut (*Cocos nucifera*) fruit juice (Cococin, Sabinsa Corp) | Active | 3.00 |
| Cyclomethicone | Antistatic agent | 3.00 |
| **Phase E** | | |
| Deionized water | Solvent | 1.00 |
| Imidazolidinyl Urea | Preservative | 0.30 |

**Procedure**
In a suitable container, heat Phase A ingredients to 80° C under medium speed propeller mixing. Combine Phase B ingredients and heat to 80°C. Mix until the contents present a clear and uniform appearance. Slowly add Phase B to Phase A and mix for 15 minutes while maintaining batch temperature. Add pre-mixed Phase C and mix well. Cool to 25°C. Add Phase D ingredients at 25°C. Add premixed Phase E.

## Formulating effective anti-aging cosmetics

The innovative extracts described in this article exemplify current trends in active raw materials for natural anti-aging skin care. With scientifically validated safety and efficacy, such extracts present attractive approaches to formulating all-natural cosmetics with traditionally used raw materials.

A sample formulation that incorporates the natural extracts described is presented. This Anti-aging cream formulation offers multiple functional benefits in smoothening, soothing, revitalizing and rejuvenating aging skin.

**Figure 5**

*Green coconuts, the source of Cococin.*

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## Footnotes

[A] Patents pending, a trademark of Sabinsa Corporation.
[B] A trademark of Sabinsa Corporation.
[C] Patent pending, trademarks of Sabinsa Corporation.
[D] A trademark of Sabinsa Corporation, patent pending, skin permeation enhancer derived from black pepper fruit.