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Research Article

Estimation of Caffeine in Different Marketed Samples of Tea

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ABSTRACT

The objective of this study was estimate of Caffeine in Different Marketed Samples of Tea Although there were no significant differences between the orders of caffeine content among the tested tea brands, the method with chloroform isolation exhibited significantly lower results and the highest results obtained by the micromethod using H₂SO₄ at 273 nm UV wavelength with regard to other methods applied for the determination of caffeine. The non-laborious chemical method of determination of caffeine in tea samples using Lead oxide and Chloroform has shown us the caffeine levels in various samples. It is also true that caffeine in tea can have positive and negative effects on the organism consuming it.

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INTRODUCTION

Caffeine is an alkaloid found naturally in tea and coffee plants which acts as a stimulant of the central nervous system in humans, having the effect of temporarily warding off drowsiness and restoring alertness¹. Other sources of caffeine include cocoa beans, kola nuts, guarana berries, yerba mate and yaupan holly. Indeed it is found naturally in leaves seeds or fruits of many plant species. Caffeine's popularity as a natural stimulant is unparalleled. An estimated 80% of the world's population enjoys a caffeinated product daily. Other sources of caffeine include cocoa beans, kola nuts, guarana berries, yerba mate and yaupan holly. Due to its stimulating effects, it has been known to enhance alertness and focus, improved athletic performance, elevated mood and increased metabolism².

Caffeine which is found in tea and coffee imparts bitterness and also act as a flavor constituent³. It is a mild nervous stimulant towards drowsiness and fatigue. In this respect, is used by athletes to enhance performance since it mobilizes fats from stores a process that normally does

not become maximal until intense activity is underway⁴. Caffeine is used as a drug on the basis of its effect on respiratory, cardiovascular and the central nervous system. It is included with aspirin in some preparations for treatment of headaches as it decreases cerebral eye blood flow. It is included with ergotamine in some antimigrane preparations, the object being to produce a mildly agreeable sense of alertness⁵. Caffeine is administered in the treatment of mild respiratory depression caused by central nervous system depressants such as narcotic⁶. Caffeine may also be used in the treatment of acute circulatory failure. In either beverage or in nonprescription tablet form, it may be used to relieve fatigue since it increases the amount of urine flow. In fact there are about 2000 non-prescription and about 1000 prescription drugs containing caffeine⁷. An excessive intake of caffeine in some person appears to augment the sensitivity of the heart to emotional and other factors and so increase the incidence of extra systoles and other arrhythmias. Since Caffeine affect the central nervous system conversely, Omission of a habitual morning dosage often results in Nervousness

irritability, drowsiness, poor work performance and headache curable only by taking more Caffeine⁸.

MATERIALS AND METHODS

All the glassware were soaked overnight with chromic acid solution and washed thoroughly with water and detergent, then rinsed with Deionised water before use. The chemicals and reagents used in this study were of high quality at least analytical grade. Three brands of tea Samples: Brookebond Taaza, Tata tea Agni, Goodricke. Tea samples were kept at room temperature throughout analysis.

Method of estimation of Caffeine

Sample preparation: Three brands of tea available in Bhopal market were collected that are Brookebond Taaza, Tata tea Agni, Goodricke in leaf form. In order to simulate household brewing conditions, teas were prepared using an aqueous extraction. Tea samples (2.5 g) were poured with 200 ml of boiling water and stirred for 10 minutes. Extracts were filtered through a cotton wool, cooled at a room temperature, diluted to 250 ml with distilled water, and used for spectrophotometric analyses.

Caffeine Isolation with Chloroform: The caffeine isolation procedure was performed according to a modified method described earlier. Briefly, 20 g of tea and 90 ml of distilled water was refluxed for 30 min, and filtered under vacuum. The residue was again refluxed and filtered. Obtained filtrates were combined, 12.5 ml of Pb (CH₃COO)₂ solution was added, boiled (5 min), and filtered through a Büchner funnel with silica gel layer. The filtrate was extracted four times with chloroform (40 ml). Combined chloroform phases were washed with KOH solution and then with distilled water. Chloroform was removed from extracts by rotary evaporator. After evaporation, extracted caffeine was weighed and expressed in mg/l.

Caffeine determination using the lead acetate solution: This procedure is based on international standards with some modifications. Tea extract was treated with HCl solution (5 ml), Pb(CH₃COO)₂ and H₂SO₄ solution. Absorbance of obtained extracts was measured at 274 nm. The content of caffeine (mg/l) was calculated using a standard curve derived from caffeine (0–250 mg/l). All measurements were performed in triplicate.

Micromethod for the determination of caffeine: The teas were also analysed for caffeine content according to the method reported by **Groisser (1978)**⁹. Briefly, tea extracts (pH=8–9) were extracted with benzene and H₂SO₄. Absorbance of extracts was read at 273 nm against a blank (H₂SO₄). Results, obtained by triplicate analyses, were calculated using a standard curve, as mg/l.

RESULTS AND DISCUSSION

Caffeine content of three type of teas determined by the extraction procedure with chloroform ranged 1.16 % (Goodricke) 1.64% (Tata tea Agni) and 1.74 % (Brookebond Taaza). Results confirm this contains the lowest caffeine content.

Table 1: Caffeine content in tea using chloroform isolation procedure

S. No.	Brand Name	Percentage of Caffeine Obtained
1	Brookebond Taaza	1.74
2	Tata tea Agni	1.64
3	Goodricke	1.16

The determination of caffeine content by the using the lead acetate solution revealed that 2.62% (Goodricke) 2.89% (Tata tea Agni) and 3.36% (Brookebond Taaza).

Table 2: Caffeine content in tea using lead acetate solution method

S. No.	Brand Name	Percentage (%) of Caffeine Obtained
1	Brookebond	3.36
2	Tata tea Agni	2.89
3	Goodricke	2.62

The determination of caffeine content, the micromethod with benzene exhibited the highest results. Brookebond Taaza contained the highest caffeine content (4.98 %) and Tata tea Agni modest (4.61) and Goodricke (3.96) lowest.

Table 3: Caffeine content in tea using micromethod

S. No.	Brand Name	Percentage (%) of Caffeine Obtained
1	Brookebond Taaza	4.98
2	Tata tea Agni	4.61
3	Goodricke	3.96

Discussion:

Although there were no significant differences between the orders of caffeine content among the tested tea brands, the method with chloroform isolation exhibited significantly lower results and the highest results obtained by the micromethod using H₂SO₄ at 273 nm UV wavelength with regard to other methods applied for the determination of caffeine.

CONCLUSION

The non-laborious chemical method of determination of caffeine in tea samples using Lead oxide and Chloroform has shown us the caffeine levels in various samples. It is also true that caffeine in tea can have positive and negative effects on the organism consuming it. Further analysis on amount of catechin and gallic acid is required to show how a certain tea sample can cause psychological changes in the consumer. This analysis, to some extent also shows deciding factor for the selection of tea. High Performance Liquid Chromatography (HPLC) determination of catechin and gallic acid can help us understand and analyse the quality of tea samples with great precision.

CONFLICTS OF INTERESTS

There are no Conflicts of interests.

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