Chia seed CO2 extract:
A revolutionary ingredient for food and cosmetics

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Imagine a world without wheat, rice or bananas, and you will get an approximate idea of what we would actually be missing if there weren't any chia seeds. Like the most extensively grown food crops of our second millennium, the seeds of Salvia hispanica, a Lamiaceae from Mexico, known by the Aztecs as chia seeds, were the most important staple food grain during the Mesoamerican civilisation. Before the Spanish settlers arrived, chia was grown even more than maize in Mexico and various other parts of Central America.

There are many reasons for that great success of the past. Chia has a large number of medicinal properties, mainly due to the aromatic compounds that it and all the plants of this genus contain. The seeds were used before and after the 16th century for skin diseases, gastro-intestinal disorders, fever and respiratory ailments and more generally as a stimulant. During the post-Columbian period, chia seeds were reputed to cure ophthalmic troubles like eye obstructions or infections.

Of course as the food grain chosen by the Aztecs, chia seeds have a 20 % protein content which is higher than that of other regular cereals like wheat, oats or barley (14 – 15 %), and they have an excellent essential amino acids profile.

Photo : Joseph Cahill

Salvia hispanica is an annual herbaceous plant belonging to the mint family, a native of Southern Mexico and Northern Guatemala. Its long inflorescences give numerous small seeds in fall.

But over and above all these wonderful qualities, what makes chia seeds exceptional is their oil content of 33 %, and more than 61 % of that is the precious omega-3- or alpha-linolenic acid, which is probably the highest percentage seen in any plant. With an additional 22% of omega-6 linoleic acid, we reach a total of 83 % essential poly-unsaturated fatty acids. The addition of an optimised natural antioxidant based on the ingredients of rosemary or sage immediately after production, extends its shelf-life to about 2 years. This provides a competitive advantage and additional health benefits.

Photo : Joseph Cahill

The commercial production of chia seeds is starting to be developed in different parts of South America, including Argentina. The yields still vary greatly, from 400 to 900 kg per ha. Agricultural methods and the content of omega-3 in the oil can also be very different.

Flavex guarantees a minimum omega-3 content of 60 % in its CO2 extract, which contains practically no heavy metals or pesticide residues.

This is mainly why, after various ethno-botanical screening and biochemical research, Flavex has selected Salvia hispanica to provide the European market with a high quality supercritical CO2 extract. It is amazing to count up all the uses and properties of Salvia hispanica, and to realise at the same time that this plant is still so little-known in Europe.

Chia oil is a sensitive product due to its special fatty acid composition. Extraction with supercritical CO2 has the advantage of gentle process conditions and the exclusion of oxygen. The supercritical chia oil is free of solvent residues and needs no refinement. There is no formation of artefacts or isomerisation of double bonds. Lipophilic trace components like tocopherols and phytosterols are included in the oil according to their content in the raw material. This guarantees the genuine and high grade product character.

Under closer examination the chia seed extract shows great potential. In cosmetics, the extract combines real advantages for the skin, anti-inflammatory and anti-allergic properties that favour the flexibility of dermal tissues with a possible application for mucous membranes. Moreover, the marketing of any product containing chia seed extract could be easily supported by the very trendy image of omega-3.

In health foods, and particularly in food supplements, chia seed extract meets the new requirements for unsaturated fatty acids: it is safe, vegetarian and has a pleasant smell. Moreover, chia seed oil is probably the only botanical oil which can really compete with fish oil due to its fabulous omega-3 acid content.

Although omega-3 and omega-6 fatty acids are both required for human health it is important to know that during the last century the ratio of omega-6 to omega-3 in our daily food has changed from 4:1 to about 16:1 and is out of balance today. That's the reason why dietary experts strongly recommend a supplement of 1-2 grams omega-3 fatty acids per day.

Omega-3 fatty acids can be found in fish oils and in some seed oils. Fish oils contain the longer chain omega-3 acids with 20 and 22 carbon atoms and 4-6 double bonds (ETA, EPA, DHA) and plant oils provide the essential alpha-linolenic acid (ALA) with 18 carbon atoms and 3 double bonds. Recent studies prove that the body's own enzyme systems (elongase, 5- and 6-desaturase) are able to use ALA for the production of i.e. EPA with a good yield. Thus omega-3 oils of chia, kiwi, perilla or flax seeds can be considered as vegetarian alternative to fish oils with the advantages of a neutral smell and the absence of marine pollutants like PCB's, pesticides or mercury compounds.

The essential fatty acids are precursors of eicosanoids (prostaglandins, leucotrienes, thromboxanes), hormone like substances which regulate almost all physiological processes inside the human body. In doing so a complex equilibrium between 'good' and 'bad' eicosanoids has to be established with pro and anti-inflammatory, thromtotic and anti-thrombotic efficacies. Eicosanoids are produced locally on a cellular level and cannot be orally supplemented. They can only be influenced indirectly by a healthy nutrition and a balanced intake of essential fatty acids. If this sensitive regulation system is out of equilibrium there are no healthy inflammation and immune responses with the result of a creeping development of degenerative civilisation diseases.

Omega-3 fatty acids stand for the good icosanoids. They control the omega-6 fatty acids and have a positive influence on total body health. Many studies prove that they

- **reduce the risk for cardiovascular disease and arteriosclerosis**
- **reduce cholesterol and blood lipids**
- **reduce blood viscosity and platelet aggregation**
- **reduce blood pressure**
- **protect against inflammation and arthritis**
- **prevent auto-immune diseases and cancer development**
- **are essential components of cell membranes and transport processes.**

Table 1: Typical fatty acid composition of different seed oils

Oil	Latin name	Omega-3 linolenic acid	Omega-6 linolenic acid	Omega-6 linoleic acid	Omega-9 oleic acid
Chia seed oil	Salvia hispanica	62%		21%	8%
Kiwi seed oil	Actinidia chinensis	62%		15%	12%
Perilla seed oil	Perilla frutescens	58%		14%	18%
Flaxseed oil or Linseed oil	Linum usitatissimum	53%		15%	22%
Rapeseed oil or Canola oil	Brassica napus	9%		20%	56%
Evening primrose oil	Oenothera biennis		9%	73%	10%
Borage oil	Borago officinalis		22%	40%	20%

Compared to chia seed oil, rapeseed and flaxseed oils have inferior reputation and evening primrose and borage are omega-6 oils which don't perform the same purpose. After a quick look at table 1, it is easy to predict that in the years to come Salvia hispanica seed oil is going to become a leading source worldwide of omega-3.

Still on the subject of the food industry, chia seeds are also endowed with high culinary qualities. With a very pleasant smell, chia seed extract could act as a flavour enhancer. The great names of the "Grande Cuisine" will crave to use it, so delicate is its taste and so interesting its story.

Photo : François Gérard

Chia seeds are very small grains 2 mm in length, and they are grey, black or brown. Even today in Mexico, the seeds are crushed in water with lime and sugarcane to give a very refreshing and healthy drink. Prior to the Hispanic culture, chia seeds were roasted and ground into flour, then mixed with maize grains to make delicious pancakes.