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Functional Aspects of *Lepidium meyenii* (Maca) Diet Integration

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Abstract

Lepidium meyenii (Maca) is an edible root plant, belonging to the Brassicaceae family, found in the Andean regions of Peru. It is sold as a nutritional supplement and is gaining as a botanical extract for, among other things, its enhancement of energy and sexual performance. A recent experimentation has shown that Maca supplementation in food is able to improve sperm count and motility in bulls and because of its nutraceutical qualities, our research group has been experimenting for some years the effects of Maca on stallion reproduction.

Research carried out so far has shown that dietary supplementation with Maca improved sperm concentration and total sperm count. The beneficial effects of Maca supplementation on motility and acrosome integrity in the raw semen were detected from the end of treatment with Maca until the end of the study. Therefore, the dietary supplementation with Maca increased sperm production and stabilized semen quality during chilled storage.

Keywords: Lepidium meyenii (Maca); Reproduction; Dietary supplementation

Lepidium meyenii Walpers

Lepidium meyenii (Walpers) (Maca) is a perennial plant belonging to the Brassicaceae family, which includes many edible species, including Brusselss prouts, watercress, radish, and turnip [1]. It grows spontaneously in Peru, at 3000-4000 m above sea level, with standing the extreme climatic conditions of the Andean regions, where it has been cultivated since 1600 BC.

The part used is the tuberous root that, for its high nutritional value, has always played a fundamental role in the nutrition of the indigenous populations and their animals, still constituting a fundamental component of the diet of the Peruvian populations.

It is used by the Andean populations since the time of the Incas and with the arrival of the Spanish conquerors, Maca was also known in Europe, where it was appreciated above all for its beneficial effects on fertility. Maca was initially used as a food for its excellent nutritional qualities, in fact it is a complete food, which when dried can maintain its nutritional characteristics unaltered for years.

Lepidium meyenii contains many nutrients including carbohydrates (60%-75%), protein (10%-14%), fiber (8.5%), and lipids (2.2%) [2,3]. The dried root contains protein (13%-16%) and is rich in essential amino acids, while the fresh root is high in iodine and iron. It contains calcium (250 mg), potassium (2 g), and iron (15 mg) in 100 g of dried root, and sterols (0.05%-0.1%), minerals, and vitamins. Maca contains fatty acids (3.72%), including caprylic acid, capric acid, lauric acid, myristic acid, palmitic acid, palmitoleic acid, stearic acid, oleic acid, linoleic acid, and linolenic acid [4]. It has been shown that the Yellow Maca has higher lipid and carbohydrate content compared to the red and black varieties [3].

The secondary metabolites of Maca, including alkaloids, glucosinolates, macamides, and sterols, are just some of the marker constituents that may provide desirable nutritional, biological, and therapeutic (such as fertility-enhancing, aphrodisiac, and chemopreventive) leads.

Among the biologically active components of Maca, there are glucosinolates, containing sulphured glycosides; it is rich in benzyl glucosinolates, glucotropoline and m-methoxybenzyl-glucosinolate. The latter can be considered chemotaxonomic markers for this species, since their combination is not found in other plants of the Brassicaceae family [5].

Recent experimentation has shown that Maca supplementation in food is able to improve sperm count and motility in bulls [6], and on stallionsperm production and on preservation of sperm quality during storage at 5°C [7].

Del Prete et al. [7] for the first time had shown that supplementation with Maca in the diet of stallions improves semen production, resulting in more artificial insemination (AI) doses per ejaculate. Furthermore, the semen from Maca-treated stallions was more resistant to cooling and storage, preserving acrosome and DNA integrity and total and progressive sperm motility decrease.

The study performed on Maca by our research group demonstrated for the first time that diet supplementation with Yellow Maca powder increases semen quantity and quality of stallions. The mechanisms that promote the effect of *Lepidium meyenii* (Maca) on stallion semen remain unclear. Further research is required for elucidate the mechanisms of *Lepidium meyenii* effects on semen production and to explore the potential effect of Maca on the systemic antioxidant capacity in horses.

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Received: March 27, 2018; Accepted: April 25, 2018; Published April 30, 2018

Citation: Tafuri S, Cocchia N, Carotenuto D, Esposito L, Ciani F (2018) Functional Aspects of *Lepidium meyenii* (Maca) Diet Integration. Biochem Pharmacol (Los Angel) 7: 247. doi: 10.4172/2167-0501.1000247

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