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Maca and its beneficial health on male students

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Abstract: Maca also named Peruvian ginseng is a plant found in the mountains of Peru. It is believed to provide health benefits. The object of the study is to explore some of the beneficial effects of Maca on male students. The study included forty male students from Port Said University. They were divided to two equal groups. The control received placebo for 2 months. The experimental group ingested Maca (2000) mg daily for two months. 5ml venous blood withdrawn from all participants pre-post experiment for blood analysis of lactate, stem cell, testosterone, T. protein, nitrite, Rbcs, Hb, Wbs, cortisol hormone, pulse and respiratory rate. Results revealed that Maca induce positive results in relation to the tested parameters compared to the control group.
Conclusion: Maca may act as aphrodisiac, decreased stress increased stem cells to renew cells and tissues and stimulate blood cells and oxygenate muscles.
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Key words: Maca, health benefit, natural herbs, aphrodisiac, male students, hormones

1. Introduction:

Lepidium meyenii (Maca) or Peruvian ginseng is a plant found in South America in the mountains of Peru. It was found in 1980 **(Herman and Bernet, 2009)** they added Maca may be cooked as a vegetable. Or, may be used as flour for baking or even be used as a dietary supplement or traditional medicine. The seeds are the only means of reproduction, through self-pollination. Maca is known as short day plant.

Leon (1964) stated that Antonio de Espinosa gave a description of the plant 1598 and Bernabe Colo also made the same thing at 17th century and Gerhard Walpers in 1843.

El Naggar (1998) in his report back to nature, stated that there are western therapies and alternative therapies such as physical therapies include herbal medicine, psychological therapies include hypnotherapies, sensory therapies include art and music therapies and oriental therapies include acupuncture. **El Gogary (1998)** added that ancient Egyptians used acupuncture as a therapy from more than 2000 years ago. Chinese used this kind of therapy from more than 3000 years. In a study, acupuncture therapy for 2 months in obese women was associated with significant reduction in ghrelin and leptin hormones while adiponectin was significantly increased. **Hefnawi (1998)** added that natural herbs possess many medicinal uses, in drug manufacture and are important elements in medicinal remedies or the active principles in drug manufacture and may be used as a nidus of the chemical structure of important drug such as cortisol and other hormones and plasma substitute. He also stated that natural herbs are a wonderful world with many imaginations that scientists tried to explore. **Murray *et al.* (2009)** and **Florini *et al.* (1996)** demonstrated that in addition to Vitamins and minerals herbs is definition of using any part of plant which can be used as medical treatment or nutrient. Herbs may be used to enhance physical or mental performance due to their nutritional value to sportmen or in case of aging, also to stimulate energy levels or the immune system and other important systems: endocrine, muscle and nervous system, herbs may contains anti-oxidants and can affect growth and can be used as ergogenic agents.

Supplements may be used for specific goals such as to lose weight by caffeine, to get stronger using (IGF) found in colostrum, to build muscle mass by BCAA, for anaerobic energy using energy drinks and baking soda, and for aerobic energy herbal for musele, for recovery of exercise T. Glutamine, in case to reduce pain by aspirin, for rapid arousal using phosphateidylserine, and for general health, Vitamins, mineral complex and ginseng **(ATSDR, 2021; Hatfield, 2013; Guyton and Hall, 2006)**.

2. Material and methods

Participants

Forty health male students from Port Said University were engaged to the study, they were divided to two equal groups, a control (n=20) and experimental group (n=20). The experimental group ingested daily (200 mg/capsule) of Maca lepidium meyenii (Peruvian ginseng) **(Gonzales et al, 2006)**.

Control group ingested placebo. All participants ingested Maca or placebo for two month.

Table (1): Characteristic features of the sample

Variables	Sample		Skewness
	M	SD	
AGE(Y)	21.3	2.6	0.82
Height (cm)	178.4	5.1	0.91
Weight(kg)	79.3	3.8	0.67
BMI(kg/m^2)	22.6	1.6	0.32

The table indicated homogeneity of the sample (skewness ±3).

All participants were free from different diseases; they did not take any drugs or medication that may affect stem cells numbers or functions. All participants sign written contest for participation to the study.

5ml venous blood was withdrawn from all participants' pre-post experiment for two months, and all students were refrained from caffeine and Vits, drugs for 48 hours, prior to blood testing.

Blood analysis:

- Rbcs, Hb and Wbcs were estimated using coulter counter.
- Lactate testing using accusport.
- CD34+ was determined using flow cytometer.
- Testosterone, cortisol hormones using Elisa Kits.
- Total protein using spectrophotometer.
- Nitrite detection using greiss Reagent.
- Height, weight recorded and BMI calculated for all subjects.

Muhamed *et el.* (2002) reported the constituents of Maca to be: the average composition of Maca is 60-75% carbohydrates (polysaccharides) 10-14% protein, 8.5% fiber and 2.2% fat, Maca contains glucotropaeolin, m-methoxy glucotropaeolin, benzyl glucosinolates, polyphenols, alkamides, carboline3, carboxylic acid, MTCA, methoxy benzyl isothiocyanate.

Statistical analysis:

T test was used to test the difference between control and experiment groups. Where data did not meet the assumption of normality non-parametric (u) test was used for comparison between the two groups. A α level of 0.05 was used to indicate statistical difference.

3. Results

Table (2) revealed that testosterone, stem cells and T. protein increased significantly post Maca ingestion, while cortisol decreased significantly, indicting positive effect ergogenic on muscle function and performance with elevated sexual performance with decreased stresses.

Table (3) revealed significant increased Rbcs, Hb, Wbcs with nitrite concentration post Maca ingestion which indicated beneficial effect for oxygen increase and immune action together with increase blood flow that increased oxygen and nutrient to the muscles.

Table (4) revealed decreased pulse and respiratory rate together with lactate concentration, indicating a higher physical performance and fitness.

Table (2): Some variables of male students of control and experimental group pre-post treatment.

Variables	Control		Experimental	
	Pre	Post	Pre	Post
	M±SD	M±SD	M±SD	M±SD
Testosterone mg/ml	3.2±0.6	3.4±0.7	3.5±0.5	6.7±0.9*
Cortisol mg/dl	6.6±0.3	6.3±0.4	6.8±0.5	4.2±0.7*
Stem cells ull/ml	334.0±9.3	341±10.2	344±7.2	573±8.1*
Total protein g/dl	77.2±1.3	78. ±41.6	81.1±1.8	98±2.1*

There are significant changes for the favor of the experimental group.

Table (3): Some blood content of male student of control and experimental group pre-post Maca treatment

Variables	Control		Experimental	
	Pre	Post	Pre	Post
	M±SD	M±SD	M±SD	M±SD
Rbcs (10^6/ul)	4.23±1.4	4.26±0.9	4.28±0.8	5.45±1.2*
HB (g/dl)	12.7±1.6	12.8±1.2	12.3±2.1	14.6±1.3*
Wbcs (10^3/ul)	6.8±0.7	6.9 0.6	6.7±0.5	8.4±0.4*
Nitrite (mu)	45.2±2.3	45.6±2.1	44.9±1.9	57.2±2.2*

There are significant changes for the favor of the experimental group.

Table (4): Physiological changes of control and experimental group, pre-post test

Variables	Control (G1)		Experimental	
	Pre	Post	Pre	Post
	M±SD	M±SD	M±SD	M±SD
Pulse Rate (count/min)	75.5±4.5	76.1±3.9	75.8±3.7	70.2±3.1*
Respiratory Rate (count/mi)	15.3±1.2	15.1±1.4	14.9±1.5	12.8±1.4*
Lactate (mmol/l)	1.7±0.5	1.61±0.4	1.64±0.8	1.1±0.3*

There are significant changes for the favor of the experimental group.

4. Discussion

Table (2) showed that the supplement treatment of Maca (Peruvian ginseng) induced significant increase in testosterone concentration compared to control group.

This increased testosterone levels may stimulate the skeletal muscle strength and mass which in turn induced a higher fitness and physical performance. **Fahey and Rolph (1971) and Ganong (2000)** demonstrated that testosterone hormone is bound to special receptors inside the cells, this relation is associated with the DNA of the nucleus leading to facilitating the expression of the genens and testosterone may be transformed to (DHT) dihydro testosterone affect genetalia growth together with skeletal muscle.

A significant decrease in cortisol concentration was observed post supplementation compared to control group. This decreased cortisol level may be due to decreased stress following supplementation which affect positively the experimental group **(Murray *et al.*, 2009)** demonstrated that cortisol which is a hormone of adrenal cortex is an essential component of adaptation to serve stress and that the lesser the concentration of cortisol the lesser stress affecting the body and its organs and systems, the decreased stress unable the body and brain to act properly which is beneficial effect. **Mougios (2006)** reported the main functions of cortisol to enhance gluconeogenesis, glycogen synthesis and protein synthesis in the liver and estimation of cortisol at rest may aid in estimation physical or mental stress. As for the main function of testosterone, to be responsible for the development of the male reproduction, sperm production and promote protein synthesis and curbs proteolysis in muscles, high concentration of testosterone within physiological limit may be desirable.

Moreover, **Hatfild (2013)** added that the cortisol hormone is a catabolic hormone, meaning it causes of breakdown of protein in muscle, while testosterone hormone is a powerful anabolic hormone, meaning it causes growth and synthesis of protein in muscle and the increased cortisol testosterone hormone may induce a positive effect in regard of muscle building and skeletal muscle strength.

A significant increased stem cells was marked post treatment with Maca compared to control group (Table 2) this may be due to the beneficial effect of Maca in substituting blood cells, Rbcs and Wbcs as reported by **Meissner *et al.* (2015) and Abd Allah (2021**), who reported also that Maca can increase sperm count and stimulate brain cells such as education and memory, and increase muscle mass and sexual ability of men, increase stem cells was also noted after aerobic and anaerobic exercise **(Shalabi *et al.*, 2012 and Amani and Mohamed, 2011)**.

Data of total protein (Table 2) revealed a significant increased total protein post Maca treatment

for two months compared to the control group. This was also recorded by **Meissner *et al.* (2015)** who reported an increase muscle mass following Maca ingestion, Moreover, **Mckeever *et al.*, (1993)** reported an increased total protein due to hemo concentration due to inter compartment fluid shifts or due to a marathon run (Foram *et al*., 2003) due to the effect of dehydration or due to a mild reduction in plasma volume.

Table (3) finding showed a significant increased Rbcs and Hb values post Maca treatment compared to the control group which indicated an increased oxygen levels leading to higher energy production and higher fitness which lead to physical performance. Maca ingestion induces liberation of Rbcs and hence hemoglobin due to contractile action of spleen which act as reservoir for Rbcs. This result is in accordance with that of **Farouk (1998) and Hefnawi (1998)** that herbs and ginseng supplement stimulate CNS and increase energy production and oxygen in the different organ which help in muscle and mental performance.

Essam (1998) added that Vitamins, minerals chromium and aspartic acid may help performance through increase energy production and physical fitness enhancement. As for the leucocyte count the data (Table 3) revealed a significant increase in total leucocyte count in case of the experimental group compared to control one. This increased Wbcs count could be due to the release of lymphocytosis from the spleen, bone marrow and lymph nodes into the peripheral blood as stated by **Janicki *et al.* (2013)**. Also, some researchers reported an increased Wbcs count post exercise **(Abdo Saleh *et al.*, 2014)** or due to stress as reported by **Suchanek *et al.* (2010)** stated that leukocytes responses may be inducing activation of immunity influenced by hormones growth hormone, reproductive hormone or catecholamines. Nitrite determination revealed a significant increased concentration post Maca treatment of the experimental group which indicated an increased vasculogenesis and angiogenesis affecting the experimental group compared to the control group, who have not any changes in the nitrite determination.

This result indicated increased blood supply to the different organs and skeletal muscles as indicted by **Zemenza (2007) and Barret *et al.* (2010**) stated that nitrite is important mediator and its vasodilate activity is used as index of endothelial function, and increase oxygenation to the active muscles. Table (4) revealed a significant decreased pulse rate, respiratory rate, and lactate post Maca ingestion for 2 months compared to control. It is well known that a decreased heart rate, together with respiratory rate and lactate is indication of physically fit subject as the decreased heart rate is a sign of increased cardiac output and oxygen input to the exercise muscle and organs, the same goes for the decreased respiratory rate with deeper inspiration and inspiratory volume. As for the decreased lactate concentration at rest which is an indication of fit person and better performance, it indicate a lower consumption of oxygen for the same time or duration compared with the control group.

These results are in accordance with that of **Aubert *et al.* (2001)** that is due to elevate parasympathetic function, or due to adaptation of the sinus node of the heart **(Catai *et al.*, 2002)** all these explanation indicated lower heart work and lungs with high benefit and more rest of the vital organs of heart and lung **(Alena, 2022)**.

In summary

Maca refers to two herbs, Lepidium Peruvian and Lepidium meyeni, the plant have a reputation of being aphrodisiac indicating its sexual function for male and female, also it may help mood and get rid of depression and anxiety. It work through action on male hormone testosterone, estrogen and luteinizing hormone (LH) also is used for health benefits and health problem of menopause and may enhance performance, physical, mental and boost energy, reduce blood pressure. The standard dosage for Maca is between 1500-3000 mg/day, by eating root or its extract, should be taken daily for 8 to 12 weeks as recommended. Maca is not associated with health risks or side effect except people having thyroid problem or treatment with hormones or cancer.

Conclusion

It may be concluded that:-

- Maca may be acting as aphrodisiac due to increased testosterone, also may increase muscle strength and T. Protein and act as ergogenic agent.
- Cortisol decrease may indicate of decrease stress an important action of MAca.
- Increased stem cells may indicate its function in formation of blood cells and tissues of the body as a repair element.
- Nitrite may increase blood flow and increase oxygenation to the organs and active muscles.

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