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Original Article

Benefits and Risks of Green Tea in Libyan Meals and the Safe Method of Preparing it and Nutritive Advices.

Amal R. Agila*[1] and Ambaraka Eid.H. Kreim*[2]

[1]Department of Biochemistry, Faculty of Medicine, Derna University, Derna, Libya.

[2]Department of Nutrition, Faculty of Public Health, Al-Arab Medical University, Benghazi, Libya.

Corresponding Author*: Amal R. Agila: amal_agela@yahoo.com, a.khalil@uod.edu.ly.

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ABSTRACT:

This effort clarifies the percentage of daily tannin and caffeine in Libyan green tea beverages. Also, it is to know the extent of Libyan's awareness of the healthy method of preparing green tea. As well as it is to know the nutritional and healthy benefits of green tea and nutritive advice. 12 samples of *vert de chine* of green tea were analyzed. 12 samples were divided into four groups. Each group contained three samples. The preparations include raw samples steeped in boiled water, samples heated for 5 minutes, samples heated for half an hour, and samples heated for an hour. The heating temperature was at 100C˚. A cross-sectional study was randomly achieved on 200 healthy Libyan people (100 men and 100 women) aged from 30 to 45 years old from 1 January to 31 March 2023 in Derna, Libya. The questionnaire was about the type of preparation method of green tea, boiling time, and their knowledge about the nutritional benefits and health risks of green tea beverages. The caffeine percentages were 1.6 %, 2.1 %, 2.5%, and 4.7%, respectively. Also, the highest tannin participation in green tea (heated for an hour) was 91 mg/100ml. This value is higher than the values in raw green tea steeped in boiled water and heated for 5 minutes, which were 0.109 mg/100 ml and 0.49 mg/100 ml, respectively. The heating time affects the proportion of caffeine and tannin in green tea drinks; as the heating time rises, the percentage of caffeine and tannin rises**.** There was a statistically significant difference between percentages of caffeine and tannin according to their heating times (P= 0.031). The proportion of tannin in green tea was higher than caffeine. The expansion of tannin percentage in green tea may lead to genetic faults and other problems. This indicates that raw green tea steeped in boiled water and boiled green tea for 5 minutes may nutritionally be regarded as the most excellent for improving human health because they provide the smallest percentages of caffeine and tannin in Libyan routinely prepared green tea drinks. However, no participant preferred to steep green tea in boiled water.

Key Words: Tannins, Caffeine, Libyan Green Tea, Healthy Method, Nutritive advices**.**

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INTRODUCTION

Green tea is nutritionally described by nutritionists for supporting patients with clogged arteries, heart disease, osteoporosis, liver diseases, Parkinson's disease, high cholesterol, hypertension, diabetes, obesity, asthma, flu, and cold. Similarly, green tea supports people diagnosed with cancers including bladder, esophagus, pancreas, breast, colon, stomach, leukemia, mouth, and ovarian. prostate, and lung. (Wolfram et al, 2006; Pasrij and Anandhamakrishnan 2015). Green tea is one of the major expendable beverages in the earth. It is largely safe, healthy, and used as a food supplement because it contains a valuable amount of polyphenols. Whereas, the other types of tea contain smaller amounts of polyphenols. These polyphenols in green tea include caffeine and tannin. Tannins are considered one of the acids found in tea that work as antioxidants. Caffeine keeps from heart diseases, cholesterol, hypertension, diabetes mellitus, cancer, and iron absorption and body control.

Nutritionally, green tea has medicinal and nutritional properties. Newly, it has a big deal of care because tea polyphenols are significant antioxidants (Devine et al. 2007; Farhoosh et al 2007; Florian et al. 2004; Hirasawa and Takada 2004, Jeu-Ming et al. 2015). Temperature and water steeping affects the antioxidant action and caffeine content in green tea. However, some phenolic compounds in green tea are not heat resistant and volatilized at high temperatures. Also, green tea reduces the absorption of non-heme iron; therefore, people should eat ascorbic acid-containing foods such as broccoli to enhance non-heme iron absorption (Tadelech Atomssa, 2011, Bhagwat et al 2021). High-tannin-containing tea may lead to a disturbance in the excess production of iron at rates that are harmful to human health. This disorder stems from a genetic defect of uncontrolled absorption of iron. While, a high amount of caffeine may lead to headaches, anxiety, irritability, and insomnia (Bhagwat et al. 2021). So, studying tannin and caffeine contents in routinely prepared Libyan green tea drinks should be highly considered merit. The present study aimed to determine the percentage of tannin and caffeine in routinely prepared Libyan green tea. Also, it is to know the extent of Libyan's consciousness of the healthy method to prepare green tea and its standing for health. As well as it is to identify the nutritional and healthy benefits and risks of green tea and nutritive advice.

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MATERIALS AND METHODS

Chemical Manual Method

Four chemical manual methods for caffeine and tannin separation from green tea were performed. The chemical methods were applied based on Amal et al., 2021. Green tea samples were sold from Al-Tamzeny Shop, Derna, Libya. The devices used in this research were analytical balance, hot water, 1000 volume flasks, cooler, separating funnels, filter papers, crucible, and drier. The chemical solutions were ammonia solution, chloroform, Quinine sulfate, and 1N H_2SO_4. 12 samples of Libyan green tea *vert de chine chunmee* were divided into 4 groups and analyzed. Firstly, 3 samples were raw green tea steeped in boiled water, and secondly, 3 samples were heated for 5 minutes. Thirdly, 3 samples were heated for half an hour and fourthly, 3 samples were heated for an hour. The heating temperature was 100 ˚C. All samples for each group were prepared at a constant time. The separation of caffeine from green tea was manual. Approximately, 5 grams of green tea was added to 400 ml hot water in a 1000-volume flask with 5 ml craz I and 5 ml craz II, then it was completed to volume by hot water, then cooled and put in a separating funnel. About 10 ml of ammonia solution was added and separated by 25 ml chloroform 5 times and collected in the crucible. For manual separation of tannin, about 5 grams of green tea was added to 400 ml water, heated for 1 hour, and filtrated. 1 gram of quinine sulfate was added to 25 ml water, then 2.5 ml 1N H_2SO_4 was added. The final solution was filtrated. The precipitate was formed and dried in known weight.

Dietary Questionnaire Method

A cross-sectional study was randomly conducted on 200 Libyan people (100 men and 100 women) from Derna, Libya. The participants were in good health and aged from 30 to 45 years old. Derna is a city located in Eastern Libya. The questionnaire study was performed from 1 January to 31 March 2023. The participants were randomly selected from different places in Derna City including Al-Gebela, Al-Sahal, Sheha, Wadi Alnaga, Al-Dahar Alahmar, and Sayada Kadija. The questionnaire was about drinking green tea daily, the type of method for preparing green tea beverages, the time of boiling temperature, and their knowledge about the nutritional benefits and health risks of green tea.

Statistical Analysis

Descriptive statistics were performed using the SPSS Statistics Software Program (version 24, Inc., Chicago, Illinois, USA). An independent T-test was achieved to evaluate the

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significance of the association between percentages of caffeine and tannin according to the temperature time of the separation method. In all tests, $\alpha < 0.05$ was regarded as statistically significant with a level of confidence intervals of 95% for statistical significance. Graphs of percentages of caffeine and tannins were built using Microsoft Office Excel 2021 program. The percentage formulas were calculated based on the Libyan National Center for Standards in the Nutrition Laboratory, Al-Arab Medical University, Benghazi, Libya.

RESULTS AND DISCUSSION

Chemical Analysis

In the present chemical analysis, there was a significant difference between percentages of caffeine in the four Libyan routine preparation methods of green tea. The average percentages of caffeine were 1.6 %, 2.1 %, 2.5%, and 4.7%, respectively (Table 1). In contrast, there also was a significant difference between percentages of tannins in the four routine preparations of Libyan green tea. The average percentages were 10.9 %, 49 %, and 83 %, 91 %, respectively. This indicates that caffeine and tannin contents increase with heat, as the percentage increases by increasing the heating time (Table 1). According to the Libyan National Center for Standards, the Libyan standard criteria ratio for caffeine in raw green tea steeped in boiled water was 1.5 %. While, the Libyan standard criteria ratio for tannin in raw green tea was 10.5 % (Amal et al., 2021). In the present work, the ratio of caffeine in raw green tea steeped in boiled water was 1.6%, whereas the ratio of tannin in raw green tea was 10.9 %.

Tannin %	Caffeine %	Preparation Method
10.9	1.6	**Raw (steeped in boiled water)**
49	2.1	**Heated for 5 minutes**
83	2.5	**Heated for half an hour**
91	4.7	**Heated for hour**

Table 1: Average Percentages of Caffeine and Tannin in Green Tea Samples

This chemical analysis implied that the way of green tea preparation may affect the contents of caffeine and tannin in green tea. One finding in this work is that the rise in the temperature during the preparation of green tea drinks will promote the participation of tannin. This indicates that a green tea sample boiled for an hour produces 0.91 mg/100 ml of tannin. This value is higher than the amount of tannin in raw green tea steeped in boiled water samples and the samples boiled for 5 minutes. They were 0.109 mg/100 ml and 0.49 mg/100 ml, respectively. In comparison, boiling the leaves of green tea for an hour led to yielding the highest amount of caffeine (0.047 mg/100 ml).

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Whereas, boiling the leaves of green tea for five minutes lead to produce the lowest content of caffeine (0.021 mg/100 ml). The raw leaves of green tea steeped in boiled water produced 0.016 mg/100 of caffeine.

The data demonstrated that there was a statistically significant difference between percentages of caffeine and tannin according to their heating times (P= 0.031). This implies that tannin and caffeine percentages increase with heat and time. Likewise, tannin percentages in the boiled green tea samples were higher than the caffeine percentages. Tannin may lead to genetic imperfection, irregular absorption of iron, and other health problems (Bhagwat et al. 2021). Therefore, the boiling time for preparing green tea beverages should be short to have a minimum amount of tannin. Thus, we can reduce the health risks of green tea. This points to that the preparation ways include steeping green tea in boiled water and boiling green tea for 5 minutes are nutritionally safe and the best for human health because they provide safe and healthy amounts of caffeine and tannin in green tea beverages.

Nutritional Questionnaire Study

The random questionnaire study was accomplished on 200 healthy young men and women from Derna, Libya. All participants confirmed that they drink one to three cups of green tea daily. Moreover, all participants know that green tea has many health advantages. All participants believe that green tea provides them with health and increases their ability to concentrate. They all prefer drinking it over all other types of tea or drinks. A previous study reported that green tea is the most common beverage on the earth and promotes good health (Devine et al. 2007). 5 % (10) of participants boil green tea for 5 to 10 minutes, while 45% (90) of participants prefer to boil green tea for half an hour. About 50% (100) of participants like to drink green tea after boiling it for an hour as shown in Figure 1.

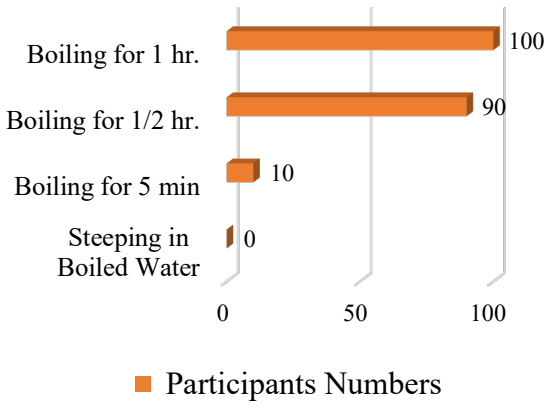

Figure 1. Preparations Ways for Libyan Green Tea.

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Results exhibited that 25% (50) of participants knew that boiling green tea for a long time poses health risks. While 70% (140) of participants did not know that boiling green tea for an hour or more produces high amounts of tannin that enhance health damage. About, 5% (10) of participants knew that boiling green tea for a long time may harm health, but they did not care. Because they are accustomed to drinking this preparation way. Despite this, nutritionists select green tea as part of meal planning to improve many health problems that people suffer from, such as obesity, liver diseases, cancers, and others (Anandhamakrishnan 2015). Further research is needed to study people's awareness about the correct use of green tea drinks during daily life in a way that promotes human health.

Nutritional Recommendations

For good health, green tea strongly can improve alertness; however, continuous consumption of large amounts of caffeine in green tea may cause negative side effects such as headaches anxiety, and insomnia. Also, the increase in tannin levels in green tea drinks may cause genetic difficulties, abnormal iron concentrations, and other health risks. Since green tea is considered one of the most popular drinks in Libya, people should follow the following nutritional instructions to benefit healthily from drinking green tea (Newman, 2021; Jenna, 2008; Sinija and Mishra, 2008; Katiyar et al, 2007; Berube-Parent et al, 2005; Rietveld and Wiseman, 2003):

1-Visit a nutritionist to determine the appropriate amount of green tea drink according to health condition.

2- Drink good quality green boiled for five minutes without sugar.

3- Avoid steeping green tea for a long time.

4- Avoid drinking green tea on an empty stomach.

5- Avoid adding honey to very hot green tea beverages and do not drink tea before bed.

6- Add drops of lemon because vitamin C in lemon stimulates iron secretion.

Conclusion

Green tea contains tannin and caffeine. Tannins are considered one of the acids found in tea that work as antioxidants. Caffeine protects from heart diseases, cholesterol, hypertension, diabetes mellitus, cancer, and iron absorption and body control. Green tea beverage is beneficial for human health and protects it from many diseases that are harmful to the body. However, the method of preparing the tea affects the extent of its benefit or harm to the body. The tannin and caffeine percentages increase with

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heat and time. The green tea samples prepared by boiling at 100˚C for an hour gave the highest percentage of caffeine (4.7 %) and the highest percentage of tannin (91 %) than other Libyan routine ways for preparing green tea. The rise of tannin percentage in green tea may lead to genetic problems, abnormal iron levels, and other health problems. Therefore, the boiling time during the preparation of green tea should be short. The study concludes that steeping green tea in boiled water and boiling green tea for 5 minutes may be nutritionally considered the best for improving human health. Both provide a smaller percentage of caffeine and tannin in green tea beverages.

Competing Interests

We (authors) declare that we have no conflict of interest.

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