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Effect of Daily consumption of green tea and hibiscus on Some Biochemical Parameters in a Sample of Healthy Volunteers (Preliminary Study)

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ABSTRACT

Green tea from the leaves of plant *Camellia sinensis* has been shown to have wide range of antioxidant, anti-inflammatory, anti-carcinogenic and antibacterial activity against many pathogens. In addition, Hibiscus sabdariffa (Linn) (HS) (family Malvaceae), showed benefits in the most of body health. This study is aimed to evaluate the effect of daily consumption of green tea and hibiscus on some biochemical parameters in healthy volunteers. Fourteen healthy volunteers were divided randomly into two groups each one contains seven volunteers. They were allowed to drink hot tea of Hibiscus sabdariffa calyces and the leaves of green tea 2g three times daily for 2 weeks. Then fasting blood sugar, lipid profile, blood pressure, serum uric acid and testosterone level were measured before and after as well as total body weight was measured daily. Both plants were shown significant reduction in lipid profile, SBP, DBP and mean arterial blood pressure, as well as uric acid only in green tea group, but there is no significant change according to the fasting blood sugar and testosterone level. There is rapid reduction in body weight by using green tea but not significantly. From this study, we conclude that both plants showed potent hypotensive and hypolipidemic effect. These effects made them very efficiently in protection against cardiovascular diseases. Additionally, Green tea showed worthwhile hypouricemic effect compared with hibiscus.

Keywords: Green tea, Hibiscus sabdariffa calyces, Lipid profile, Blood pressure, Uric acid, Testosterone.

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1. Introduction

Green tea is made solely from the leaves of *Camellia sinensis*, it originates from China and has become associated with many cultures throughout Asia. It has recently become more widespread in the West, where black tea is traditionally consumed [1]. Over the last few decades green tea has been subjected to many scientific and medical studies to determine the extent of its long-purported health benefits, with some evidence suggesting that regular green tea drinkers may have a lower risk of developing heart disease [2] and certain types of cancer [3]. Although green tea does not raise the metabolic rate enough to produce immediate weight loss, a green tea extract containing polyphenols and caffeine has been shown to induce thermogenesis and stimulate fat oxidation, boosting the metabolic rate 4% without increasing the heart rate [4]. According to a survey released by the United States Department of Agriculture in 2007 the mean content of flavonoids in a cup of green tea is higher than that in the same volume of other food and drink items that are traditionally considered of health contributing nature, including fresh fruits, vegetable juices [5].

Flavonoids are a group of phytochemicals in most plant products that are responsible for such health effects as anti-oxidative and anticarcinogenic functions. However, the content of flavanoids may vary dramatically amongst different tea products [6]. Moreover, green tea contains salubrious polyphenols, in particular catechins, the most abundant of which is epigallocatechingallate. Green tea also contains proteins (15-20% dry weight), whose enzymes constitute an important fraction; amino acids (1-4% dry weight), carotenoids, tocopherols, ascorbic acid (vitamin B, C, E), minerals such as chromium, manganese, selenium or zinc, and certain phytochemical compounds. It is a more potent antioxidant than tea although black tea has substances that green tea does not such as the aflavin [7].

Fresh leaves contain, on average, 3-4% of alkaloids known as methyl xanthines, such as caffeine, theobromine, and theophylline [8]. Hibiscus sabdariffa is related to Malvales and Family: Malvaceae. The fresh and dried epicalyces and calyces are used for herbal remedies and the most active constituents are mucilage polysaccharides and pectin's, polyphenols organic acids (hibiscus, ascorbic (vitamin C), citric, malic and tartaric acids). Hibiscus tea is widely consumed as a drink on its own from Southeast Asia to Africa and the Caribbean [9]. Moreover, this plant is characterized by many health benefits like lowering blood pressure and cholesterol [10]. This aim of the present study is to evaluate the effect of daily consumption of green tea

and hibiscus on some biochemical parameters in a sample of healthy volunteers.

2. Materials and Methods

2.1. Participants:

14 male Yemeni individuals participated in this study. Their ages range from 20-23 years old.

2.2. Materials

Camellia Sinensis (green tea) leaves (Lipton® Unilever, Englewood Cliffs NJ, 07632) and *Hibiscus sabdariffa* (Elnasr Processing & Food Packaging Factory-Sudan) were purchased from special herbal store in Sana'a City and identified by Botanist in Pharmacognosy Department at UST.

2.3. Study design:

14 male Yemeni individuals participated in this study. Their ages range from 20-23 years old and weight range from (50-60kg), healthy and did not take any medications or herbal remedies throughout the duration of this study. Food and drinks were kept in fixed situation. They were randomly divided into two groups. First group: they consumed hibiscus flowers 2g three times per day as a form of hibiscus tea (n=7) and second group: they consumed green tea leaves 2g three times per day (n=7). Studied parameters were measured before and after 14 days (duration of this study).

Biochemical tests including fasting blood sugar (FBS) [11], total cholesterol [12], triglycerides [13], uric acid [14] and testosterone [15] levels were measured Spectrophotometer (JEN WAY 6061-Colorimeter-UK). Daily blood pressure (Beurer-89077 Um Germany) and total body weight were measured before, during and after using beverages and comparison was done. All steps of this study was in accordance with the guidelines for the human, and approval from the Institutional Research and Ethics Committee, UST was received prior to the experiments.

2.4. Data analysis: Data entry and analyses were carried out using (SPSS) version 13.0 statistical program using T-test with a significance level less than 0.05.

3. Results and Discussion

Daily consumption of either hibiscus or green tea for two weeks produced insignificant change in the level of FBS as shown in table (1). Moreover, both plants produced significant reduction in the level of cholesterol, triglycerides and high density lipoprotein (P<0.05) as shown in table (1). Additionally, they produced significant reduction in SPB, DBP and MAP (P<0.05) as shown in table (2).

Table 1: Effect of daily intake green tea (2g tid) and hibiscus (2g tid) on (mean±SE) FBS(mg/dl) and lipid profile (mg/dl) for 14 days in healthy volunteers (n=14)

Parameter	Hibiscus		Green tea	
	Before Mean± SEM	After Mean± SEM	Before Mean± SEM	After Mean± SEM
FBS (mg/dl)	84.3±4.7	84.4±3.25	83.2±5.0	82.6±4.7

Cholesterol (mg/dl)	121.8±10.7	94.4±3.5*	143.6.0±25.3	104.6±6.8*
TG (mg/dl)	117.5±6.2	95.0±4.5*	144.8±25.0	101.3±8.9*
HDL (mg/dl)	42.3±2.4	39.0±0.89	37.0±2.0	44.0±3.7*

*Significant as compared with control (before) at P<0.005

Table 2: Effect of daily intake green tea (2g tid) and hibiscus (2g tid) on (mean±SE) blood pressure (mmHg) for 14 days in healthy volunteers (n=14)

Parameter	Hibiscus		After	
	Before Mean± SEM	After Mean± SEM	Before Mean± SEM	After Mean± SEM
SBP mmHg	115.7±5.6	98.7±3.1*	116.6±3.3	104.1±2.7*
DBP mmHg	75.0±3.6	65.5±1.9*	78.3±3.0	66.7±2.2*
MAP mmHg	90.4±2.1	76.8±1.7*	91.1±1.8	79.1±1.3*

*Significant as compared with control (Before) at P<0.005

Regarding the effect of both plants on uric acid and testosterone level, green tea was shown significant uricosuric effect as it reduced the level of uric acid. Both

plant had insignificant effect on the testosterone level table (3).

Table 3: Effect of daily intake green tea (2g tid) and hibiscus (2g tid) on (mean±SE) uric acid and testosterone(ng/ml) for 14 days in healthy volunteers (n=14).

Parameter	Hibiscus		Green tea	
	Before Mean± SEM	After Mean± SEM	Before Mean± SEM	After Mean± SEM
Uric acid(µmol/l)	283.6±17.6	285.1±12.4	308.2±15.7	270.0±31.8*
Testosterone (ng/dl)	652.0±78.0	644.0±23.0	684.0±53.0	678.0±46.0

*Significant as compared with control (Before) at P<0.005

Regarding to body weight, daily consumption of hibiscus produced increase in the body weight, while green tea

produced decrease in the body weight but both of them insignificantly (P>0.05) figure (1, 2)

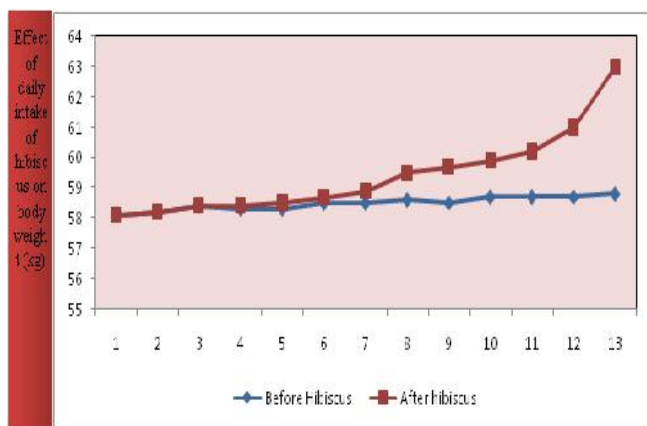


Figure 1: Effect of daily intake hibiscus (2g tid) on (mean±SE) body weight (kg) for 14 days in healthy volunteers (n=7)

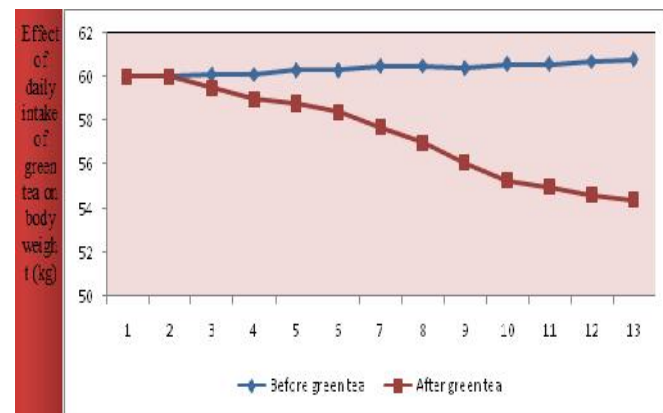


Figure 2: Effect of daily intake green tea (2g tid) on (mean±SE) body weight (kg) for 14 days in healthy volunteers (n=7)

Discussion

Green tea and hibiscus are the most famous hot beverages used traditionally in Yemen and some of Arab countries International Journal of Current Trends in Pharmaceutical Research

especially in Egypt and Sudan as habit and to relive different ailments. In the present study neither green tea

nor hibiscus flowers (calyces) daily consumption produced significant reduction in fasting blood sugar. This result was disagreed with Iso Het al; 2006 who suggested that green tea may help to regulate the blood sugar and reduce the risk for type 2 diabetes [16]. In addition, Japanese researchers demonstrated that daily intake of green tea extract lowered the hemoglobin A1c level in people with borderline diabetes, that indicates the increased body's ability to utilize blood sugar. Hemoglobin A1c is a test that measures the amount of glycosylated hemoglobin molecules in red blood cells. These molecules attach to glucose and so people have more of them if they have more glucose in the blood [17].

However, the outcomes of the present study both plants showed significant reduction in lipid profiles including bad lipids like total cholesterol and triglycerides; contradictory they increased the good lipid which is called high density lipoprotein as well as the blood pressure. All these were accompanied with significant reduction in systolic, diastolic and mean arterial blood pressure. Our results were agreed with Norton and Amy, 2012 who showed that green tea consumption is associated with reduced heart disease in epidemiological studies through reduce total and "bad" (LDL) cholesterol by decreasing cholesterol absorption in the gut [18]. Other study performed at the University of Birmingham showed that average fat oxidation rates were 17% higher after ingestion of green tea extract than after ingestion of a placebo [19]. Al-Dujaili et al, 2009 showed that short-term consumption of commercial green tea reduces systolic and diastolic Blood Pressure, fasting total cholesterol, body fat and body weight [20]. In contrast, other several small, brief human trials found that tea consumption did not reduce cholesterol in humans [21]. Green tea is a potent antioxidant agent due to the presence of high levels of polyphenols and other antioxidants. These compounds may work in several ways to improve cardiovascular health through improve cholesterol level as well as preventing the oxidation of LDL cholesterol (the "bad" type), which, in turn, can reduce the buildup of plaque in arteries [22].

With regarding to hibiscus Lin TL et al, 2007 was agreed with our result as he found that people who drank the hibiscus tea had a significant reduction in their cholesterol numbers, including total cholesterol, triglycerides, and LDL (bad) cholesterol. There was also a significant increase in HDL (good) cholesterol [23].

Herrera-Arellano A, et al, 2007 showed that when patients consumed hibiscus tea for 30 days, they showed a measurable difference in their blood pressure readings. They referred this effect to diuretic effect of hibiscus and inhibition of angiotensin converting enzyme (ACE) [24]. Additionally, present study result was shown reduced in body weight of green tea group compared with increased in body weight of hibiscus group, but both of them insignificantly. This may be referred to the duration of this study. According to the effect of both plants on serum uric acid level, green tea was reduced significantly serum uric acid level, while hibiscus hadn't effect on it. Our result was

in agreement with Jatuworapruk K et al, 2014 who found that green tea consumption in different concentration can reduce the level of serum uric acid as well as increase its clearance [25]. The hypouricemic effect of green tea may be referred to the ability of it to inhibit xanthine oxidase enzyme, which is the key role and rate limiting enzyme in the production of uric acid [26]. In addition, both plants produced insignificant change in testosterone level in the present study.

4. Conclusion

From this study we can conclude that both famous antioxidant plants *Camellia* (green tea) and *Hibiscus sabdariffa* calyx showed potent hypotensive and hypolipidemic effects especially if they are taken as food supplements with the usual medicines of hypertension and hyperlipidemia. Also the change of the life style of these patients like exercise and weight reduction as well as salt and saturated fats restriction may augment that effect.

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