

REVIEW ARTICLE

Maca: New Insights on an Ancient Plant

Tori Hudson, ND

Abstract

The maca species *Lepidium meyenii* grows all over several South American countries, but, to date, only maca from Peru has been significantly researched and shown to have therapeutic benefit. This has resulted in many botanists referring to maca that grows in Peru as *Lepidium peruvianum* in order to specify the exact origin. Some botanists, in fact, believe *L. peruvianum* to be a different species than *L. meyenii*. While there will continue to be dissension on maca's correct botanical nomenclature, the most important point to clarify is that the origin of the maca referred to in this article is Peru and, due to this fact, will be referred to as *L. peruvianum*.

Maca's high nutritional value makes it a Peruvian dietary staple. Traditionally, the herb is best known as an adaptogenic plant, ie, a plant that modulates the body's response by supporting it in dealing with physiological, biochemical, and

psychological stressors. Traditional healing methods include using the herb to benefit the endocrine and reproductive systems by addressing such disorders as chronic fatigue, anemia, and infertility and to aid in enhanced stamina and hormonal balance. Maca research shows benefit in the production of sex hormones, enhanced sex drive, stimulation of body metabolism, control of body weight, and increased energy, stress reduction, antidepressant activity, and memory improvement.

It has been suggested that maca's therapeutic actions rely on plant sterols stimulating the hypothalamus, pituitary, adrenal, and ovarian glands and, therefore, also affecting the thyroid and pineal glands and, thus, improving sleep, mood, fertility, energy, and hot flashes. As such, this herb has been found clinically useful in perimenopausal and menopausal women.

As a clinician specializing in women's health for almost 25 years, I'm always eager to be introduced to new botanicals for the tough health issues I encounter in my practice. I also like to discover new clinical indications for botanicals I've been using for years and to seek out new research in women's health. I feel responsible—and also fortunate—to share this kind of new information with patients, consumers, and fellow health-care practitioners.

Such is the case with the Peruvian herb maca (*Lepidium peruvianum*). I've been prescribing maca off and on for more than 15 years. In the past 2 years, I have prescribed a select maca extract with very satisfying results for common perimenopause and menopause issues such as hot flashes, insomnia, and mood swings, as well as for common symptoms of premenstrual syndrome (PMS) such as mood swings, irritability, and depression. I have also been pleasantly surprised about the successful outcomes in cases of secondary amenorrhea. Now, thanks to the people of Peru and some committed researchers, we have significant new scientific information to back up the reasons why this herb is effective.

Overview

The maca species *Lepidium meyenii* grows all over several South American countries, but the species *Lepidium peruvianum* grows only in Peru. Historically, maca has played an important role in the diet and lives of the Peruvian people, where its cultivation goes back perhaps 2 millennia. The plant's nutritional value helps explain the use of maca as a dietary staple. *L. peruvianum* has been found to be rich in minerals, containing high concentrations of calcium, magnesium, iron, sodium, silica, manganese, copper,

zinc, vanadium, and others.¹ It also contains thiamine, riboflavin, ascorbic acid, proteins, carbohydrates, lignans, glucosinolates, phytosterols, and alkaloids.¹ The alkaloids in its root are believed largely responsible for the plant's traditional healing use, benefiting the endocrine and reproductive systems by addressing such disorders as chronic fatigue, anemia, and infertility and aiding in enhanced stamina and "female hormone balance."¹

In addition to the unique mineral content of the central Andes of Peru that leads to *L. peruvianum*'s nutritional content, it appears that the elevation, temperatures, precipitation, and winds of the region make for a special climate and environment that is important in the germination and maturation of this plant because, as I understand it, several growers who have tried to cultivate this species elsewhere in the world have been unsuccessful.

History of Maca Research

The Peruvian scientist Gloria Chacón, PhD, is largely responsible for current scientific knowledge of the maca plant. Her dissertation on maca root from the early 1960s laid the groundwork for eventual identification of 13 different *L. peruvianum* phenotypes (based on observable physical or biochemical characteristics of a plant as determined by both genetic makeup and environmental influences) as well as identification of the regions in Peru where these phenotypes grow. According to some researchers, different phenotypes of maca exhibit different physiological effects.^{2,3} The demarcation among phenotypes depends on the source and degree of specific distinction in shades and combinations of commonly observed colors. *L. peruvianum* alone has 13 different phenotypes, as it comes in 13 different colors, some of them containing unique DNA profiles and distribution patterns of active constituents.

In her dissertation, Dr Chacón also recorded chemical analyses of maca's constituents (the nutritional list mentioned above) and established criteria allowing identification of the medicinal *Lepidium* species, *L. peruvianum*—which brings us to an interesting conundrum. The species *L. meyenii* was described by botanist Gerhard Walpers in 1843. However, it has been suggested, specifically by Dr Chacón, that the cultivated maca of Peru is a unique species in of itself, *L. peruvianum*. This has been verified by numerous herbalists around the world and is based on various specimens collected since 1960 in the district of San Juan de la Jarpa in the Huancayo province of Peru.⁴ Thus, the species name now accepted by many (but not all) for medicinal maca from Peru is *Lepidium peruvianum*, a classification used by major herbariums in the United States and Europe. It is important to point out, however, that the US Botanical Council has not yet accepted this name and continues to use *L. meyenii*, which has caused some confusion as well as controversy among herbalists.

Hence, maca plants called *Lepidium meyenii* may or may not be the maca from Peru—and therefore may not contain the researched medicinal constituents of *L. peruvianum*. Thus, in commerce around the world, *L. meyenii* may be the “wrong maca” or, more likely, maca named with a nonspecific synonym. While this can be confusing, it is critical for a practitioner to investigate the source of the maca used as from Peru and/or ensure it is identified and labeled as *L. peruvianum*.

For purposes of this article, from this point forward I will use the commonly accepted name maca to refer to *L. peruvianum*.

Health Benefits of Maca

Traditionally, maca is best known as an adaptogenic plant, ie, a plant that modulates the body's response by supporting it in dealing with physiological, biochemical, and psychological stressors. Adaptogens are among the most useful medicinal herbs, helping individuals to better cope with fatigue, anxiety, stress, depression, and sleep problems.⁵ Other common adaptogenic plants include American ginseng (*Panax quinquefolius*), Asian (or Siberian) ginseng (*Eleutherococcus senticosus*), Ashwagandha (*Withania somnifera*), licorice (*Glycyrrhiza glabra*), and more. Traditional botanical materia medica texts are rich in historical uses for adaptogens; each plant is reported to have specific effects, though not all are backed by scientific research to confirm historical observations.

Maca's adaptogenic properties represent an alternative approach to managing symptoms of menopause. Researchers theorize that maca stimulates hormonal reserves by strengthening the body's ability to regain and maintain hormonal homeostasis in the face of stressors.⁶ However, while other adaptogens have been used by herbal and alternative practitioners for years, the extent of maca's effects on the range of menopausal symptoms has not been documented in studies of these other adaptogenic herbs. To my knowledge, *Panax ginseng* is the only other adaptogen that has been subjected to research in menopause.^{7,8} Thus, maca may be unique in its adaptogenic menopausal effects. Of particular importance to menopausal women is research done on sex hormones, sex drive, body metabolism, body weight, energy, stress, depression, and memory.^{2,9-11}

Scientific Classification of *Lepidium*

Lepidium, commonly known as peppergrass or pepperwort, is a genus of plants in the mustard family *Brassicaceae*. It includes about 175 species found worldwide.

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Brassicales

Family: Brassicaceae

Genus: *Lepidium*

Species: About 175 worldwide, with about 14 in South America, including *L. peruvianum* Chacón

Positive estrogenic effects have been documented. Research on perimenopausal and menopausal women performed by Meissner, et al, using a proprietary maca product (Maca-GO) found that, unlike hormone replacement therapy (HRT) and phytoestrogenic botanicals, maca can increase the body's production of estrogen—versus simply adding estrogen replacement to the body—and lower levels of cortisol and adrenocorticotrophic hormone.⁶ What makes this especially interesting is that, from other research conducted on the composition of various powdered preparations of maca root, it appears that the herb does not contain plant estrogen or hormones.¹²⁻¹⁵ It has been suggested that maca's therapeutic actions rely on plant sterols stimulating the hypothalamus, pituitary, adrenal, and ovarian glands, and, therefore, also affecting the thyroid and pineal glands¹⁶ and, thus, improving sleep, mood, fertility, energy, and hot flashes. As such, maca tends to treat menopausal symptoms as a whole; it doesn't treat any 1 specific symptom of menopause (such as hot flashes) alone.⁶

In Meissner's double-blind, randomized, 4-month study of early postmenopausal women, patients were given either placebo or two 500 mg capsules of Maca-GO twice daily for a total of 2g/day. Menopausal symptoms were assessed according to Greene's Score and Kupperman's Index. After 2 months, this particular maca product stimulated estradiol production and suppressed follicle stimulating hormone, T3, adrenocorticotrophic hormones, and cortisol. It also had a small effect on increasing bone density and alleviated numerous menopausal symptoms including hot flashes, insomnia, depression, nervousness, and diminished concentration.⁶

Most research prior to and after the Meissner research demonstrated reductions in menopausal symptoms, but either they had not examined or not seen effects on hormones, lipids, and bone density.

Clinical Evidence

In my practice, some of the most common symptoms of menopause I observe in my patients are hot flashes, moods swings, and low energy. In my own experience, prescribing Maca-GO at 1 g/twice daily for perimenopausal and postmenopausal patients, I usually observe an onset of benefit

within 2 to 3 weeks, although other cases require treatment for up to 2 to 3 months. The time frame often relates directly to the patient's overall health and prior prescription history. The benefits I have seen most frequently in my patients are a remarkable reduction in the number of hot flashes, an overall improvement in mood (less depression and irritability), and increased energy levels.

In 1 of my recent cases, I prescribed Maca-GO for a 48-year-old perimenopausal woman at a dosage of 1 g/twice daily. After a 6 week follow-up, we saw a 50% reduction in both hot flashes and her moderate depression/anxiety, a 75% improvement in her energy, and a 20% increase in her serum estradiol levels. It seems possible that, as previously mentioned, the bioactive compounds and nutrients in the maca helped to stimulate hormonal reserves just enough to correct or balance hormone levels, possibly by enhancing the body's own response to stressors.

Other Considerations

In light of ongoing discussions about the benefits and risks of long-term HRT and available alternatives to managing symptoms of menopause, it is in the best interests of our patients to explore the safest possible approaches to symptom relief and protection from menopause-associated risks such as osteoporosis and cardiovascular complications. Much research is still needed, especially to clarify the role of exogenous estradiol (such as via prescription) versus endogenous estradiol (produced by the body) in general and, specifically, in patients in whom exogenous estrogen is questionable or even contraindicated.

How estrogen replacement differs from using a nonhormonal substance to increase a woman's own estrogen levels remains a point for discussion and further research. Increasing estrogen levels in post-menopausal women clearly does provide benefits in common issues such as managing hot flashes and slowing bone loss.¹⁷ However, the means by which this is done deserves exploration. In a climate of confusion, contradiction, and inconsistency about the benefits and risks associated with HRT, it behooves us to seek the lowest dose and the most gentle, least invasive approach to achieve the identified goals—whether these be relief of symptoms, prevention of bone loss, or protection of cardiovascular health. The advent of maca research helps us to rethink the optimal strategy for menopause, especially as we try to minimize unnecessary long-term exposure to exogenous estrogens.

Conclusion

By improving the body's own hormone production and thereby reducing menopausal symptoms, it appears maca improves foundational health and may also prove to have beneficial effects on heart and bone health. There may be other adaptogenic herbs as well that, after adequate research, could demonstrate additional benefits in preventing heart disease and osteoporosis. That said, maca research must not only progress in several directions but undergo longer-term clinical studies to account for differences among species, variations within species, modes of action, and neurological and physiological pathways.

Current Supply Issues

A number of issues have clouded the commercial use of maca. Some of the product previously and currently available in the United States may contain less than a therapeutically useful dose. We don't know the lowest therapeutic dose, but we do know now that 1 g/twice daily of a standardized, concentrated, preparation is therapeutic. Additionally, as explained in the main article, the product available in the United States may not contain the appropriate combination of phenotypes to elicit the desired gender-, age-, and symptom-related physiological responses, or the product may simply contain the wrong plant.

This last has led some in the herbal community to raise the issue of biopiracy. According to the Action Group on Erosion, Technology, and Concentration, "Biopiracy refers to the appropriation of the knowledge and genetic resources of farming and indigenous communities by individuals or institutions who seek exclusive monopoly control (patents or intellectual property) over these resources and knowledge."¹⁸

My response to this potential threat has been to check into the ethics of the companies selling and manufacturing maca products. In particular, I recommend that a practitioner

- look for American companies with products originating in Peru that are in cooperation with Peruvian scientists, healthcare practitioners, researchers, academicians, and manufacturers;
- look for American companies that work with conscientious farmers—buying only from companies that assure the Peruvian farmers make their livelihood in a respectful and ethical manner, thus considering the sustainability of farming methods to safeguard their future ability to produce maca raw materials and products and participating in responsible and generous ways with other people and villages of Peru;
- look for sources of maca that are from USDA organically certified fields and manufacturing facilities as well as harvested and dried using traditional methods; and
- cautiously scrutinize any statements made by a company accusing another of biopiracy, knowing that there may be a conflict of interest in those accusations.

Tori Hudson, ND, an *IMCJ* associate editor, is a 1984 graduate of the National College of Naturopathic Medicine (NCNM) in Portland, Oregon, and has served the college in several capacities, including medical director, academic dean, and associate academic dean. She is currently an NCNM professor and is also a clinical professor for Southwest College of Naturopathic Medicine in Scottsdale, Arizona, and for Bastyr University in Kenmore, Washington. Dr Hudson has been in practice for 24 years; is the medical director of her clinic, *A Woman's Time*, in Portland; and is director of product research and education for the supplement company *Vitanica*. Dr Hudson was awarded the 1990 President's Award from the American Association of Naturopathic Physicians (AANP) for her research in women's health as well as the prestigious 1999 AANP Naturopathic Physician of the Year Award and the 2003 NCNM Alumni Pioneer Award. She is author of the *Women's Encyclopedia of Natural Medicine*

(Keats Publishing, 1999; 2nd, McGraw Hill, 2008). Dr Hudson serves on several editorial boards and advisory panels and is a consultant to the natural products industry.

References

1. Chacon Gloria. *Maca (Lepidium peruvianum Chacon)*. 1st ed. Lima, Peru: Grafica Mundo; 2001.
2. Gonzales GF, Vasquez V, Rodriguez D, et al. Effect of two different extracts of red maca in male rats with testosterone-induced prostatic hyperplasia. *Asian J Androl*. 2007;9(2):245-251.
3. Gasco M, Aguilar J, Gonzales GF. Effect of chronic treatment with three varieties of *Lepidium meyenii* (Maca) on reproductive parameters and DNA quantification in adult male rats. *Andrologia*. 2007;39(4):151-158.
4. Taylor L. *Maca (Lepidium meyenii). The Healing Power of Rainforest Herbs*. Garden City Park, NY: Square One Publisher; 2005. Available at: <http://www.rain-tree.com/mac.htm>. Accessed November 4, 2008.
5. Winston D, Maimes S. *Adaptogens: Herbs for Strength, Stamina, and Stress Relief*. Rochester, VT: Inner Traditions; 2007.
6. Meissner HO, Mscisz A, Reich-Bilinska R, et al. Hormone-balancing effect of pre-gelatinized organic maca (*Lepidium peruvianum Chacon*): (III) Clinical response of early-postmenopausal women to Maca in a double blind, randomized, placebo-controlled, crossover configuration, outpatient study. *Int J Biomedical Sci*. 2006;2(4):375-394.
7. Wiklund IK, Mattsson LA, Lindgren R, Limoni C. Effects of a standardized ginseng on the quality of life and physiological parameters in symptomatic postmenopausal women: a double-blind, placebo-controlled trial. *Int J Clin Pharmacol Res*. 1999;19(3):89-99.
8. Tode T, Kikuchi Y, Hirata J, Kita T, Nakata H, Nagata I. Effect of Korean red ginseng on psychological functions in patients with severe climacteric syndromes. *Int J Gynaecol Obstet*. 1999;67(3):169-174.
9. Rea J. Raices Andinas: Maca. In: Hernandez Bermejo JE, Leon J, eds. *Cultivos Marginados, Otra Perspectiva de 1492*. Rome: FAO;1992:163-166.
10. Prior JC. Perimenopause: the complex endocrinology of the menopausal transition. *Endocr Rev*. 1998;19(4):397-428.
11. Repo-Caraseo R. ASpectos quimicos, nutricionales y tecnologicos de la Maca. Curso Taller Internacional Sobre Maca: cultivo, aprovechamiento y conservacion. Lima, Peru; 1999.
12. Dini A, Migliuolo G, Rastrelli L, Saturnino P, Schettino O. Chemical composition of *Lepidium meyenii*. *Food Chem*. 1994;49(4):347-349.
13. Fahey JW, Zalcmann AT, Talalay P. The chemical diversity and distribution of glucosinolates and isothiocyanates among plants. *Phytochemistry*. 2001;56(1):5-51.
14. Ganzera M, Zhao J, Muhammad I, Khan IA. Chemical profiling and standardization of *Lepidium meyenii* (Maca) by reversed phase high performance liquid chromatography. *Chem Pharm Bull (Tokyo)*. 2002;50(7):988-991.
15. Genyi L, Ammermann U, Quiros C. Glucosinolate contents in *Maca (Lepidium peruvianum Chacon)* seeds, sprouts, mature plants and several derived commercial products. *Econ Botany*. 2001;55(2):255-262.
16. Walker M. Effect of Peruvian Maca on hormonal functions. *Townsend Lett*. 1998 Nov:18-22.
17. Rossouw JE, Anderson GL, Prentice RL, et al; Writing Group for the Women's Health Initiative Investigators. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the Women's Health Initiative randomized controlled trial. *JAMA*. 2002;288(3):321-333.
18. Action Group on Erosion, Technology and Concentration. Biopiracy [definition]. *ETC Group*. Available at: www.etcgroup.org/en/issues/biopiracy.html. Accessed November 4, 2008.