The Study of The Amounts of Heavy Metals in Green Teas Determine By Using Atomic Absorption Spectrophotometer.

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Abstract**—**The amount of heavy metals in green tea has been of great concern because of their toxic when their concentration is more than the permissible level. These metals enter in the environment by different ways such as traffic, Human behavior, industrial activities, soil pollution. We have used flame atomic absorption spectrophotometer technique to determination of the concentration of Co, Cd, Cu and Pb in different type of five samples in water and powder of green teas. The concentrations of Co, Cd, Cu and Pb in all examined green teas were less than the reported literature values (WHO). The results mentioned that the green teas obtained in water and powder were safety to consumption and make the quality of life of people in community look better.

Keywords**—**Heavy metals, Green tea, Atomic absorption spectrometer

I. INTRODUCTION

GREEN tea is tea leaves of the botanical name of the *Camellia sinensis (L) O. Kuntze.* Tea is the most widely used worldwide due to its unique flavor and tea. Sources in China and spread to Europe and America. At present, the market of tea there more expansion in the year 2008, Thailand's exports of tea increase from last year. The purchase tea from Thailand, the United States and the European Union and the United States in the year 2551[1-2]. 118,339.52 hectares of tea growing area is ranked 14th in the world by the provinces that grow very slowly. Chiang Mai, which had grown tea is used to produce green tea the most. 60 per cent of all drink tea. The quality of green tea, it is important that operators must take into account. In particular, the Tea is safe to consume. It has been harmed by the contaminated substances or qualities of green tea into the quality of the ingredients in green tea. Contamination from bacteria that cause the disease and hazardous chemicals Particularly contamination of heavy metals, which can accumulate in the body longer and injustice to the body [3-4]. The heavy metal contamination that has occurred for several reasons, for example, the geological formation of the area planted, management of tea garden of pesticides or chemical or fertilizer production. The study of absorption of heavy metals into the tea tree is found early. Tea can absorb heavy metals into the trunk and from the contamination. Heavy metal lead in the tea leaves on the market of Sierra Jiang. People's Republic of China, China also found that the soil around the plant for Thailand. The study heavy metal residues in tea and soil at planting but there are reports of pesticide residues. Found that the quality of drinking green tea and 25 samples in Chiang Mai. Drug residues found some examples are the 20 pesticides that exceed the standards set to take the metal. Also a heavy mixture of pesticides and fertilizers. May result in the tea leaves that have been contaminated with chemicals. It is dangerous [5-9]. And tea plantations in some areas are also using the chemical. Pesticides or chemical fertilizers National policy on organic agriculture. The kitchen is the world's food crops. Production must be free from harmful substances or heavy metals that are toxic to the human body. If found to have High concentrations of heavy metals in any area. It indicated that the contamination occurred. And have managed to Eliminate the cause of the problem; The study of heavy metals in soil on agricultural crops in the wetlands. In Chiang Rai And Chiang Mai found With an average of lead, copper and zinc was 21.07, 19.15 and 39.25 milligrams per kilogram respectively [10-15]. But there were no reports of heavy metals in the soil of the plateau. The land of tea plantations. Technical inspections of heavy metal contamination in several departments often use. How Atomic Absorption Spectrometry (AAS), which is a less precise method ICP-MS and AAS methods can be analyzed as only one element (single - element analysis) time-consuming to analyze. Because ICP-MS method can be used. In testing, both qualitative and quantitative analyzes quickly. It can be analyzed Meanwhile, several elements (simultaneous multi - elements analysis) solution addition. The samples will be analyzed using small amounts. Convenience and ease the process of analysis, if the study to analyze multiple elements using ICP-MS analysis will be faster than that in. This research aims to study heavy metals in soil and green tea grown by ICP-MS. By linear regression equation to predict and calculate the amount of heavy metals. The absorption of heavy metals in the tea. And a comparative analysis between heavy metal and Flame AAS method [16-18] as well as the accuracy. And determining the percentage recovery of heavy metals in the sample.

Also experience low signal noise and high stability. Which currently has mineral analysis tools. High performance elemental analysis such as Inductively Couple Plasma-Optical

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Emission. Spectrometer (ICP-OES) is an analytical tool. Both qualitative and quantitative tests as well. Analysts have multiple elements at the same time. (Simultaneous Multielements Analysis) using ICP technique are two parts to produce high temperature plasma with argon gas emissions through torch attached to the transmitter frequency. When the frequency into a magnetic field is induced. The electric Spark with Tesla. A high-energy electrons collide with other electrons. A chain reaction A plasma fraction OES principle makes the transition from the ground state to the substance. The substance is excited to emit light or spectrum analyzer out. For example, inIndian study heavy metal contamination in black tea leaves grown in the city in six areas.Valparai town in Nilgiris Vandiperiyar town of Munnar and Wayanad town of the city. Karnataka total of 100 samples using AAS analysis found that the volume. Of copper, chromium, nickel, cadmium and lead, in the amount of 24.07 ± 2.25, 4.76 ± 1.27, 2.53 ± 1.01, 0.14 ± 0.06 and 0.81 ± 0.32 mg per kg, respectively [19-21]. For Argentina it has used. Electrothermal Atomic Absorption Spectrometry (ETAAS) and Ultrasonic Nebulization System Coupled to Inductively Coupled Plasma Optical. Emission Spectrometry (USN-ICP-OES) Determination of Heavy Metals in the tea leaves. And tablets are made Herbs by random sampling from the market. The sample beverages and dry tea leaves. The analysis not found the amount of chromium and cobalt. Because the value is well below the detection limits as can be. Steel, aluminum, cadmium, lead and vanadium have. But the analysis has been lower than that acceptance by consumers each day (acceptable daily intake), the World Health Organization recommendations and the survey sample digestion with tea. Microwave (microwave digestion) and extracted with hot water (hot water extraction), then measure. Boron is in black tea, green tea, coffee, fruit juice. And roasted coffee beans found in large quantities. 3:21 to 9:25, 3:54 to 5:52, from 2.71 to 27.7, from 13.3 to 21.3, and from 7.57 to 17.5 mg per kg, respectively [22-26]. Studies on the absorption of Lead from soil into the tea found that soils with high acidity makes tea tree can absorb lead in soil. It was also found that increasing the alkalinity to the soil by adding calcium carbonate to pH. An increase of one unit can reduce the absorption of lead into the tea percent of 20-50.

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Testing for amounts of a heavy metals in green teas.

The scope of the research project

This study randomly sampled green tea available in the market, covering all sources producing a total of 5 samples (water and powder) were analyzed for heavy metals.

II. MATERIALS AND METHODS

A. EQUIPMENT

Atomic Absorption Spectrophotometer, the company GBC model AVANTA (Australia)

- filler paper No. 1 (Whatman)
- Furnace model Nabertherm (Germany)
- Crucible
- Micropipet
- grassware basic in operation room

B. CHEMICALS SUBSTANCE

- Cd(aq) 1000 ppm [Spectracer UK Ltd]
- Co(aq) 1000 ppm [Merck K GaA]
- Cu(aq) 1000 ppm [Merck K GaA]
- Pb(aq)1000 ppm [Spectracer UK Ltd]
- Conc. HNO_3 (68-70 %) [BAKER ANALYZED]
- 0.01 M HNO_3

C. SAMPLE PREPARATION

This research prepared standard solution of heavy metal of 4 kinds : Cd, Co, Cu and Pb to have concentration as follow:

- 0.2, 0.6, 0.8, 1.5, 1.8 ppm for Cd
- 1.0, 3.0, 5.0, 10.0, 15.0 ppm for Co
- 1.0, 3.0, 5.0, 10.0, 15.0 ppm for Cu
- 2.0, 5.0, 10.0, 15.0, 20.0 ppm for Pb

The Green tea samples were collected from Market and cleaned then washed with distilled water. Dried green teas were dried at room temperature for two weeks. The dried Green teas were digested as following: 1.0 g of each was dissolved in 1M nitric acid (10 ml), boiled to complete the dissolution and filtrated. The obtained precipitate was washed with nitric acid (1 M) and transferred to 25 ml volumetric flask and fill up to the level with de-ionized water and then analyse with AAS.

III. RESULT AND DISCUSSION

The accepted values of the concentrations of Co, Cd, Cu and Pb in Herbs as reported in the World Health Organization (WHO) were presented in Table I.

TABLE I
LEVELS OF HEAVY METALS IN HERBS AS REPORTED IN WHO

Heavy metal	Concentration (mg/kg)
Co	0.015
Cd	0.030
Cu	0.025
Pb	0.050

The concentrations of Co in Green tea were presented in Table II.(water)

TABLE II
THE CONCENTRATION OF Co IN GREEN TEAS

No.	Name	Concentration (mg/kg)
1	Sample A	0.003
2	Sample B	0.005
3	Sample C	0.010
4	Sample D	0.007
5	Sample E	0.008

It was found that the concentration of this metal (Co) was ranged from 0.003 mg/kg to 0.010 mg/kg, which means that, the concentrations of Co in all examined green teas were less than the reported level shown in Table I.

TABLE III
THE CONCENTRATION OF Cd IN GREEN TEAS

No.	Name	Concentration (mg/kg)
1	Sample A	0.019
2	Sample B	0.007
3	Sample C	0.011
4	Sample D	0.015
5	Sample E	0.016

The results of analysis indicated that the concentrations of the Cd in all examined green teas varied from 0.011 mg/kg to 0.019 mg/kg as shown in Table III and was less than the standard value.

TABLE IV
THE CONCENTRATION OF Cu IN GREEN TEAS

No.	Name	Concentration (mg/kg)
1	Sample A	0.009
2	Sample B	0.007
3	Sample C	0.005
4	Sample D	0.015
5	Sample E	0.016

The results of analysis indicated that the concentrations of the Cd in all examined green teas varied from 0.007 mg/kg to 0.016 mg/kg as shown in Table IV and was less than the standard value.

TABLE V
THE CONCENTRATION OF Pb IN GREEN TEAS

No.	Name	Concentration (mg/kg)
1	Sample A	0.035
2	Sample B	0.020
3	Sample C	0.031
4	Sample D	0.032
5	Sample E	0.015

Table V present the concentration level of Pb in all examined green tea samples. The obtained results from this table indicated that the concentrations ranged from 0.015 mg/kg to 0.035 mg/kg. These values were lower than the accepted values reported in Table I.

TABLE VI
THE SUMMARY OF THE CONCENTRATION OF HEAVY METAL IN GREEN TEAS

No.	Name	Concentration (mg/kg)			
		Co	Cd	Cu	Pb
1	Sample A	0.003	0.019	0.009	0.035
2	Sample B	0.005	0.007	0.007	0.020
3	Sample C	0.010	0.011	0.005	0.031
4	Sample D	0.007	0.015	0.015	0.032
5	Sample E	0.008	0.016	0.016	0.015

The summary of concentration of heavy metal in all examined green teas were presented in Table VI. It is very clear that these values are less than the reported values which indicated in Table I.

The concentrations of Co in Green tea were presented in Table VII.(powder)

TABLE VII
THE CONCENTRATION OF Co IN GREEN TEAS

No.	Name	Concentration (mg/kg)
1	Sample A	0.010
2	Sample B	0.004
3	Sample C	0.010
4	Sample D	0.008
5	Sample E	0.012

It was found that the concentration of this metal (Co) was ranged from 0.004 mg/kg to 0.012 mg/kg, which means that, the concentrations of Co in all examined green teas were less than the reported level shown in Table I.

TABLE VIII
THE CONCENTRATION OF Cd IN GREEN TEAS

No.	Name	Concentration (mg/kg)
1	Sample A	0.023
2	Sample B	0.022
3	Sample C	0.019
4	Sample D	0.013
5	Sample E	0.021

The results of analysis indicated that the concentrations of the Cd in all examined green teas varied from 0.013 mg/kg to 0.023 mg/kg as shown in Table VIII and was less than the standard value.

TABLE IX
THE CONCENTRATION OF Cu IN GREEN TEAS

No.	Name	Concentration (mg/kg)
1	Sample A	0.012
2	Sample B	0.010
3	Sample C	0.013
4	Sample D	0.018
5	Sample E	0.011

The results of analysis indicated that the concentrations of the Cu in all examined green teas varied from 0.010 mg/kg to 0.018 mg/kg as shown in Table IX and was less than the standard value.

TABLE X
THE CONCENTRATION OF Pb IN GREEN TEAS

No.	Name	Concentration (mg/kg)
1	Sample A	0.035
2	Sample B	0.041
3	Sample C	0.021
4	Sample D	0.022
5	Sample E	0.034

Table X present the concentration level of Pb in all examined green samples. The obtained results from this table indicated that the concentrations ranged from 0.021 mg/kg to 0.035 mg/kg. These values were lower than the accepted values reported in Table I.

TABLE XI
THE SUMMARY OF THE CONCENTRATION OF HEAVY METAL IN GREEN TEAS (POWDER)

No.	Name	Concentration (mg/kg)			
		Co	Cd	Cu	Pb
1	Sample A	0.010	0.023	0.012	0.035
2	Sample B	0.004	0.022	0.010	0.041
3	Sample C	0.010	0.019	0.013	0.021
4	Sample D	0.008	0.013	0.018	0.022
5	Sample E	0.012	0.021	0.011	0.034

The summary of concentration of heavy metal in all examined green teas were presented in Table VI and XI. It is very clear that these values are less than the reported values which indicated in Table I.

IV. CONCLUSION

The amounts of heavy metal in all types of green teas were lower than the reported values of the WHO. This result confirmed that all type of green teas obtained from market were safe to consumption for long live living (clean food good health). From this experiment it was concluded that 5 types of green teas can be consumption with safety and to improve the sustainable quality of life in the community.

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