

## Rosemary and Sage Antioxidants – Multifunctional Ingredients for Natural Skin Protection

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### Abstract

Rosemary and sage CO<sub>2</sub>-antioxidants contain high concentrations of diterpene phenols (DTPs) such as carnosic acid and carnosol. These compounds have approved antioxidant, anti-inflammatory, anti-ageing and anti-microbial effects. A recent Ultraviolet (UV) erythema test with sage CO<sub>2</sub>-antioxidant extract reveals good anti-inflammatory efficacy *in vivo*. Compared to a placebo, sage CO<sub>2</sub>-antioxidant significantly reduces UV-induced erythema, to a similar extent as the gold standard hydrocortisone.

In a screening of various plant extracts rosemary and sage CO<sub>2</sub>-antioxidants also demonstrate a broad spectrum of antimicrobial activity against germs with dermatological relevance, thus recommending these products for topical treatment of acne vulgaris, seborrheic eczema and atopic dermatitis.

### Introduction

Demand for natural UV-protection is high since exposure to sunlight is a main factor for premature skin ageing. Photo-ageing results in hyper-pigmentation, leathery appearance, dry skin, occurrence of wrinkles and skin cancer. Excessive UV irradiation initiates a lot of biochemical reactions in the skin that reduce the ability of skin cells to repair themselves. UV light causes degradation of cellular antioxidants, DNA damage, activation of the neuroendocrine system leading to immune suppression and increased synthesis of pro-

inflammatory mediators. Furthermore, elastases and proteases released from neutrophils activate collagen matrix degrading metalloproteinases (MMPs). MMP-1 is the important enzyme involved in collagen breakdown in the skin. UV-light is a strong activator of MMP-1 *in vitro* and *in vivo*<sup>(1, 2, 3)</sup>.

All these effects lead to inflammation and increased levels of Reactive Oxygen Species (ROS), which induce the transcription of various MMPs through up-regulation of the Activator Protein AP-1.

Rosemary and sage CO<sub>2</sub>-antioxidants are already widely used in food and cosmetic products for antioxidative protection of unsaturated fatty acids<sup>(4, 5)</sup>. New research reveals that they are also promising multifunctional anti-ageing agents, since they protect cell components against oxidation and inflammation. Antioxidants have the ability to quench singulet oxygen involved in MMP-1 up-regulation, they scavenge and quench ROS<sup>(6)</sup> and suppress MMP-1 activity<sup>(7)</sup>.

The bioactivity of rosemary in dermatological applications is higher than the activity of ascorbic acid or alpha-tocopherol<sup>(8, 9)</sup>.

The increasing resistance to antibiotics of many bacteria leads to more research about the antimicrobial efficacy of plant extracts in dermatology. New research reveals that rosemary and sage CO<sub>2</sub>-antioxidants also possess anti-bacterial and anti-inflammatory activity in topical applications. They are promising multifunctional tools for the treatment of skin disorders and prevention of UV-damage and premature skin ageing.

### Production

Supercritical CO<sub>2</sub>-extraction technology is the state-of-the-art technology for production of highly concentrated and highly efficient rosemary and sage antioxidants and fits especially well into the philosophy of natural antioxidants. Supercritical CO<sub>2</sub>-extraction of *Rosmarinus Officinalis* and *Salvia Officinalis* leaves at a pressure of 500 bar alternatively at lower pressure with a small amount of ethanol as entrainer leads to a primary



*Rosmarinus Officinalis* (left) and *Salvia Officinalis* (right)