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A new lipidic ingredient becoming basic constituent of emulsion: Lipactive Inca Inchi®

By Laurent Rios*, Sylvia Deltort* and Jean-Yves Berthon*

Introduction

Inca Inchi (Plukenetia volubilis linneo) is a plant native of the high-altitude rainforest of the Andean region of South America and especially of Peru. It grows as a vine and produces a tetralobular fruit with loculi that contain one seed each. The seed collected in the wild has long been a component of the diets of the Chancas Indians and other tribal groups of the region. This seed is valued for its high oil (54%) and protein (29%) content. It is eaten either roasted or ground and mixed with maize meal and peppers. Leaves are also eaten as salad. The specific lipid composition of the Inca peanut (more than 80% of the lipids are omegas-3 and -6, 49% and 37% respectively) interests Greentech to produce, in association with Agroindustrias Amazonicas (a Peruvian company), an Inca Inchi oil with healthy and cosmetic properties.

Greentech has set out to establish since 1992 (date of its creation by Dr Jean-Yves Berthon) partnerships with small producers all over the world with a view to respecting environment, flora biodiversity, local resources, culture and ethnic resources (wealth), female parity and the ban of child exploitation.

Cultivation and Sustainable Development

To produce the Inca Inchi oil in Peru, Greentech and Agroindustrias Amazonicas have developped, in 2001, the OMEGA project. The aim of this project is to ensure respect for environment and the farmers' quality of life linked to the plant crop and the oil production quality. The OMEGA project falls into the criteria of Sustainable Development and Fair Trade [i) *Social:* to allow the small poor producers to meet their basic needs (health, education, accomodation, etc.) ; ii) *Environment:* to encourage a natural mode of production without any chemical products, to take part in the protection of natural environment (reforestation, animal protection) ; iii) *Economic:* to optimize the most underpriviliged incomes, to purchase equipment for local production of oil and to develop new technology in Peru ; iiii) Quality : to improve the oil quality (our raw material) and to promote the by-products for food or cosmetic uses)].

Today, the OMEGA project has permitted the expension of about 20000 hectares of Inca Inchi culture associated with the reforestation of Amazonian deforested areas with native trees as well as food and medicinal plants. This project has also permitted the creation of 8000 new direct or indirect jobs in farming, industry and services. Fifty-five farmers' associations have been created and twenty-five centers for the Inca Peanut collection and one unit for oil production have been implanted. Now, the OMEGA project is evaluated to obtain both the Max Havelaar and the BioEcocert labels. These two labels will be the recognition of the place of the OMEGA project in Peruvian programs of Sustainable Development and Fair Trade and the recognition of the quality of Inca Inchi oil (organic product).

Inca Inchi virgin oil

The Inca Inchi oil is obtained from seeds growing in the Amazonian area of Peru, according to traditional and organic agriculture methods. Coming from an integrated field from the seed to the oil, these seeds are guaranteed without any chemical treatment and stored in controlled conditions from their crop to their industrialization. From non GMO source with a non-allergen nature, this oil presents all traceability and food guarantees. It is free from undesirable compounds and chemical pollutant traces.

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	Inca Inchi	Olive	Soya	Maize	Peanut	Sunflower
Oil	**54**	--	19	--	45	48
Palmitic acid (saturated)	**4**	13	10	11	12	7
Stearic acid (saturated)	**2**	3	3	2	2	5,3
Oleic acid (Ω9 – mono-unsaturated)	**8**	71	22	28	43	29
Linoleic acid (Ω6 – poly-unsaturated)	**37**	10	54	58	37	58
Linolenic acid (Ω3 – poly-unsaturated)	**49**	1	8	1	0	0

Table 1: Lipid composition of different oils (%)

Fatty Acids	Formula
Oleic acid (Ω9) $C_{18}H_{34}O_2$	$CH_3-(CH_2)_7-CH=CH-(CH_2)_7-COOH$
Linoleic acid (Ω6) $C_{18}H_{32}O_2$	$CH_3-(CH_2)_4-CH=CH-CH_2-CH=CH-(CH_2)_7-COOH$
Linolenic acid (Ω3) $C_{18}H_{30}O_2$	$CH_3-CH_2-CH=CH-CH_2-CH=CH-CH_2-CH=CH-(CH_2)_7-COOH$

Table 2: Poly-unsaturated fatty acids found in the Inca Inchi Lipactive®

The Inca Inchi oil is extracted from these selected seeds by mechanical pressure in cold followed by a mechanical clarification by decantation and filtration. This oil production process alters neither the nature nor the quality of the oil. The extra virgin Inca Inchi oil is 100% natural. This oil is from far the richest vegetal oil in poly-unsaturated fatty acids of all oleaginous seeds used for human consumption (Table 1). The concentration of this unsaturated fatty acids oil can reach 94%, including in average 49% in essential fatty acid alpha-linolenic omega-3 and 37% in essential fatty acid linoleic omega-6.

The Inca Inchi oil is the unique vegetal oil with both essential fatty acids in a so high amount. This specific lipid composition gives cosmetic and dietetic properties to the Inca Inchi oil. The exceptional content in poly-unsaturated fatty acids and especially in omega-3 and the low ratio (omega-6/omega-3) (< 1) are two arguments to consider the Inca Inchi oil as one of the best oil for human food and health (protection of lipid membrans and protection against cardio-vascular diseases). Today, Greentech is looking for the European authorization (Food Grade Certificate) before marketing the Inca Inchi oil as a food product.

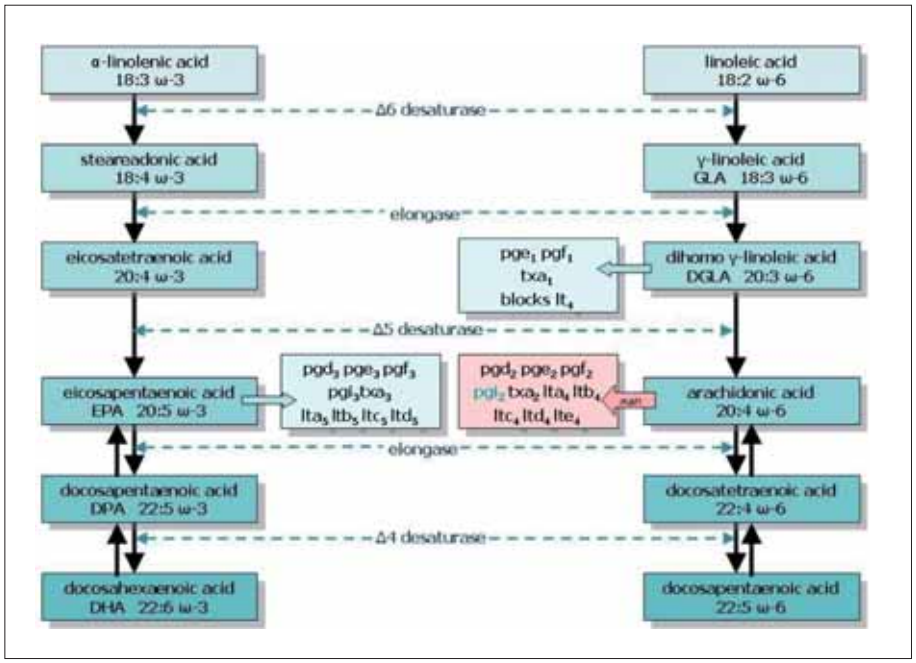
Cosmetic properties of the Lipactive Inca Inchi®

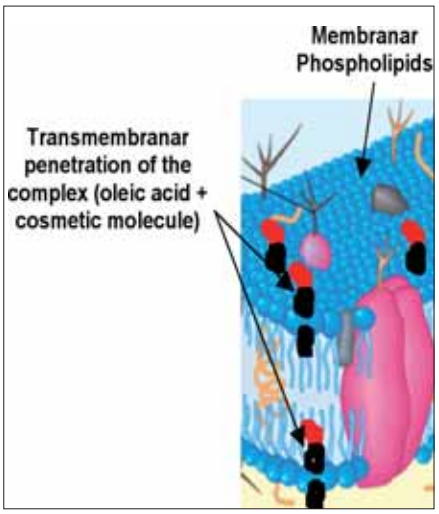
The Inca Inchi oil obtained by the "natural" process used by Agroindustrias Amazonicas is marketed by Greentech as Lipactive Inca Inchi®. The high levels of poly-unsaturated fatty acids (> 80%, especially of omega-3, -6 and -9 (Table 2.)) and tocopherols (1500 to 2000 mg/kg) are responsible for the biological activities of the Lipactive Inca Inchi®.

Linolenic and linoleic acids are called "essential fatty acids" because humans are not able to synthetize them. As a result, they must be introduced by food or by cosmetic products.

The deficiency in linoleic and gamma-linoleic acids (omega-6), often linked to a deficiency in enzymes involved in their absorption (due to ageing, stress, tobacco or alcohol consumption), induces cutaneous perturbations. This particularly results in a decrease of membrane fluidity involving a disruption of the cutaneous barrier and a loss of the epidermic elasticity. All these events induce a cutaneous dehydratation accompanied by the appearance of squamas and wrinkles on the skin surface. The supply of linoleic and gamma-linoleic acids restores the cutaneous permeability and the function of the skin barrier. They contribute to the control of the imperceptible water loss and they maintain the moisturizing of the skin.

In addition, studies have shown that these poly-unsaturated fatty acids play a part in the synthesis of "hormone like" chemical compounds as prostaglandins. Indeed, omega-3 take part in the E3 prostaglandins (PGE3) synthesis which in turn regulate the inflammatory process. They allow to fight against inflammation in particular on the skin in case of superficial wounds. As far as omega-6 are concerned, they play a part in the E1 and E2 prostaglandins (PGE1 and PGE2) synthesis. PGE1 allows to stimulate different body functions, particularly the blood circulation. It has been recently shown that PGE1 allows to treat dry and damaged skins as in eczema attacks. As far as PGE2 is concerned, it is involved in the regulation of the blood coagulation. However, an excess of PGE2 stimulates the inflammatory process.





As far as omega-9 are concerned, they belong to a family of lipids involved in the constitution of cell membranes. They take part in their fluidity. Their characteristic to filter into cell membranes enables them to carry different molecules through the cutaneous barrier.

Lipactive Inca Inchi® has also got anti-oxidant properties thanks to its high content in tocopherols (1500 to 2000 mg/kg). By trapping free radicals, tocopherols protect the various cellular structures against oxidative damages.

Cosmetic applications of Lipactive Inca Inchi®

Lipactive Inca Inchi® has got anti-oxidant and anti-inflammatory properties thanks to its high content in poly-unsaturated fatty acids and tocopherols. It also has the ability to stabilize membranes by insertion between phospholipids, restoring the cutaneous permeability and the function of the skin barrier. Thus, Lipactive Inca Inchi® is recommended for:

- Anti-ageing skin care,
- Regenerative skin care,
- Healing skin care,
- Anti-stretchmarks skin care,
- Moinsturizing skin care,
- Dry skin with atopic tendency skin care,
- After sun care,
- Feet care,
- Hand care,
- Activator of blood microcirculation.

Lipactive Inca Inchi® is a promising product prone to become one of the basic ingredients used in the cosmetic formulation. Lipactive Inca Inchi® can indeed be used as an oil basis gifted with numerous biological properties.

Lipactive Inca Inchi® is not only an active cosmetic ingredient, it is also a nutraceutic product with healthy properties (regulation of lipid metabolism, protection against cardio-vascular diseases, etc.).

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