Roseroat (Rhodiola rosea L.) is a potent medicinal plant

Roseroat (Rhodiola rosea L.), also called golden root or arctic root, is a perennial plant with succulent leaves, yellow flowers and thick rhizomes. The plant originates from Russia (South Siberia) and is distributed in cold temperate or subarctic areas in the Northern hemisphere. The name roseroot originates from the rose like scent that the rhizomes spread when they are divided.

The rhizomes from roseroot have since long been used as an adaptogen within traditional medicine. It was described during the 1st century AD by the Greek physician Dioscorides and was used by the Vikings for strength and endurance. The plant is used to increase physical and mental performance, as well as to counteract tiredness, stress and depression. It also holds anti-inflammatory, antioxidant and cardiovascular protective properties.

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Roseroat also has a positive effect on sensitive skin and improves overall skin condition.

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**REFERENCES**

3. Demmen et al. (2009), J. Ethnopharmacol., 122, 397–403.

**PRODUCT SPECIFICATION**

**INCI:** Rhodiola Rosea Callus Extract

**Botanical name:** Rhodiola rosea L.

**Description:** Extract obtained from in vitro produced roseroot plant stem cells

**Plant part used:** Plant stem cell (undifferentiated cell)

**Extraction solvent:** Ethanol/water

**Composition:** 10% dried natural extract in glycerol OR maltodextrin

**Appearance:** Viscous liquid OR powder

**Country of origin:** Sweden
The extract protects against free radicals and cell damage

The total phenolic content (TPC) in our roseroot plant stem cell (RR PSC) extract is standardised to 2% (22 mg gallic acid equivalent (GAE)/g dry extract). This shows a good cell protective activity. The antioxidant capacity and scavenging activity is 1.4% (measured for c=1 µg/ml) as compared with the standard ascorbic acid (14% for c=1 µg/ml). We can therefore conclude that the roseroot plant stem cell extract contains high levels of phenolic compounds and the extract has a strong antioxidant capacity.

The antioxidant substances in the roseroot plant stem cell extract can penetrate through the skin and restore the antioxidant capacity

We also wanted to determine if the antioxidant substances are able to penetrate skin still remaining their biological activity. Therefore electrochemical measurements were performed. Here the skin was first treated with hydrogen peroxide (H₂O₂), which causes stress and cell damage to skin cells, and thereafter treated with the roseroot plant stem cell extract. Skin treated with the roseroot extract was able to recover from the damaging effect of hydrogen peroxide. This is shown as an increase in electric current. It can therefore be concluded that the antioxidant substances in the roseroot plant stem cell extract can penetrate through the skin and still remain its antioxidant capacity.
The roseroot plant stem cell extract gives increased protection in skin epithelial cells

We found that topical application of roseroot plant stem cell extract increased the expression of several interesting genes, such as the SOD2 gene. SOD (Super Oxide Dismutase) plays an important role in cell protection. With age the levels of antioxidant enzymes, such as SOD, decreases resulting in increased oxidative stress and increased oxidative cell damage. Application of plant extracts that stimulates the levels of antioxidant enzymes in the skin, such as SOD, will help to protect the cell against oxidative damages, thereby cell ageing can be slowed down. SOD also has anti-inflammatory effects. Treatment of epithelial cells with roseroot plant stem cell extract (0.5% dry extract in glycerol) increased the SOD2 gene expression 5.5 times as compared with non-treated cells.

The GAPDH gene is used as a reference gene for normalisation of the gene expression data.

Application of roseroot plant stem cell extract also increased the expression of TFPI2 gene (Tissue Factor Pathway Inhibitor 2) 18.9 times as compared with non treated cells. TFPI2 encodes a serine proteinase inhibitor, that promotes the integrity of the extracellular matrix (ECM) and prevents ECM degradation.

The roseroot plant stem cell extract also increased the gene expression of and RND3 (RHO family GRPase 3) 2 times and COL3 (collagen type III, alpha 1) 1.6 times as compared with non-treated cells. RND3 encodes a GTPase protein which acts as a molecular switch and regulates many aspects of intracellular actin and cytoskeletal integrity. It is also involved in organelle development and actin formation in certain skin regenerative processes. The impact of the roseroot plant stem cell extract on COL3 gene expression will be further verified by protein analysis.

IN VITRO ANALYSIS

The gene transcript analysis was performed by Bioalternatives (France), using the qRT-PCR (reverse transcription quantitative polymerase chain reaction) with aged human skin fibroblasts after 24 h incubation with or without extract treatment. The data was normalized to GAPDH.

References
15. Kim et al. 2011
16. Lino et al. 1998
17. Kaibuchi et al. 1999
The total metabolic profile of the roseroot plant stem cell (PSC) extract was analysed using HPLC. Phenolic compounds absorb well in the broad UV range, but the simultaneous detection of phenolics from a complex plant extract is not sufficient using a single wavelength. It is due to the variabilities in the molecular structure of different phenolic compounds. Therefore chromatograms for 280nm and 320nm are presented. The analysis revealed that roseroot has a complex metabolic profile with multiple peaks as shown in the 280 and 360 nm wavelength diagrams.

Clinical, *in vivo* efficacy studies

Analyses are currently being performed and will be presented for night and eye cream in regards to impact on wrinkles, moisture and elasticity in May 2017.

Consumer evaluation

Analyses are currently performed and will be presented in April 2017.