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Review Article

**MEDICINAL BENEFITS AND SIDE EFFECTS OF PERUVIAN
MACA (*Lepidium Meyenii*): A REVIEW**¹Raju K. Dhavale*, ²Ruchita R. Patil, ³Tushar M. Dalavi, and ⁴Suyash S. Patil¹PG Student, Loknete Shri Dadapatil Pharate College of Pharmacy Mandavgan Pharata. Tal-Shirur, Dist-Pune- 412211^{2,3}PG Student, Institute Of Clinical Research India. Central Road No. 22, C-9, MIDC Industrial Area, Marol, Andheri East, Mumbai, Maharashtra 400093⁴PG Student, Indira College of Pharmacy, Tathawade, Pune, Maharashtra 411033**Abstract:**

Lepidium Meyenii (Maca) is a Peruvian plant of the Brassicaceae family cultivated for more 2000 years, which grows exclusively in the central Andes between 4000 and 4500 m altitude. Maca has been used for nutrition and to enhance fertility in humans and animals. It's used as a food supplement and for its presumed medicinal properties. Maca root has different colors that are responsible for positively influencing its pharmacological and biological action. The possible effects on the treatment of a wide range of diseases and medicinal conditions. The regulation of sexual dysfunctions like sexual problems related to sexual desire in male and female, male erectile dysfunction (ED) and increasing the sperm count, Mobility and improving sexual function in humans. A methanolic extract of Peruvian maca, re-extracted with n-pentane, was used to observe its effect in neuroprotective cells. Maca has a improved special learning and memory deficits and passive avoidance learning and memory deficits. It is a reduced glucose levels and lower level of lipid oxidation and increase in Insulin values and an increase in the glutathion content. Prevention and improvement of the dermatological dysfunctions, improvement the fertility, volume of ejaculation, sperm concentration and total sperms count. Maca root has a improvement of enzymatic activity, anti-oxidant capacity and it may increase libido in men and women. Another really excellent benefits of maca are hormone balance, it's known to strengthen and support our endocrine system. Maca does is it actually stimulates hypothalamus and pituitary gland and its hormones. Maca has a side effect are uncommon and mild and mostly include Gastrointestinal and Thyroid problems. If you are pregnant or breastfeeding you should consult with your healthcare team before taking maca.

Corresponding author:**Raju K. Dhavale***

PG Student,

Loknete Shri Dadapatil Pharate College of Pharmacy

Mandavgan Pharata. Tal- Shirur, Dist-Pune- 412211

QR code



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INTRODUCTION:

Lepidium meyenii welpers (Maca) is a Peruvian plant growing over 4000m with high potential for bioprospecting [1]. Maca has been used for centuries in the Andes for nutrition and to enhance fertility in humans and animals [1,2]. The demand for food particularly with benefits for health is high, but it will increase over the future years. Then, the search of plants with these potentials is of interest. This plant belongs to the brassica (mustard) family and *Lepidium* genus [3]. *Lepidium* constitutes one of the largest genera in the *Brassicaceae* family. Maca is used as a food supplement and for its presumed medicinal properties [4]. The interest and demand for maca have grown Worldwide through an aggressive marketing promotion of the plant. This interest has established maca as one of the flagship products of Peru, being sold as powder, pills, capsules, flour, liquor, and extract and is available from a variety of retail outlets such as health food stores and smoothie shops. Native to Andean region, Peruvian maca is rich in fiber and nutrients, including Vitamin-C, Copper and Iron. Besides these essential nutrients, this root contains bioactive compounds responsible for providing benefits to the people who look for a healthy diet [5-9]. Maca root has different colors that are responsible for positively influencing its pharmacological and biological action. It is known as the most effective type for women because of its hormonal balance effects and its acting on bone health. Studies have shown that it is the most effective form for men, especially for muscle gain, endurance, mental focus, and Libido [10]. Little is known about the safety and risk of short-term or long-term use of maca. Since it is a natural food, it is generally believed to be safe in large doses.



Fig 1: Peruvian Maca (*Lepidium Meyenii/ Peruvianum*) [11]

KEYWORDS

Medicinal benefits: Sexual dysfunctions, Neuroprotective effects, Memory enhancement, Diabetes, Dermatological dysfunctions, Fertility, Insecticide, Antioxidants, Libido, Hormone Balance and Possible Side effects of Peruvian Maca.

Peruvian Maca medicinal benefits

Many root based (Hypocotyl) food supplements of different colors of powdered maca are available on the world market due to the possible effects on the treatment of a wide range of diseases and medicinal conditions. Regulation of sexual dysfunctions, Neuroprotective effects, Memory enhancement, Antidepressants, Antioxidants, Anticancer and Anti-inflammatory effects and skin protection are most common effects of Maca. The root also presents a large number of essential amino acids, Fatty acids, and mineral content in particular iron, Calcium and Copper [12].

Sexual dysfunctions regulation

Sexual problems (or Sexual dysfunctions) are widespread and adversely affect mood, well-being, and interpersonal relationship. They occur in 20%-30% of men and 40%-45% of women according to 18 descriptive epidemiological studies from around the world. Most sexual problems relate to sexual desire (interest in sex) in both male and female and male erectile dysfunction (ED) [13]. Maca has been used for centuries in the Andes to enhance fertility in humans and animals [14]. Preparations from the maca root have been reported to improve sexual function in a healthy population [15]. Maca is a plant extract and not a drug, several in vivo studies have shown that maca may improve sexual behavior and enhance androgen. Recent clinical trials have also suggested significant effects of maca for increasing sperm count, mobility and improving sexual function in humans [16].

Neuroprotective effects

Improvement of cognitive function in stroke patients and age-related animals and humans, reduction in oxidative stress, Anti-inflammatory action, regulation of transcription factors and protein inhibition [17,18]. A methanolic extract of Peruvian maca, re-extracted with n-pentane (98%), was used to observe its effect in neuroprotective cells [19].

Memory enhancement

Improved spatial learning and memory deficits and passive avoidance learning and memory deficits [12]. The black maca improves memory impairment

induced by scopolamine, a muscarinic cholinergic receptor antagonist. Maca is used for its capacity to improve memory, antioxidant activity, the greatest effect on cognitive function and acetylcholinesterase (Ache) inhibitory activity. Moreover, other studies showed that the deleterious effect of overiectomy on memory could be related to cholinergic and monoaminergic dysfunction in brain [20,21].

Peruvian maca and Diabetes

Reduction in glucose levels and lower levels of lipid oxydation inhibiting the oxydative damage in the liver, a significant increase in insulin values and an increase in the glutathion content [12,22].

Dermatological effects

Prevention and improvement of the damage to skin caused by UV radiation and acceleration of wound healing at high altitudes [12,23].

Fertility

Improvement in sexual desire, volume of ejaculation, sperm concentration and total sperm count [12].

Insecticide

Possible insecticide effect for dengue mosquito control [24].

Anti - Fatigue

Improvement of the enzymatic activity of glutathion peroxidase and creatine kinase and helping in delaying the onset of symptoms of fatigue. Increasing the antioxidant capacity and accelerating the

conversion of energy in ATP. Decreasing the level of nitrogen urea. Increasing the level of glycogen (dose - dependent effects) [12,25,26].

Antioxidant

Intermediate antioxidant effect, where in antioxidant activity depends on the extract concentration and microenvironment in which the compound is located. Antioxidant activity capable of inhibiting the formation of oxydation products [27,28].

It may increase Libido in Men and Women

Reduce sexual desire is a common problem among adults. Consequently, interest in herbs and plants that naturally boost libido is high. The maca has been heavily marketed as being effective at improving sexual desire, and this claim is backed by research [29].

Hormone Balance

Another really excellent benefits of maca and what its kind of known for is it's role in hormone balance it's known to strengthen and support of endocrine system, so thyroid gland as well as a whole bunch of other hormone related conditions like premenstrual syndrome (PMS), what maca does it is actually stimulates of hypothalamus and pituitary glands and when those glands are in balance it can help to balance of other glands in the body, Adrenal glands, thyroid glands, pancreas even overian and testicular glands can all kind of be brought into a bit more balance when take a maca [30,31].

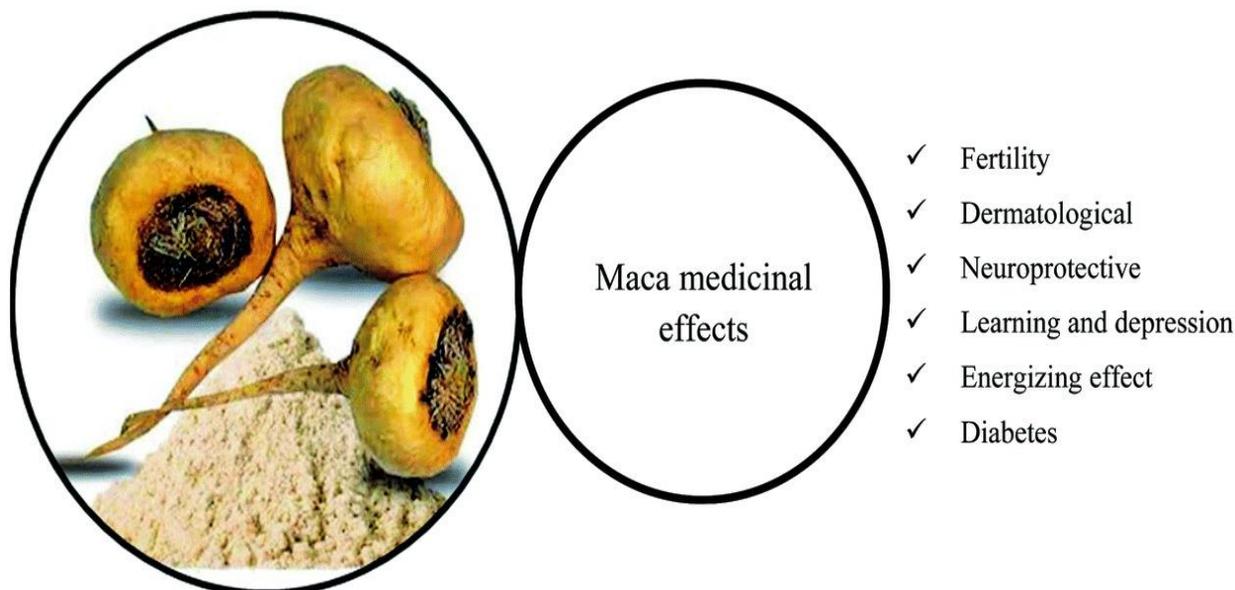


Fig 2: Medicinal effects of Peruvian Maca[12]

Safety and Side effects of Peruvian Maca

Maca is generally considered safe. However, Peruvian natives believe that consuming fresh maca root may have adverse health effects and recommend boiling it first.

Side effects of maca are uncommon and mild, and mostly include gastrointestinal symptoms and headaches [32]. Additionally, if you have thyroid problems, you may want to be careful with maca. That's because it contains goitrogens, substances that may interfere with the normal function of the thyroid gland. This compound are more likely to affect you if you already have impaired thyroid function.

Lastly, if you're pregnant or breastfeeding, you should consult with your healthcare team before taking Maca [33].

CONCLUSION:

The Peruvian maca is highlighted in the literature in the treatment of several diseases, syndromes and dysfunctions. However, There's a lack of studies in humans and application of maca in food products to evaluate its potential pharmacological functions. The different benefits of maca are regulation of sexual dysfunction, hormone balance, memory enhancement, neuroprotective effects, diabetes, it may increase Libido, fertility and dermatological effects. These are Major side effects of maca are thyroid problems and gastrointestinal symptoms. Whether you need to boost your libido, strengthen your bones, or even try for a baby, maca is your root.

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