

The Effect of Sumac Powder on Some Biological Elements of Importance to Health of Male Students

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ABSTRACT

Sumac has been used in treatment of some diseases. **Aim of the study:** was to explore the effect of sumac powder on some biological elements of importance to health of male students. **Materials and Methods:** 40 male students participated to the study. Control (20 in no) ingested placebo for 3 months, sumac was ingested by experimental group of 3 gr/daily for 3 months. All biological variables showed a significant change for the favor of sumac ingestion compared to control in: glucose, insulin, blood cells, oxidant and antioxidant, sex hormones and T. testosterone. **Conclusion:** Daily intake of sumac (3 gr/ 3 months) may be beneficial to the students to elevate their immunity and health in increasing oxygen and decreasing glucose and insulin and help them to be less susceptible to diseases.

Keywords: Oxidant, antioxidants, sumac, health benefits and male students.

1. Introduction

Mediterranean diet is a food used to eat in countries border to the Mediterranean Sea, the people are healthy and had low risk of chronic diseases due to the compound of the food of: fruits, legumes, vegetables, whole grain, and nuts, seeds and healthy fat which may promote weight loss and prevent heart attack and strokes (Link, 2018; Altomare *et al.*, 2013). In the same line many investigators wrote about healthy food specially plants and herbs. Abou Reidah *et al.*, (2014) also demonstrated that sumac can be found also in Mediterranean regions, Italy, Turkiye, Iran and Syria, Lebanon. It is alternative to some spices like zaata and lemon, also it has many health benefits such as:

Supporting metabolic, cardio vascular health, and may be consumed at a dose of 3 grams daily for 2-3 months. And those ingesting it regularly experience low risk of cardio vascular disease, antimicrobial properties and muscle pain reduction and lower pain score after exercise vigorously.

Researchers demonstrated that sumac is one of the most powerful anti-inflammation spices, as it ranks high on the Orac chart and has the ability to neutralize free radical and inflammation that cause cancer, heart disease and signs of aging.

This was also reported in the studies that sumac induce a significant lower effect of MDA and increased significantly SH reduced glutathione and C-RP as reported also by Isik *et al.*, (2019); Rahideh *et al.*, (2014) and Abou Reidah *et al.*, (2014). Hatfield (2013) demonstrated that herbs may be a natural sport pharmacy and define herb to be any part of a plant, which can be used as a medical treatment and added that herbs may enhance performance in many ways:

- 1- Through the contain of antioxidants.
- 2- Herbs can have a great nutritional value of Vit. and minerals.
- 3- Can raise energy levels.
- 4- Can stimulate immunity.
- 5- Can stimulate other system such as endocrine system.

Underand Saltan (2019) and Rayne *et al.*, (2007) stated that sumac is rich in flavonoids, tannins, phenolic acid and is defense against oxidative stress, inflammation obesity, hyperglycemia, hypercholesterolemia, and hyperlipidemia, also improve functions of liver, heart metabolism and cancer diseases and concluded that sumac may be useful in the management of metabolic conditions as liver and blood vessels complications. Also, mentioned by Abu Reida *et al.*, (2014), that Sumac (RHUS Coriaria) benefits are:

- Induce antioxidant effect.
- Anti-inflammatory action (contain Tannin and Gallic acid).

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- Fight free radicals.
- Rich in Vit C (antioxidant).
- Sustain collagen.
- Act as antimicrobial specially salmonella.
- Promote balance blood sugar.
- Contain Onerga3 FA.
- Sustain the heart and vessels decrease injuries of the heart and brain.
- Increase HDL and decrease LDL.
- Contain anti-clotting agents to decrease density of the blood.
- Decreased common cold (Respiratory system) and bronchitis due to content of volatile oils (carvacrol, thymol).
- Help curing of digestive troubles.
- Protected effect of liver.

Wojcik-Cichy *et al.*, (2018) and Rahideh *et al.*, (2014), demonstrated that sumac help in the normalize the function of digestive system, decrease the sense of (thirst) decrease dental pain and improve gums, treatment of urinary system, decrease glucose level and may be used in diabetes. There are four types of sumac:

- 1- Fragrant sumac.
- 2- Bright sumac.
- 3- Smooth sumac.
- 4- Staghorn sumac.

It is used as spice, coloration material and nutrient preservative, in cosmetic and drugs and treats over-active bladder, urinary incontinence, bed wetting, intestinal cystitis and decrease glucose and decrease heart risk, and blood vessels and stimulates male sex hormones. Reichling *et al.*, (2009) demonstrated that sumac is an herbal product, commonly consumed as a spice and was used for medical treatment for centuries and that sumac had a free radical scavenger effect and a protective effect against liver damage along with antiviral effect, antimicrobial effect and antioxidant effect and these effect are in accordance with the studied data that sumac exerts an antioxidant properties. Also, reported by Kossah *et al.*, (2011) and Akbari-Fakhrabadi *et al.*, (2018). Asgary *et al.*, (2018) demonstrated the effect of sumac as cardio protective and on hyperlipidemia and blood sugar and revealed that sumac decreased BMI, SBP, DBP, while plasma level of TG did not change and reach the conclusion that sumac consumption may decrease cardiovascular risk factors in persons with mild to moderate hyperlipidemia, the data is in coordination with that of Sabzghabae *et al.*, (2014)

Bashiti (2018) explored many components found and known about sumac, and stated that it contain potential benefits such as fiber, healthy fats and some essential vitamins, and contain 17% carbs, 19% fat and 5% protein. Most important is the healthy fats as oleic acid mono unsaturated F.A associated with heart health as recorded, linoleic acids poly unsaturated F.A associated with healthy cellular membranes. Sumac is used to enhance the flavor of spice rubs, sauces and dressing and is a key ingredient in a famous food named Za'atar.

Akbari-Fakhrabadi *et al.*, (2018) demonstrated the anti-inflammatory effect of sumac due to the high amount of phenols and flavonoids this may help the brain health and reduce nervous system inflammation and help fight degenerative nervous system disease and is a good protector to the nervous and internal organs. Together with the protection of DNA from damage and has antitumor action by inhibiting cancer cell growth and health. Also help to reduce liver enzyme and help people with fatty liver. They added that sumac could be consumed with water as tea, also may be ingested with honey and be added to food.

Mahernia *et al.*, (2015) reported that sumac has beneficial properties that can ease inflammation of the gastric epithelium and in preventing anti-inflammatory based gastric diseases induced by *H. pilori* and limit bacterial growth.

The aim of the study was to investigate the effect of sumac powder on some biological elements of importance to health of male students.

Research procedures

Methods the researcher used the experimental method (pre-post) measurements of two groups of male students, due to the suitability of the nature of the study.

Study sample: 40 males student of Port Said Univ. were randomly chosen to participate to the research aged (18-20 years). They were divided to control (n=20) and experimental group (n=20). All the participants were free of contagious diseases and in a good health willing to participate to the study, given a written informed consent to participate, they must refrained from any medication throughout the experiment. Sumac supplementation in dose of 3 grams daily for 3 months to the experimental group and the control group obtain placebo.

Table 1: Characteristic features of the participants

Variables	Control	Experimental	Sig
	M±SD	M±SD	
Age(y)	19.4±1.3	19.2±1.5	NS
Height(cm)	177±6.8	175.8±6.2	NS
Weight (kg)	81±3.3	80.4±3.5	NS

Data collection

- Height using restameter.
- Weight using medical scale.
- Pulse rate using pulse meter.
- GSH using Elisa method.
- MDA using spectrophotometer.
- Blood glucose using spectrophotometer.
- Insulin using Elisa method.
- T. cholesterol using spectrophotometer.
- FSH, LH – testosterone using Elisa method.
- C-RP using Rose Waaler test.
- Muscle strength of leg using seated leg press.
- T. leucocytes using coulter counter.
- Rbcs, Hb, and MCV, PCV coulter counter.

Statistical analysis

Using SPSS including

- Arithmetic mean.
- Medias.
- Standard deviation.
- P< 0.05, T test for comparison between pre-post measurements.

Results

Table (2) indicated pulse rate, blood cells and muscle strength of legs and revealed that sumac ingestion induced a significant decreased pulse rate while all other parameters increased significantly compared to control group.

Table (3) showed that sumac induced a significant change in glucose, insulin, oxidant, anti-oxidant, C-RP and T. cholesterol for the favor of the experimental group compared with the control one that revealed beneficial in the health, heart and act as anti-inflammatory agent.

Table (4) showed that sumac ingestion induced a significant increased FSH, LH and testosterone; it means that sumac led to improvement in sex hormones which affect the reproduction and act as anabolic agent.

Table 2: Express pulse rate wbcs and Rbcs variables and muscle strength pre-post sumac and placebo ingestion of male students

Variables	Control (G1)		Experimental	
	Pre	Post	Pre	Post
	M±SD	M±SD	M±SD	M±SD
Pulse rate (beat/m)	72.3±1.9	72.1±1.8	71.9±1.3	68.2±1.2*
Rbcs 10 ⁶ /ul	5.31±0.13	5.22±0.19	4.9±0.17	6.1±0.2*
Hb (g/dl)	12.6±0.5	11.9±0.6	12.2±0.4	13.7±0.3
MCV (PG)	31.5±0.2	31.7±0.10	30.9±0.4	32.1±0.3*
PCV %	40.1±1.3	40.2±1.4	39.6±1.1	42.3±1.2*
Leg press (cm)	1.87±0.5	1.89±0.5	1.88±0.5	2.15±0.6*
T. Wbcs 10 ³ /ul	5.4±0.6	5.3± 0.7	5.5±0.4	7.1± 0.8*

Table 3: Variables changes post sumac ingestion and placebo of male students

Variables	Control (G1)		Experimental	
	Pre	Post	Pre	Post
	M±SD	M±SD	M±SD	M ± SD
Glucose (mg/dl)	89.3±6.3	92.1±6.5	91.5±5.9	79.2±4.1*
Insulin (mg/dl)	6.3±1.3	6.5±1.2	6.4±1.5	4.6±1.1*
GSH (mg/dl)	59.3±2.6	60.2±2.7	58.9±2.3	67.2± 4.1*
MDA (mmol/ml)	1.6 ±0.2	1.5±0.5	1.7±0.4	1.2±0.3*
C-RP (mg/l)	1.02±0.43	1.03±0.45	1.05±0.44	0.3±0.01*
T. cholesterol (mg/dl)	232±31.1	234±30.2	235± 32.2	201±25.1*

P< 0.05

Table 4: Sex hormonal changes post sumac and placebo ingestion of the male students.

Variables	Control (G1)		Experimental	
	Pre	Post	Pre	Post
	M SD	M SD	M SD	M SD
FSH (iu/l)	32.3 6.2	33.1 5.4	31.2 6.3	42.3 6.2*
LH (iu/l)	21.6 3.4	22.5 2.9	22.9 2.7	33.1 3.9*
Testosterone (mg/ml)	4.6 2.1	4.7 2.6	4.8 2.5	5.1 1.3*

P< 0.05

Discussion

Data of table (2) revealed a highly significant increase in the number of Rbcs, Hb concentration, and PCV, MCV Wbv in case of the experimental group ingesting sumac compared to control.

These results may be induced due to action of sumac on the spleen which act as a reservoir for blood cells (Rbcs), the same occur to the concentration of Hb and related variables, MCV and PCV: these changes may increase oxygen utilization and volume of oxygen to the active organs and improved muscle performance and heart action leading to higher fitness and better efficiency of muscle and heart action.

These are coordinated with the studies reported of Bucci and Unlu (2000); Cordova *et al.*, (2004). The increase T. leukocyte in table (2) indicated a higher immunity level against micro-organism and improved immunomodulatory action of the sumac ingestion leading to significant T. Wbcs number. This was also reported by Abdelrazek *et al.*, (2017), they added that immune-stimulants include a wide range of chemical agents, animal and plant extracts modulated the immune system by increasing host resistance to disease and facilitate the function of Wbcs and increase their activity.

Table (2) the significant increase of leg muscle strength reported in this study is in accordance with Fisher (2003) that same supplements including sumac or Whey and Ferroglobin may induce and stimulate muscle function and indicated a higher fitness and muscle efficiency. This was also showed

by the cardio vascular effect and increased pulse rate which in turn induced an extra oxygenation of the organs specially muscle which is in accordance to the studies of Brooks *et al.*, (1999); Anwar *et al.*, (2018); Bucci and Unlu (2000); Cordova *et al.*, (2004). They stated that supplementation might stimulate muscle abilities and oxygen stimulate muscle function and decreased muscle damage which is extra advantage towards boosting muscle health (Van Den Driessche and Mensink 2018) reported the many benefits of sumac as:

- High in antioxidants, it is antioxidant powerhouse.
- Regulate blood sugar and reduces cholesterol.

This is in accordance with the table (3) of data presented that sumac decreased T. cholesterol which means that sumac help to reduce risk factors for heart diseases as it reduces T. cholesterol.

Coriaria may exceed 200 compounds, tannins, phenolic acids, essential oils, that affects the health as reported antioxidants estimated by DPPH. And act as antidiabetic by inhibiting PTP1B enzyme, reduced lipo-grams as recorded in this paper, and act as anti-migratory with other protective activity, and act as neuroprotective due to linoleic acid.

Rahideh (2014) reported that sumac powder in a dose of 3 grams per day for 3 months, induced a significant decrease in insulin and a decrease C-RP activities and glucose levels (table 3) and came to the conclusion that daily intake of 3 gr sumac for 3 months may be beneficial for diabetic patients to make them less susceptible to cardiovascular disease.

These results were in accordance with those reported in table (3) which indicated the health benefits of sumac treated diabetic patients and help to restore cardiovascular health.

Ansley (2000) reported that 3 grams daily of sumac for 3 months may help balance sugar and act as antioxidant also may elevate muscle pain. It is used as herbal supplement in a capsule form and clinical research demonstrated that doses of up to 3 grams/daily are safe and sumac is a red berries and is dried for use is herbal medicine or culinary spice.

Link (2018) reported about sumac spice as heart-healthy, bone supporting antioxidant herbs, by saying that sumac is red in color with lemon like flavor, its contents of polyphenols and flavonoids may help lower cholesterol level, and sugar and reduce bone loss. She added that sumac grow in East Asia, Africa, North America. The plant has a good reputation in fighting oxidants and relieves muscle pain. It may maintain normal blood sugar and prevent insulin resistance and help against chronic disease in the same line. Noor (2018) commented about the health benefits of sumac to be nutritious as it includes fiber, fats and vitamins together with antibacterial, antifungal effect, anti-inflammation, anti-cancer and may promote blood sugar levels and help to promote the prevention of insulin resistance and help ease muscle pain and promotes healthy bones and act as diuretic to remove toxins through urination. All these benefits make of sumac an important spice and have many health uses of high importance.

Khalilpour *et al.*, (2018) and Akbari-Fakhrabadi *et al.*, (2018) reported the pharmacological activities of the plant as to be antioxidant, anti-ischemic, antimicrobial, hypoglycemic, hypo-lipidic effects and added that the chemical constituents of *Rhus cortaria* has a wide range of uses such as the development of new drugs and food preservatives and food industry like meat and fish and is rich in antioxidant and as feed additive to increase the performance of laying hens and broilers instead of antibiotics that should not be used because of its residual effect on eggs. Also it can be used as antioxidant in the food industry for it delay deterioration the aspect and taste of food.

Sumac extract was helpful in decreasing pain as Mohammadi *et al.*, (2016) reported which is an extra benefit.

Murray *et al.*, (2009) reported the biochemical importance of the unsaturated fatty acids as the content of these fatty acids in a fat determines its melting point and its fluidity. Also in maintaining membrane fluidity and a high ratio of polyunsaturated F.A to saturated F.A in the diet is a major factor in lowering cholesterol concentration by supplementation with diet such as sumac for example which is healthy and beneficial in preventing coronary heart disease.

The researchers added that by varying the proportions of the different poly-unsaturated FA, it is possible to influence the type of eicosanoids and may influence the course of disease by dietary means.

In this study administration of sumac extract led to increased testosterone, FSH, LH levels compared to the control group. Table (4) this is in accordance with the study of Ahangarpour *et al.*, (2014) they stated that sumac administration increased gonadotrophic hormones (FSH, LH) and testosterone concentrations. They added that gonadal hormone, testosterone play a prominent role in spermatogenesis, hence, it could be suggested that the sumac extract improved sperm parameters via

enhancing gonadotropins and testosterone. Mahdavi *et al.*, (2018) demonstrated that sumac powder may affect not only male but also female fertility hormones they used sumac powder for 6 weeks in diabetic female rats and the results of the study showed that sumac powder contains a high amount of fiber and carbs and moderate amount of fat and protein and phenols and flavonoids and recommended that sumac powder could be used to improve blood glucose and fertility hormone of the female diabetic rats. This was also reported by Ahangarpour *et al.*, (2014) in male mice. About the mechanism of action of gonadotropins and testosterone, Guyton and Hall (2006) reported that the major share of the control of sexual functions in male begins with secretion of (gnrh) by the hypothalamus, which in turn stimulates secretion of gonadotropins hormones from anterior pituitary gland (FSH, LH), LH is the stimulus for the secretion of testosterone by the testes, while FSH stimulates spermatogenesis.

Conclusion

Rhus coriaria is an important plant due to its broad biological effect such as antioxidant, hypoglycemic hypo lipedetic effects act as sex hormonal effect and restore hormone balance and strength, together with neuroprotective actor and boost immunity as immune stimulant and increased oxygen which give the herb the name of the magical herb (spice).

Recommendation

Sumac powder could be used to improve glucose level and stimulate sex hormones.

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