Resurrection in Cosmetics

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1. Introduction

The protection and restructuring of the skin is a matter of major concern in cosmetics. Mother Nature is an excellent guide in the search for new concepts. On the one hand, our skin is subjected to stress by abiotic factors such as heat, coldness, dryness and other influences. On the other hand, however, the living world shows us which surprising possibilities are available to protect our skin from the harsh aspects of our environment.

Water is one of the most important and limiting factors for plants, animals and humans. The human being consists of 60-65 % water and loses daily up to several litres through the skin. The regulation of water content is therefore very significant. Plants especially have developed fascinating physiological and structural strategies to minimize water loss and survive periods of dryness. The so called "resurrection plants" are examples of such survival artists. These plants have the ability to dry out completely and to survive a dry period of several months in a state of anabiosis without harm. Anabiosis is a state of reduced metabolism. After such plants have picked up moisture again, the green colour of their leaves is restored and the plant can resume its normal growth within one to two days (fig. 1).

Figure 1: The resurrection fern Selaginella lepidophylla in the dry state (left) and two days after watering.

Such plants are mostly algae, lichen and ferns [1]. In the case of the flowering plants, there are only a few "resurrection plants" to be found. They settle in different arid sites. Some grow in dry cavities or on the top of rocks where the plants grow in the hot sun and may use rain water for a short period of time. Others grow in swamps that dry out for several months per year and others prefer the semi shade protected from the hot sun.

During the drying out period, these plants undergo intensive morphological and physiological changes in order to be able to transfer the existing cell components in an ordered form into the anabiosis reduced phase of activity. In this phase specific protective substances are accumulated [2]. Many of these protective substances are special, low molecular weight sugars such as trehalose and raffinose which are not present in most other plants or occur only at low concentrations.

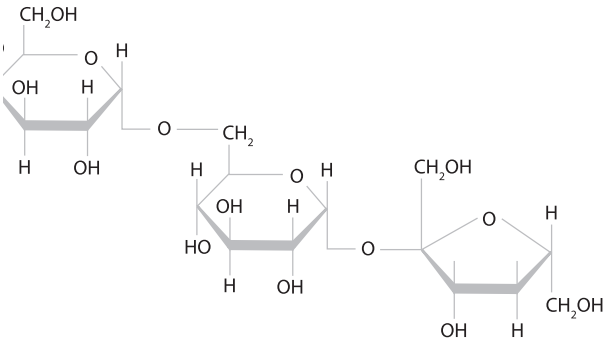

Figure 2: Chemical structure of the trisaccharide raffinose. Raffinose consists of one of each of the sugar molecules galactose, glucose and fructose.

Most of these low molecular protective substances possess a so-called cosmotropic property, i.e. they have a structure enhancing property for other molecules. This prevents crystal formation when the plant is drying out and protects the main structures of the cell such as the mitochondria, chloroplasts