



**Analytical Composition**

Different studies made to the maca root define that this vegetal has very valuable elements to the human nutrition : proteins, Amino acids, Carbohydrates, fiber, vitamins B1, B2, B6, B12, many essential minerals such as : calcium, potassium, Iron, sodium etc.

<b>COMPONENTS</b>	
Humidity	10,1%
Proteins	11,6%
Lipids	0,9%
Carbohydratos	52%
Ash	4,7%
Fiber	21,2%

*Analysis 100 gr.*

**VITAMINS**

Maca have many vitamins such as B1, B2 , C and others. Research has shown that Maca also contains 4 alkaloids: macaïne 1,2,3d and 4. They stimulate the reproductive system of men and women.

**Thiamine - B1** this vitamin convert blood sugar to energy (co-enzyme) - very active people like sportmen need specially this vitamin for efficient nutrient absorption from food. This vitamin will also help you feel more active and have more energy for your day to day living.

<b>VITAMIN</b>	<b>MACA</b>	<b>Radish</b>	<b>Cabbage</b>	<b>Turnip</b>
Proteins	<b>3,9</b>	0,8	1,5	0,6
Carotene	<b>0,07</b>	0,0	0,1	0,0
Thiamine (B1)	<b>0,5</b>	0,01	0,3	0,01
Riboflavin (B2)	<b>0,11</b>	0,02	0,03	0,04
Ascorbic Acid (C)	<b>2,80</b>			

**Riboflavin - B2** Helps body release energy from protein/carbohydrates/fat, and to cope better with stressful situations; essential to life. Lack of HCl leads to inefficient B2 absorption. Lost via perspiration/urination (water soluble). Destroyed by light. Insufficient B2 can lead to: -Sores at corner of mouth; -Eczema, conjunctivitis, baldness; -Burning feet, muscle weakness, dizziness, tremors/shaking; -Mental apathy

source: Perú, Instituto de Nutrición, INCAP, ICNND

**MINERALES**

In the analysis of maca it is surprising its big quantities of **iron, calcium, potassium and zinc**(see table).



**Potassium** Important to maintain the acid/alkaline balance required for efficient cellular activity. Regulates body's electrical activity (ie. heartbeat) and carries nerve messages to muscles, releasing some hormones and neurotransmitters en route. Low levels are associated with high blood pressure and heart arrhythmias.

**Iron** is the responsible of blood production and oxygen transportation within the body, that's why maca has been very useful for the adaptation of the Incas to the high altitudes where oxygen is scarce. Linked to childhood learning problems, poor concentration and short attention. Low levels can result in anaemia characterized by fatigue, cold sensitivity, and lowered immunity. When women enters menopause period they need a double quantity of iron in their diet.

**Calcium** Maca has the higher concentration of this mineral than other vegetal of his gender. Calcium is the most abundant mineral in the human body, very important to the teeth, bones and for the normal levels of growing for children.

**Zinc:** This mineral is required by brain and CNS enzyme systems (ie. digestion/respiration); by the reproductive system (fertility); for bone calcification; and by the immune system . Can be depleted by alcohol, breast feeding, diabetes, ageing oestrogen supplementation, corticosteroids, and diuretics.

#### Mineral analysis, main vegetables - maca (mg/100gr)

Minerals presentes en la maca (mg/100gr)		VEGETAL	Energy	Iron	Calcium	Potasium	Zinc
Potasium	2050	garlic	135 cal	1,4 mg	38mg	-	
Calcium	150	Artichoke	49 cal	1,5mg	53mg	350 mg	
Iron	16,6	Spinach	18 cal	4,1 mg	126mg	633 mg	500mcg
Zinc	3,8	<b>Maca</b>	<b>270 cal</b>	<b>16,6mg</b>	<b>150mg</b>	<b>2050mg</b>	<b>3,8mg</b>
Sodium	18,7	Turnip	10 cal	0,9 mg	32 mg	322 mg	160mcg
Manganese	0,8	Potato	71 cal	1,0 mg	9 mg	443 mg	270mcg
Cooper	5,9	Leek	26 cal	1,1 mg	87 mg	200 mg	310mcg
<b>source: A. Dini, 1994</b>		Tomato	17 cal	0,5 mg	13 mg	297 mg	240mcg
		Carrot	27 cal	2,1 mg	37 mg	290 mg	640mcg

Se puede observar claramente que la maca es un vegetal superior a muchos de los vegetales conocidos.

#### AMINO ACIDS

Amino acids are the basic structural building units of proteins. They form short polymer chains called peptides or polypeptides which in turn form structures called proteins.

Twenty amino acids are encoded by the standard genetic code and are called proteinogenic or standard amino acids. Rarer, more complicated ones are produced by the body and are called nonstandard. Proline is the only proteinogenic amino



acid whose side group is cyclic and links to the  $\alpha$ -amino group, forming a secondary amino group. Formerly, proline was misleadingly called an imino acid. Other amino acids contained in proteins are usually formed by post-translational modification, that is modification after translation (protein synthesis). These modifications are often essential for the function of the protein. At least two amino acids other than the standard 20 are sometimes incorporated into proteins during translation

Scientific researches suggest that maca has a well quantity of amino acids: (see table).

Amino acids present in maca (mg/gr of protein)	
Aspartic acid	91.7mg
Glutamic acid	156.5mg
Serine	50.4mg
Histidine	21.9mg
Glycine	68.3mg
Threonine	33.1mg
Alanine	63.1mg
Arginine	99.4mg
Tyrosine	30.6mg
Phenylalanine	55.3mg
Valine	79.3mg
Methionine	28.0mg
Isoleucine	47.4mg
Leucine	91.0mg
Lysine	54.3mg
H.O. Proline	26.0mg
Prolina	0.5mg
Sarcosine	0.7mg
<b>fuentes:</b> tomado de D. Dini, 1994.	

## STEROLS

Sterols are a large subgroup of steroid-like compounds found in plants and animals. Maca have several sterols : Sitosterol, campesterol, ergosterol, ergostadienol, brassicasterol. These elements could be the responsible of the "hormonal action" related to maca.

Sterols ( <i>Lepidium meyenii</i> )	
Sitosteryl	45.5 %



Campesteryl	27.3 %
Ergosteryl	13.6 %
Brassicasteryl	9.1 %
Ergostadienyl	4.5 %
<b>source:</b> taken from A. Dini, G. Migliuolo 1994	

### Fatty Acids

**Monounsaturated fat** is considered to be probably the healthiest type of general fat. It has none of the adverse effects associated with saturated fats, trans-fats or omega-6 polyunsaturated vegetable oils.

**Polyunsaturated fat** is healthier than saturated fats. It is also an essential element in our diet because polyunsaturated fat includes a special family of essential fatty acids (which the human body cannot manufacture for itself) called omega 3 and omega 6 fatty acids.

<b>Fatty Acids of "Maca" %</b>	
<b>Monounsaturated (c/s)</b>	<b>13,4%</b>
Omega 9c: Oléico	13,4%
<b>Polyunsaturated (c/s)</b>	<b>52,8%</b>
Omega 6 c: linoleic	40%
Omega 3: alpha linoleic	12,8%
<b>Saturated</b>	<b>33,8%</b>
palmitic	25,4%
stearic	3,8%
Henicosan	2,0%
Behenic	1,4%
Lignorceric	1,2%
<i>Ratio: saturated/unsaturated</i>	<i>0,51</i>
<b>source:</b> Interlabor Belp SA, Suiza 2001	