

Evaluation Of Different Solvents For Determination Of Caffeine In Tea Leaves Using UV- Visible Spectrophotometric Method.

Aisha Abu al-Qasim Muftah

Abtisam Miftah Dhaw

Higher Institute of Medical Sciences and Technology

Abu Salim – Pharmacy Department

Tripoli – Libya.

Abstract

Caffeine goes about as a stimulant drug. In people, caffeine goes about as a focal sensory system energizer, briefly avoiding laziness and reestablishing sharpness. It is the world's most generally burned-through psychoactive medication, at the same time, dissimilar to numerous other psychoactive substances, it is both lawful and unregulated in virtually all areas of the planet. Due to the wide spread utilization of caffeine, it is essential to gather exact data of their substance in sorts of beverages. Most exploration exercises have been centered around chromatographic like as HPLC technique, nonetheless, spectra-photometric assurance is favored in view of its velocity, high exactness, effortlessness and reproducibility. A benefit of UV Spectrophotometric is useful and it is found in many research facilities. Yet, caffeine content in tea leaves not really set in stone straightforwardly utilizing UV noticeable spectrometer, because of the lattice impact of UV engrossing substances. Straightforward and exact technique for the assurance of Caffeine content in tea leaves straightforwardly utilizing UV-apparent spectrometer was created. Standard direct adjustment bend with acknowledged relationship esteem was gotten.

Key words; Evaluation ; Caffeine ; Spectrophotometric ; Tea leaves ; Solvents

ملخص البحث:

يعمل الكافيين كعقار منبه للإنسان، أيضا يعمل الكافيين كمنشط للجهاز العصبي المركزي، مما يقوي مؤقتًا من النعاس ويعيد اليقظة. إنه أكثر العقاقير ذات التأثير النفساني استهلاكًا على نطاق واسع في العالم، ولكنه على عكس العديد من المؤثرات العقلية الأخرى، فهو قانوني ومنظم في جميع أنحاء العالم تقريبًا. بسبب الانتشار الواسع للكافيين، من المهم جمع معلومات دقيقة عن محتواها في أنواع المشروبات. تركزت معظم الأنشطة البحثية على الكروماتوغرافيا، ومع ذلك، يفضل تحديد الطيف الضوئي بسبب سرعته ودقته العالية وبساطته وإمكانية استنساخه. مزايا قياس الطيف الضوئي بالأشعة فوق البنفسجية رخيصة وموجودة في العديد من المعامل. لكن محتوى الكافيين في أوراق الشاي لا يمكن تحديده مباشرة باستخدام مقياس الطيف المرئي للأشعة فوق البنفسجية، بسبب تأثير المصفوفة للمواد الممتصة للأشعة فوق البنفسجية. تم تطوير طريقة بسيطة ودقيقة لتقدير محتوى الكافيين في أوراق الشاي مباشرة باستخدام مقياس الطيف المرئي للأشعة فوق البنفسجية. تم الحصول على منحنى معايرة خطي قياسي بقيمة ارتباط مقبولة.

1. Introduction

Caffeine is a white glasslike xanthine alkaloid that goes about as a stimulant drug (Bdullahi et al., 2019). Caffeine is found in fluctuating amounts in the seeds, leaves, and product of certain plants, In people, caffeine goes about as a focal sensory system energizer, briefly avoiding sleepiness and reestablishing sharpness. It is the world's most generally devoured psychoactive medication, be that as it may, not at all like numerous other psychoactive substances; it is both legitimate and unregulated in practically all areas of the planet. Refreshments containing caffeine, like espresso, tea, sodas, and caffeinated drinks, appreciate incredible ubiquity; in North America, 90% of grown-ups burn-through caffeine day by day (Amra et al., 2006). Many customers like to stay away from caffeine to some extent or by and large, because of its stimulant effect on others, still on wellbeing concern. This makes decaffeination of tea a significant modern interaction. Moreover, caffeine has a somewhat harsh flavor. Subsequently, decaffeinating espresso beans and tea leaves will leave the flavor somewhat changed, regardless of whether no different parts are lost. It ought to be noticed that, decaffeinated espresso and tea are not caffeine free (Guzin A., 2002).

Tea is refreshment on the planet's second most broadly devoured later mineral water. Tea is likewise exceptionally well known as a drink (beverage), notwithstanding espresso and chocolate, which has had a long history and utilized in almost 160 countries all over the planet as a refreshment every day. The prominence of tea as a refreshment since it is accepted to drink tea can work on the soundness of people. This is on the grounds that the tea contains many poly phenols compounds, which known to have high enemy of oxidant activity beside caffeine (Tuminah S., 2004). Caffeine is a kind of alkaloid that normally present in espresso beans, tea leaves, cashew leaves, cola nuts, cocoa beans, and a few refreshments (model: caffeinated drink). Caffeine has a sub-atomic weight of 194.19 g/mol. with the compound formula $C_8H_{10}N_4O_2$ as shown in figure 1, and pH 6.9 (1% arrangement of caffeine in water) (Ashihara and Crozier, 1999). There was no such thing as experimentally, the immediate impact of caffeine on wellbeing, however that there are aberrant impacts, for example, animating the respiratory and heart, and give impact be sides feeling of anxiety (neuroses), cannot sleep (insomnia), and unpredictable earth beat (tachycardia) (Bdullahi et al., 2019; Wanyika et al., 2010). In general, caffeine has been used widely in the field of food and drug industry, as in the assembling of jar of soda refreshments, just as medications for the treatment repairer energizer and diuretic. Caffeine is remembered for the Purina alkaloid called the bromine assuming it is in chocolate and thiamin on the off chance that it is in the tea. Low dosages of caffeine, 15-60 mg/serve (probably as much as in a solitary cup of moment tea (teabag) or green tea or prepared tea) worked on long haul memory. Low to medium dosages (around two cup's worth) further developed consideration, memory and coordination. But of the many advantages of tea, there are awful impact delicate one of which is caffeine are hazardous when utilization is excessively unreasonable (in excess of 300 mg/day) (www.kalbe.co.id,2011). So that the vital observing of caffeine levels in tea leaves available.

Proof of a danger to pregnancy is dubious, yet a few specialists have inferred that reasonable counsel is for pregnant ladies to restrict utilization to what could be compared to two cups of espresso each day or less. Caffeine has diuretic properties when directed to individuals, who are not accustomed to it, however customary clients foster a resistance with this impact, and studies have commonly neglected to help the normal idea that conventional utilization contributes altogether to parchedness. With weighty use, solid

resilience grows quickly and caffeine can create clinically huge physical and mental reliance (Bolton and Null, 1981).

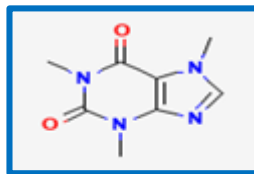


Fig.1 The formula structure of Caffeine. (IUPAC name: 1,3,7-Trimethylpurine-2,6-dione).

1.1 Hypothesis and problem

Caffeine content in tea leaves not set in stone straightforwardly utilizing UV-noticeable spectrometer, because of the lattice impact of UV retaining substances. This impact can be seen in the otherworldly groups of tea leaves in water that is caffeine spectra interface with different mixtures in tea leaves. Consequently, it is important to foster a technique to beat this trouble.

1.2 Objectives

Investigation of different solvents for caffeine assurance utilizing UV Spectrophotometry.

1.2.1 Scope of Work:

1. To approve UV-Visible spectrometer strategy for the assurance of caffeine in a few dissolvable include: wavelength most extreme, affectability, scope of fixation measurement, limit of discovery.
2. To find a suitable solvent to dissolve the tea leaves.
3. To find a suitable solvent used in extracting caffeine from tea leaves.
4. Validation of UV spectrophotometric strategy for deciding caffeine in tea leaf using several extracted solvents and their outcome contrast each other with get the best solvent, and extraction of caffeine from the tea leaves. then determine caffeine content in tea leaves using UV spectrophotometric with the best solvents to decide the exactness and precision of the strategy.

2. Material and Methods

UV-apparent spectrometer UV frequency range from (180-400) nm (Shimadzu model 1650, Tokyo, Japan) was utilized, all the crystal were splashed for the time being with chromic corrosive arrangement and washed completely with water and cleanser, then, at that point, flushed with refined water before use. UV-1601-UV-Visible spectrophotometric. Volumetric carafe (10mL-100mL) glass bottle, pipette(10mL-100mL), Beaker, water shower, Magnetic stirrer, Filter paper, Test tube, Funnel, Standard flagon (10mL-100mL), little Spoon, thermometer, reparatory pipe. UV-visible spectra-photometer. The solvents use in this review including (Methanol, Chloroform, water and Ethyl Acetate) with was of great essentially logical grade. Espresso and tea tests were gotten from business sectors the espresso and tea tests were kept at room temperature.

2.1 Sample preparation

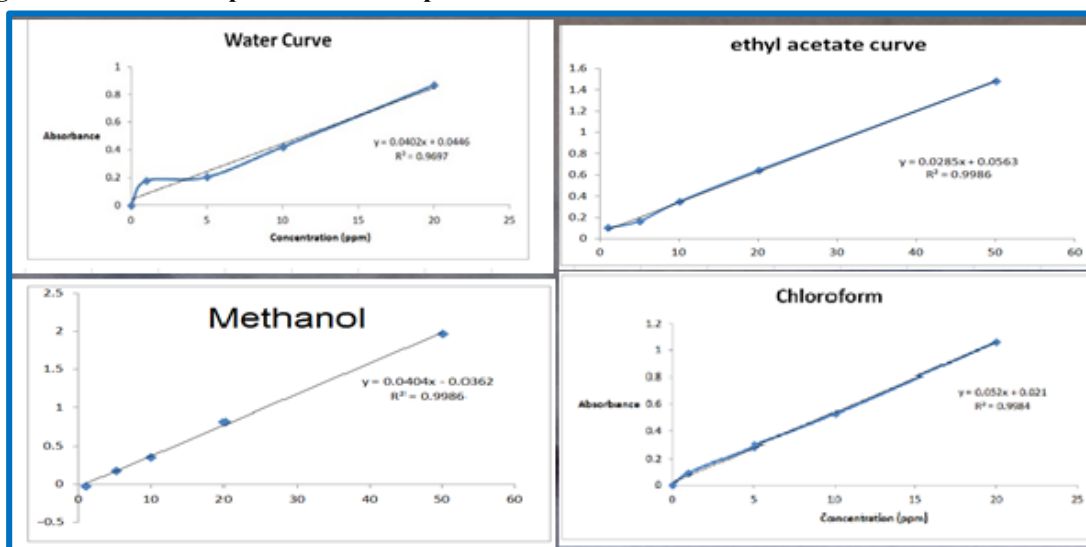
10 mg of unadulterated caffeine was immersed in 50 mL of selected solvent and stirred for 30 minutes. The absorbance versus frequency of the arrangement was estimated using spectrophotometrically at the maximum. Measurement of tea samples: Warm (40°C) distilled water was used to dissolve three types of tea packages as follows. 50 mL of distilled water was warmed to 40°C. then 100 mg of tea bags were added to hot water and stirred for 30 minutes with a magnetic stirrer. The mixture was filtrated through a glass filter and cooled to room temperature. 50 mL of the selected solvent was added to the aqueous extract of tea, and stirred for 10 minutes using a magnetic stirrer, then the water layer was separated from the organic layer with a separator funnel. A UV cuvette (1 cm) quartz cell was used to measure the absorbance of the sample. The sample was measured with precision and accuracy.

3. Results and Discussion

Several solvents have been examined to observe the best one for dissolving the tea leaves such as water, ethyl acetic acid derivation, chloroform and methanol. The standard adjustment curves were obtained for each soluble as shown in figures 2. It is obvious from calculates that chloroform is the best dissolvable as a result of its alignment bend has the most elevated worth of the slant notwithstanding great solvency of tea roof in it so we thought about chloroform the best one.

The alignment diagram was produced Six unique groupings of caffeine from 10 ppm to 100 ppm were dissected by exploratory conditions. Then, at that point, the alignment curve was set up as indicated by the gut reaction (top region) and the centralizations of caffeine in standard arrangements. The outcomes show a decent direct relationship.

Fig. 2 The relationship between absorption versus concentration of standard caffeine and caffeine



extracted using a different solvents.

4. Conclusion

Basic and exact strategy for the assurance of Caffeine content in tea leaves straightforwardly utilizing UV-noticeable spectrometer was created, the best dissolvable was chloroform. Standard direct adjustment bend was raced to get the straight scope of test investigation, connection factor was with acknowledged worth = (0.9984) and the standard alignment bend was direct over the reach (0-20) ppm caffeine with condition ($y = 0.052X + 0.021$)

Chloroform was the best specific dissolvable between the four solvents because of its extremity properties and great capacity to disintegrate leaves of tea.

References

- Amra, P., S. Mojca, K. Zeljko, W. Bernd, O. Frank, G. Sabine, 2006. Extraction of active ingredients from green tea (*Camellia sinensis*): Extraction efficiency of major catechins and caffeine, *Food Chem.*, 96: 597-605.
- Ashihara, H., and Crozier, A. (1999). Biosynthesis and catabolism of caffeine in low-caffeine-containing species of *Coffea*. *J. Agric. Food Chem.*, 47, 3425-3431.
- Bdullahi, R., Lawal, A. M., Ibrahim, M. S., Khalid, A., Muhammed, U. L., 2019. *Korean Journal of Food and Health Convergence*, 5(3): 7-20.
- Bolton, S., Null, G., 1981. Caffeine, psychological effects, use and abuse, *Orthomol Psychiatr.*, 10(3): 202-211.
- Guzin, A., 2002. Derivative spectrophotometer determination of caffeine in some Beverages. *Turk. J. Chem.*, 26: 295-302.
- Tuminah, S. 2004. Teh (*Camellia sinensis* var. *Assamica* (Mast)) sebagai Salah Satu Sumber Antioksidan. Jakarta: Pusat Penelitian dan Pengembangan Pemberantasan Penyakit, Balai Penelitian dan Pengembangan Kesehatan, Departemen Kesehatan RI.
- Wanyika, H. N., Gatebe, E. G., Gitu, L. M., Ngumba, E. K., Maritim, C.W., 2010. Determination of caffeine content of tea and instant coffee brands found in the Kenyan market. *Afr. J. Food Sci.*, 4, 353-358.
http://www.kalbe.co.id/files/144_16AntioksidanTea.pdf/144_16AntioksidanTea.html. (diakses tanggal 28 April 2011)