SYNONYMS
Lepidium meyenii, peruvianum, root

DESCRIPTION
Maca (Lepidium meyenii, peruvianum, root) is a Peruvian tuberous plant that grows high in the Andean Mountains, that belongs to the tuberous plants of the Brassicaceae family. Partly because of its effect on energy, stamina, libido and vitality, maca has also been dubbed ‘Peruvian ginseng’, or ‘ginseng of the Andes’. The maca is the only edible plant able to survive during extreme weather conditions and at altitudes of between 3,000 and 4,000 metres. The roots of the plant are extremely nutritious and for thousands of years have been eaten during almost every meal by the local population.

The rich nutritional value of this tuberous plant means that Maca is considered to be an adaptogenic plant. Maca is also used in traditional medicine by both men and women to treat gender and hormone-related disorders. Maca can potentially be used for perimenopausal and postmenopausal symptoms, premenstrual syndrome (PMS), libido and potency disorders, fertility problems, disrupted hormonal homeostasis, osteoporosis and prostate enlargement.

There is currently considerable scientific interest in the possible therapeutic effect of the plant. During the period between 1961 and 2012, a series of scientific articles were published about the positive effects of maca on a range of human body functions.

EFFECT
Macamides, macaenes and other active ingredients
Medically interesting secondary plant-based compounds are the alkaloids, flavonoids, various phenol compounds, steroids, tannins, glycosides and saponins. Aromatic glucosinolates have also been found in maca, such as glucotropaeolin, benzyl glucosinolates and p-methoxybenzyl glucosinolates and related substances, such as the isothiocyanates. The alkamides, such as the macamides and macaenes, are considered to be the marker substance when standardising maca. The concentrations of alkamides vary between 0.15% and 0.84%. The combination of two glucosinolates, sinigrin and glucotropaeolin, is unique to maca and is therefore seen as a chemotaxic marker. This combination does not occur in other plants in the Brassicaceae family. The steroid fractions predominantly contain beta-sitosterol, campesterol, ergosterol, brassiasterol and 7.22 ergosterol. The chemical composition is described extensively by Valentova and others (see the list of literature).

INDICATIONS
Perimenopausal and postmenopausal symptoms
As outlined above, maca is an adaptogenic plant. Adaptogens generally support the body in dealing with physiological, biochemical and psychological stress factors, including changes that occur during the perimenopausal and postmenopausal years. During the menopause, women can experience a variety of symptoms, such as hot flushes, irritability, mood swings, sleep disorders and night sweats, but also a marked reduction in libido and vaginal dryness. Australian research involving perimenopausal and postmenopausal women has revealed that a concentrated maca preparation (Maca-GO) stimulates the body’s own production of oestrogens and lowers the concentrations of stress hormones, such as cortisol and the adrenocorticotropic hormone.

It is worth noting that maca does not contain oestrogens or other hormones, and can therefore be a safe alternative to hormone replacement therapy. It has been suggested that the mechanism of action is that the plant sterols that are present may have a stimulating effect on the hypothalamus, hypophysis, adrenal glands and ovaries. Other endocrine glands that are modulated by maca are the thyroid gland and the pineal gland. Because of the adaptogenic properties and regulating function of maca on the endocrine glands, it is an important candidate for the holistic treatment of perimenopausal and postmenopausal symptoms. However, properly organised follow-up studies into the effectiveness and safety are needed.

Osteoporosis
Another favourable effect of maca is that it can have a beneficial effect on bone density. Research involving animals has revealed that an extract of maca is effective in the prevention of osteoporosis when the production of oestrogen ceases, and that it can improve bone density. Low oestrogen levels in post-menopausal women is one of the causes of osteoporosis.

Premenstrual syndrome (PMS) and hormonal imbalance
PMS is accompanied by a range of symptoms, such as, for example, irritability, a bloated feeling, mood swings, sensitive breasts and an uncontrollable urge for specific foods. The causes of PMS are not entirely clear, although fluctuations in hormone homeostasis and neurochemical changes in the brain play a role in this. Maca seems to have a normalising effect on the hormonal imbalance. Based on
traditional use and by maca being prescribed by doctors who specialise in complementary medicine, it has been found that this can relieve the cramps, bloated feeling, headache and the aforementioned symptoms.

**Libido and potency disorders**

Many sexual problems relate to a lack of sex drive in both men and women or erectile disorders in men. Research has shown that maca can possibly improve sexual functioning in men and women. A systematic review in which four clinical studies were compared reveals that maca does have some positive effects, although follow-up studies are required.

Animal studies involving rats and mice have shown that maca boosts libido. Furthermore, after taking maca, increased androgen-like effects were seen in rats. Maca contains a relatively high concentration of amino acids, such as tyrosine and phenylalanine which are precursors of neurotransmitters and also determine sexual functioning, and also arginine that plays a role in the formation of nitric oxide, which combats impotence in men. It has not been ruled out that the macamides and macaenes also have an effect on sexual behaviour, although this has not yet been proven scientifically.

**Fertility**

Animal studies have shown that maca can boost fertility. The fertility-boosting properties of maca can probably be attributed to the phytosterols and phytoestrogens. Maca alkaloids are said to combat sterility and the glucosinolates of maca have an antioxidative function and remove free radicals.

In men, maca can increase the production of sperm cells in the seminiferous tubules and improve the mobility of the mature spermatozoa. Both the quality and the quantity of the spermatozoa are important for men's fertility. A clinical study involving nine healthy men revealed that oral administration of maca increases the volume of seminal fluid. The number of sperm cells also increased and the mobility of the sperm cells improved. The hormone levels (sex hormones) in blood serum did not change after taking maca.

**Combats prostate enlargement**

Most men above 50 years of age suffer from prostate enlargement (benign prostatic hyperplasia). The exact causes of prostate enlargement with advancing age are not entirely clear. Changes in serum hormone levels have an effect on the cell division capacity of this gland. There are indications that maca can prevent prostatic hyperplasia. Red maca is the most effective in terms of prevention. Yellow maca and, to a lesser degree, black maca also have this effect. At the outset of an animal experimental study, testosterone was given to rats, resulting in prostate enlargement. It was subsequently found that the prostate was not enlarged in rats who had been given red maca. In comparison to other types of maca, red maca contains a higher concentration of glucosinolates and polyphenols. Yellow maca contains more of these substances than black maca. Both substances could possibly contribute to shrinkage of the prostate.

**CONTRA-INDICATIONS**

Due to the effect of maca on sex hormone homeostasis, some caution is called for in men with elevated PSA levels (prostate-specific antigen) and in women with hormone-sensitive breast cancer. Little is known about the safety of the use of maca during pregnancy and when breastfeeding.

A small clinical study has revealed that administration of 0.6 grams of maca for 90 days leads to a small increase in diastolic pressure. It is possibly better for patients who suffer from high blood pressure to avoid high doses of maca.

**SIDE EFFECTS**

No particular adverse effects are known in relation to maca. In the Andean Mountains, approximately 50-100 grams of maca tuber are consumed each day with no adverse effects.

**INTERACTIONS**

Like all plants in the Brassicaceae family, maca contains a relatively large amount of vitamin K. For that reason, patients who use blood thinners (anticoagulants, such as Warfarin) should exercise caution when using maca, because a high intake of vitamin K can counteract the effect of blood thinners.

Maca possibly counteracts the libido-lowering effect in a group of antidepressants that are known as the selective serotonin reuptake inhibitors (SSRIs). These agents are used to treat depression. The intake of 3 grams of maca a day had a libido-increasing effect in both men and women who had previously taken SSRIs such as escitalopram, citalopram, fluoxetine or paroxetine.

**DOSAGE**

The recommended dose in healthy adults is 1,500 to 3,000 mg of pulverised maca tuber each day. As an extract, a (much) lower dose (a few hundred milligrams) will suffice, depending on the extract's level of concentration. For a stable therapeutic effect, it is advisable to opt for a standardised extract, preferably standardised on beta sitosterol or other sterols.

**REFERENCES**


42. The International Association for Contract and Commercial Management. Evaluation of a new class 1 substance: Lepidium meyenii walpers; 2006. Available at: http://www.fitociacom/Biblioteca/Plantas/Maca/Articulos/2006-10pdf [accessed at 28.06.11].
54. (White Paper – Menopause and Maca-GO®)