Determination of Caffeine in Tea Samples

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Abstract- **The experiment of extraction of caffeine from tea is very professional which is time consuming and the extractor is used is poisonous; Caffeine is bitter, white crystalline xanthine alkaloid and stimulant drug. It is found in varying quantities in the seeds, leaves and fruits of some plants, where it is acts as natural pesticides that paralyses and kills certain insects feeding on the plants.**

Tea is the most commonly and widely used soft beverages in household. It acts as stimulant for central nervous system and skeleton muscles. The amount of caffeine in tea lovers varies from sample to sample. Caffeine is responsible for the taste and flavour of tea, but pure caffeine has been found to be a tasteless substance.

This experiment was conducted to estimate the total amount of caffeine used in tea leaves of black tea, red tea and green tea. For example, some people boast their ability to drink several cups of coffee in evening and yet sleep like a long, on the other hand there are people who are so sensitive to caffeine that even a single cup of coffee will cause a response boarding on the toxic. The xanthenes beverages also create a medical problem. They are dietary of a stimulant of the CNS. Often the physicians face the question whether to deny caffeine containing beverages to patients or not. In fact children are more susceptible than adults to excitation by xanthenes. For this reason, tea and coffee should be excluded from their diet. Even cocoa is of Determination of Caffeine in Tea Samples Ankit Bahuguna (XII-A) doubtful value.

It has a high tannin content may be as high as 50 mg per cup. After all our main stress is on the presence of caffeine in xanthenes beverages and so in this project we will study and observe the quantity of caffeine varying in different samples of tea leaves.

Index terms- **Caffeine, Tea, Extraction of caffeine**

INTRODUCTION

Caffeine is widely used in pharmaceuticals, food and in many other products. Tea contains more caffeine than coffee by dry weight. This may vary in caffeine content based on nature of tea leaves, growing conditions and processing techniques. Today, caffeine is used much as stimulant drug. It provides a "boost of energy" or a feeling of heightened alertness. Many workers can drink tea or coffee frequently in order to get briskness. Likewise, drivers on long road trips often fill their cup holders with energy drinks or convenience-store coffees to help them push through to their destinations.

Overall, caffeine is present in the beans, leaves, and fruit of over 60 plants, where it acts as a natural pesticide that paralyzes and kills certain insects feeding upon them. Caffeine is a stimulant of CNS, having the effect of temporarily warding off drowsiness and restoring alertness.

MATERIALS AND METHODS

Different varieties of Indian tea samples were purchased from the market. Tea waste was collected from tea stall. The physical properties of tea powder and tea waste were analyzed.

TEA ACIDITY AND TASTE

Twenty-five grams of each sample was taken in a beaker and 100 ml of water was poured to it. The solution was heated till it boiled, after which the beaker was kept covered and allowed to stand for 5 minutes. A drop was taken from each beaker to spot on a pH meter. After recording the pH of the different tea samples we also tasted a sample of the tea from each beaker.

ANALYSIS OF COLOUR

The 20 grams of the sample was taken in a beaker added 200 ml of distilled water to it. The colour intensity was measured using a spectrophotometer at 450 nm.

ANALYSIS OF BULK DENSITY

A weighed quantity of tea powder was introduced into a graduated measuring cylinder. The measuring cylinder was tapped manually till a constant volume was obtained. This volume is known as the bulk volume of the tea powder. The same procedure was followed for each brand of tea powder. Bulk density of powder is defined as the ratio of the mass of the powder to its bulk volume of distilled water.

Bulk density = mass of the powder / bulk volume

EXTRACTION OF CAFFEINE

Tea bags are used as the source of caffeine for this experiment. Different varieties of 3 tea bags (50 g of each) were taken and boiled with 200 ml of distilled water for 10 minutes. This was allowed to cool for 5 minutes and then decant the mixture into another beaker. Then the tea bags were squeezed to liberate the rest of the water. The collected aqueous solution was cooled and mixed with 30ml of dichloromethane followed by 1%sodium sulphide. This mixture was mixed and poured into separation funnel. Two layers were separated and extracted filtrate was further heated to get the white crystals of caffeine. The extracted caffeine was measured spectrophotometerically at 645nm. The physical properties of caffeine were analyzed.

ANTIOXIDANT ASSAY

Antioxidant capacity of tea extracts and caffeine solutions (100 mg/l) were determined using the ABTS radical scavenging assay according to the method reported by Reetal. (1999), and ferric reducing/antioxidant power (FRAP) assay, carried out according to the original method by Benzie and Strain (1996)

USES OF CAFFEINE

1. In medicine, it is used to stimulate, central nervous system and to increase flow of urine.
2. Because of its stimulating effects, caffeine has been used to relieve fatigue. But it is dangerous and one may collapse if not consumes it under certain limit.
3. Caffeine is also used in analgesic tablets, as it is believed to be a pain reliever. It is also beneficial in migraines.

EFFECT OF CAFFEINE

1. It is psycho - stimulant.
2. It improves physical and mental ability.
3. Its effect in learning is doubtful but intellectual performance may improve where it has been used to reduce fatigue or boredom.
4. When administered internally, it stimulates heart and nervous system and also acts as diuretic. On the contrary their excessive use is harmful to digestion and their long use leads to mental retardation.

PROCEDURE

1. First of all, 50 grams of tea leaves were taken as sample and 150 ml of water was added to it in a beaker.
2. Then the beaker was heated up to extreme boiling.
3. The solution was filtered and lead acetate was added to the filtrate, leading to the formation of a curdy brown coloured precipitate.
4. We kept on adding lead acetate till no more precipitate has been formed.
5. Again solution was filtered.
6. Now the filtrate so obtained was heated until it had become 50 ml.
7. Then the solution left was allowed to cool.
8. After that, 20 ml. of chloroform was added to it.
9. Soon after, two layers appeared in the separating funnel.
10. The residue left behind was caffeine.
11. Then we weighed it and recorded the observations.
12. Similar procedure was performed with different samples of tealeaves and quantity of caffeine was observed in them.

OBSERVATION TABLE

1. Red Label Tea

Weight of china dish	46.60 gm
Weight of china dish with precipitate	49 gm
Amount of caffeine (each 50 gm tea)	2.4 gm

2. Tata Tea

Weight of china dish	46.60 gm
Weight of china dish with precipitate	47.63 gm
Amount of caffeine (each 50 gm tea)	1.03 gm

3. Green Label Tea (Lipton)

Weight of china dish	46.60 gm
Weight of china dish with precipitate	46.65 gm
Amount of caffeine (each 50 gm tea)	0.055 gm

CONCLUSION

1. Quantity of caffeine in Red label tea is 2400 mg/sample of 50 gm.
2. Quantity of caffeine in Tata Tea is 1030 mg/sample of 50 gm.
3. Quantity of caffeine in green label tea is 55 mg/sample of 50 gm.

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