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Health benefits of Stevia and physical performance of male college students

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Abstract: The aim of the study was to explore health benefits of Stevia and physical performance of male college students. 36 male were randomly chosen and were divided to two equal groups. Control and experimental. Control group received placebo for one month, while the experimental group received 4mg Stevia per kg/w daily for one month. 10ml blood was drawn for analysis of lipogram, MDA, SOD, Glucose, Lactate together with C-RP, pulse rate was also tested. Results indicated that Stevia consumption induced an improvement in lipogram and significant changes in MDA and SOD together with significant benefit in glucose lactate and pulse rate all for the sake of post measurement of Stevia consumption. In conclusion, it has been shown that stevia possess many health benefits and induced improvement of physical performance of male students.
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Key words: Stevia benefits, physical performance, immunity, lipid profile, male college students.

1. Introduction

Supplementation are part of the integrated nutrition approach, studies show that in addition to well-known benefits of maintaining proper health, physical and mental performance can be handed with nutrition supplements, specially of natural origin such as in plant or animal origin (Hatfield, 2013; Yasser, 1998). The ability of the body to resist stresses is called immunity, which tend to increase the susceptibility to diseases. Immune stimulants induce wide range of chemical agents, bacteria, animal and plant extracts that stimulate antibody response (Yvette, 2019; Levy et al., 2017; American college of Sports Medicine., 1997).

Stevia is a plant that substitutes sugar and green stevia has many benefits:

- Help diabetic patients.
- Help in weight control.
- Reduce high pressure.
- It tastes 200-300 times sweeter than sugar.
- It is classified as non-calorie or low calorie.
- Also known as non-nutritive sweetener.
- It improves bone health.
- Does not cause any allergy.
- It can be used as sweetener for ice cream, desserts, yogurt, soft drinks, candy, shewing gum and bread (Chen et al., 2005; Geuns et al., 2007).

Stevia contains eight glucosides:

- Stevioside.
- Rebaudiosides.
- Steviolbooside.
- Dulcoside A.

These are extracted through harvesting the leaves, drying water extraction and purification crude stevia carries a bitter taste and foul smell until it is bleached or decolored (Anton et al, 2010; Tandel, 2011).

Green stevia is a purified powdered extract fromthe Stevia rebaudiana bertonai plant and due to the natural sweetness of the leaves, it is used around the world as a sugar alternative. Also, stevia is taken by mouth and some chemicals in stevia are safe but some side effects might rise such as bloating, nausea, dizziness and numbness, and the world health organization defines the daily intake as 4 mg of stevia per kilogram of body weight (Natalie Olsen, 2017).

About the nutritional value of Stevia:

Morgengo (2020) reported that stevia contain sweet leaves, that may replace sugar in the diet, but it also contains plethora of antioxidant compounds, such as flavonoids, triterpenes, tannins, caffeic acid, kaempferol and quercetin, and many other components, fiber, protein, iron, potassium, magnesium, sodium, Vit A&C. all these compounds are responsible for the many benefits reported in stevia that affects positively heart health, weight loss, diabetics, anti-cancer properties, oral and bone health, skin and kidneys. Nichols, (2018) reported some facts about stevia the dietary ingredient to be primarily grown in some countries in south America, such as Brazil and Paraguay, also very known in China and Japan, and to taste many times sweeter than sugar, and to be classified as zero calorie, and shown health benefits specially to diabetics, and they do not pose

any health risks in case of being used in moderation. She also added that there are many products containing stevia such as salad dressing and snacks and are preferred for children consuming sweet food, drinks with very low calories. Carol (2016) suggested that stevia may have many health benefits at the same line encounter some risks and that stevia is used in tea manufacture and sweet drinks and protein drinks and ice cream and marine foods of the benefits in losing weight, diabetics, diet metabolism, hypertension and as a diet for pregnant women, children as a natural product rich in iron and may cure anemia. She also added the possible risks of stevia for some cases of hypertension and diabetic person using insulin and in case of using drugs to lower cholesterol and anti-viral drugs and anti-inflammatory drugs.

What about the effect of stevia on heart health:

The study of Marengo (2020) found that stevia lowered T. cholesterol, LDL (bad) cholesterol and triglycerides and increased HDL (good) cholesterol and recent studies suggest that consuming natural product may raise risk of heart diseases, as reported by Bendix (2022) he also added that consuming many artificial sweeteners could elevate blood sugar levels and raise one's risk of heart disease or stroke as there are potential link between consuming of artificial sweeteners and heart disease (Samuel et al, 2018; Dewailly et al, 2002).

Stevia has been used for its sweet properties for hundreds of years, with the increasing rates of diseases such obesity, diabetics and in conjunction with world policies calling for reduction of sugar, low sweeteners as stevia are gaining interest among consumers making it an important choice for use in beverage product, as a safe element and for its benefit to health.

The aim of this study was to explore the potential health benefits of stevia and physical performance of male college students.

2. Methods:

The researcher sued the experimental method due to the suitability of the natural of the study.

Research sample: 36 male college students were chosen from Port Said University to participate to the study.

Table (1): Basic measurement of the participants

Variables	M	SD	Skewness
AGE(Y)	18.4	2.8	0.69
Height (cm)	172.5	5.3	0.85
Weight(kg)	71.3	5.7	0.73
BMI (kg/m^2)	20.2	3.1	0.42

Skewness was between (±3) indications of the homogeneity of the sample of the study.

Subjects:

36 participants of male college students of Port Said University were randomly chosen for this study. They were divided to two equal groups, they were free from any diseases, and they were healthy and did not receive any medications. The control groups received placebo and the experimental group was treated by stevia 4 mg (per kg/bw) daily for 30 days. 10 ml blood was drawn from antecubital vein for analysis, centrifuged and placed in freezer until analysis of: lipogram, MDA and SOD, glucose and lactate together with C-RP. Pulse rate using pulse meter

- Malon dialdehyde and SOD were analyzed by colorimetric method.
- T. cholesterol, LDL, HDL, triglyceride using commercial kits.
- Lactate by accusport.
- Glucose colorimetric method.
- C-RP using antigen antibody reaction.
- BMI by body weight (kg) and height in meter.
- Inter leukin 2 assay using commercial Elisa kit.

Statistical analysis:

It was performed using statistical package for social scene (SPSS) for mean and standard deviations T test for analysis the results of pre-post experiment. 0.05 values were statistically considered significant.

3. Results

Table (2) shows that there are significant changes for lipograms (T. cholesterol, LDL, HDL, TG, in favor of the experimental group that consumed stevia/one month.

Table (3) shows that there are significant changes in MDA, SOD and C-RP post treatment with stevia compared to control group.

Table (4) shows significant changes in pulse rate, glucose and lactate post stevia administration compared to control group.

Table (2): T. cholesterol, DLD, HDL, TG in control group and experimental pre-post

Variables	Control (G1)		Experimental Group (G2)	
	Pre	Post	Pre	Post
	M±SD	M±SD	M±SD	M± SD
T. cholesterol (mg/dl)	187.1±9.1	192.3±10.2	196.1±7.8	169.3±6.4*
LDL (mg/dl)	168.8±10.2	171± 9.6	172.2±9.1	162.4±8.5*
HDL (mg/dl)	40.3± 6.5	41.4±5.1	43.6±6.1	58.3±7.2*
TG (mg/dl)	150.2±13.3	155±11.2	148.1±9.5	131.2±7.5*

There are sig. changes in favor of experimental group post experiment (treatment with stevia) compared to control .
Table (3): Showed IL2 malondialdehyde (MDA) and superoxide dis mutase (SOD) in control and experimental group, pre-post treatment.

Variables	Control (G1)		Experimental Group (G2) (G2)	
	Pre	Post	Pre	Post
	M±SD	M±SD	M±SD	M±SD
IL2 pg/ml	751±45.2	743±43.1	749.1±41.5	766.2±47.2*
SOD mmol/ml	4.12±0.14	4.3± 0.11	4.2± 0.24	6.9±0.4*
MDA mmol/ml	1.8±0.15	1.9 ±0.18	2.1±0.17	1.1±0.09*
C-RP mg/ml	2.7±0.4	2.8± 0.6	2.9 ±0.5	1.01±0.26*

There are significant changes in IL2 oxidant and anti-oxidant and C-RP post treatment with stevia.

Table (4): Pulse rate, glucose and lactate in case of control and experimental group pre-post treatment

Variables	Control (G1)		Experimental Group (G2)	
	Pre	Post	Pre	Post
	M±SD	M±SD	M±SD	M±SD
Pulse Rate c/min	79±4.1	77 ±3.7	78±3.5	72±3.1*
Glucose mg/dl	86 ±3.1	82±2.9	84±4.2	70±2.6*
Lactic acid mmol/l	1.7±0.6	1.8±0.4	1.6±0.4	1.1±0.2*

There are significant changes post treatment with stevia.

4. Discussion:

WHO recommends to reduce sugar intake for all ages, to < 10% of total energy intake and for health benefit to < 5%, so as to decrease the percentage of diabetes and obesity and premature death, also the increase in energy production with lesser side effect and better health and physical properties for athletes (WHO, 2015; Rahul et al., 2011). Amil et al. (2018) added that since the use of artificial sweetener has been a complain matter, this led the consumer interest increased for the natural products and sweetener and search about its benefits such in case of stevia. The significant decreased malondialdehyde together with the significant increased antioxidant, super oxide dismutase (SOD) table (3) indicated that stevia consumption for 4 weeks/daily influenced the decreased free radicals while increasing (SOD) and benefit health and immunity of the body which is in accordance with Heshmat et al. (2013) and Kobyliak et al. (2018) they added that free radicals may be harmful to tissues due to stresses, exercise or radiations and the antioxidant (SOD) function is to protect the body against the potential deleterious effects of superoxide anion, also (SOD) uses oxygen as a substrate converting it into H2O2 (Ganong, 2000).

C-RP in table (3) significantly decreased post stevia treatment in comparison to the control which indicated that stevia possess anti-inflammatory process, that decreased inflammation. This is in accordance with the review of Young et al. (1991) and Chatter and Shinde (2005). They reported that CRP is bound with phosphocholine, which is expressed on the damaged cells, and with the treatment of inflammation, C-RP decrease in the blood which may be a good marker of the activity of the disease. Clyne (1999) added that C-RP is affected by arthritis, obesity, lung cancer, cardio vascular disease and allergies and is not affected by anemia, protein levels, age, Race. C-Reactive Protein (C-RP) is acute phase reactant which can predict cardio vascular risk, it may be of particular characteristic of patients with RA with high disease activity. It has been suggested that CRP is more than merely a risk factor, acting as a causal agent facilitating thrombotic occlusion and atherosclerosis (Mougious, 2006).

They also added that the increased CRP during inflammation is the result of an increase in the number of cells producing CRP as well as an increase in CRP secretion rate.

Studies were conducted using medicinal plants as feed additives instead of antibiotics to reduce antibiotic resistance (Sahu and Nahak 2014). IL-2 level was significantly increased in case of stevia supplementation compared to control group, this is beneficial effect as it may counteract effect of inflammation through up regulation of peroxisome proliferatory activated receptor-Y (PPAR-y) activation (Jacob et al., 2007) which is explained that stevia may enhance immunity by stimulating IL-2 function.

Table (3) health benefits induced by stevia consumption for 4 weeks/daily indicated that there are significant changes related to immunity effect and antioxidant (SOD) and decreased oxidant Malondialdehyde. These results are in accordance to those of Morengo (2020), Goyal et al. (2010); Sakhamani et al. (2018); Sativa et al., (2004). The health benefits recorded may be due to the content of plethora of antioxidant compound namely flavonoids, triterpenes and tannins together with Vit A, C and minerals and trace elements. Nichols (2018) reported health benefits related to diabetics. As it suppress glucose levels as indicated in Table (4). (Marengo, 2020) reported beneficial heart disease, the fact that stevia decreased T. Cholesterol, LDL, and Triglyceride and increased positive and good effect to the heart and physical performance and induced a positive action on weight control. This is in accordance to Soha (2018) all these compounds indicated the positive and beneficial effects of stevia in relation to the health of the heart and body. Also, of important to know that glycoside reach the large intestine, than colon bacteria get rid of glucose for energy production, then reach the liver and the body get rid the remaining in the urine. Stevia sugar doesn't share in energy calories or affect glucose level in the blood (El Mayadeen Net, 2020). The decreased lipid profile reported in the study which may help health and weight control and induced cardiac and benefit the different organs of the body was reported by other investigators by using different methods such as supplements, exercise training and alternative methods (Wong et al., 1985; Barbie, 2020). They added that the high level of fat, cholesterol and triglycerides may induce many metabolic diseases and they recommended limiting the consumption of saturated fat to unsaturated fat plus some supplements such Vitamins and stevia.

A study showed that the consumption of one gram of the stevioside found in stevia may decrease glucose level which indicated the beneficial effect of stevia on glucose metabolism. And decrease the side effect of diabetes of the second degree (Soren et al., 2004; Annette, 2020).

Table (4) showed that there are significant decrease in lactate concentration at rest in case of the experimental group (stevia consumption) compared to control group. The possible cause of the significant decreased lactate at rest was the hypoglycemic effect and decreased glucose concentration in this case

lactate level also decreased due to the process of glycolysis meaning the chemical transformation of glucose chemically to pyruvate than to lactate by the action of lactate dehydrogenase enzyme leading to lactate formation (Guyton and Hall, 2006; Mougios, 2006). This result means that consuming stevia for one month decreased glucose and lactate (table 4) which in turn is an indication of beneficial effect on health and physical performance at the same time (Ganong, 2000; Goyal et al, 2010).

Also, of significant result, table (4) the decreased pulse rate reported post stevia treatment which is an indication of fitness because the decrease pulse rate is accompanied with higher cardiac output and higher oxygen to the active muscle which in turn increased VO2 max. and a high oxygen diffusing capacity, this in turn increased oxygenation per inspiration and may lead to retardation of occurrence of fatigue and better physical performance as reported by Murray et al. (2009); Adams et al. (2004) and Allen et al. (2008).

Conclusion:

In conclusion, it has been shown that stevia consumption may induce immune and health benefits together with positive response of lipid profile and anti-inflammatory effects and suggested imprphysical performance. It also throws the light for the preventive therapeutic effect of stevia.

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