

### Ecocert Extract from Opuntia Cactus with Proven Activities

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#### Abstract

The pads of the cactus *Opuntia* are known as nopales and are used in Mexico as a dietary supplement to promote weight loss and as a medicine to treat inflammation and pain. Purified components of the *Opuntia* cactus were used for the development of a cosmetic ingredient that provides long-lasting hydration to skin even in rinse-off applications. This ingredient also has remarkable soothing properties which could be shown in a fascinating cell culture system with nerve cells. The *Opuntia* cactus ingredient was found to inhibit the depolarisation of sensory nerve cells when under stress. The active's protection against UV was shown in vivo. The synergistic activities can be applied in sun care products and skin care products to soothe sensitive and dry skin. *Opuntia* is sold commercially as AquaCacteen nc by our company.

#### Introduction

The most important factors for sensitive skin are skin dryness and atopic skin, meaning skin that is hyper-reactive towards allergens. This article describes a preparation of the *Opuntia* cactus that helps against sensitive skin in two different ways: it increases skin hydration and it specifically reduces the itch sensation and local inflammation. The latter phenomena are the consequence of a 'crosstalk' between the stratum corneum, free sensory afferent nerve endings and mast cells (Figure 1, next page). A stimulus such as a pruritogenic substance or inflammatory mediators or cytokines produced by keratinocytes act either directly on a subset of specialised nerve endings, called C-fibres, inducing an action potential or on mast cells inducing degranulation. The action potential leads to the evocation of nociceptive reflexes and pain behaviour and to the release of neuropeptides such as substance P and the calcitonin gene-related peptide (CGRP). These neuropeptides induce dilation of the surrounding capillaries and local inflammation and also degranulation of mast cells. Degranulation liberates histamine, which, in turn, initiates itch and local inflammation by stimulating the C-fibre nerve endings.

To the genus *Opuntia* belong about 200 – 300 cactus species that grow all over the world in arid and semi-arid zones. Commercial cultivation is carried out in Italy, Spain, Mexico, Brazil, Chile, Argentina and California. Traditionally *Opuntia* cactus plants serve as sources for fruits and vegetables and for medicinal and cosmetic purposes. The term 'nopales' is used for the flattened stem segments that are morphologically incorrectly designated as cactus leaves. The dried powdered cactus leaves are used as a nutritional supplement. They are a rich source of minerals, pectins and flavonoids<sup>1</sup>. There are several scientific publications that report the analgesic action and anti-inflammatory properties of nopal extract<sup>2</sup>.

#### Materials and Methods

##### Preparation of the Cactus Extract 'AquaCacteen nc'

Leaves of the species *Opuntia Ficus indica*, organically grown and certified, which had been carefully dried at relatively low temperatures, served as a source material. The material was taken up in a phosphate buffer solution and digested with a special enzyme mixture. The final product was obtained after passage through different filter devices and cross flow filtration through a 10 kDa membrane. For standardisation of the extract the lead substance piscidic acid (Figure 2, next page) was analysed by HPLC-MS. Piscidic acid is a chelator of free iron ions.

##### Protection Against UVA Irradiation

Human keratinocytes (HaCaT) were irradiated with UVA for 25 minutes at a dose of  $1125 \text{ kJ/cm}^2 \pm$  'AquaCacteen'. Cell growth was measured 24 and 48 hours later with the MTT assay.

##### Coculture Model with Sensory Neurons and Keratinocytes

Rat sensory neurons were cultivated in a plate with 96 wells in a coculture medium. After 10 days, normal human keratinocytes were seeded in each well. After 2 days of coculture, supernatants were changed by coculture medium alone or with the test compound and cells were incubated