Dr. BRR. GOVERNMENT COLLEGE, JADCHERLA, MAHABUBNAGAR (Dist.)

Student Study Project

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DEPARTMENT OF CHEMISTRY

Topic

QUANTITATIVE ANALYSIS OF PRESENCE OF CAFFEINE IN DIFFERENT TEA SAMPLES

Conducted by students

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QUANTITATIVE ANALYSIS OF PRESENCE OF CAFFEINE IN DIFFERENT TEA SAMPLES

ABSTRACT: Caffeine belongs to "Xanthine" family. It occurs naturally in coffee, tea, cocoa and variety of other plants. Caffeine is used as most widely used drug in the world. It has many uses as a Cardiac and Respiratory stimulant and as an agent that promotes Kidney diuresis. By using caffeine as raw material, ANACIN is prepared. Caffeine is a bioactive and in moderation it has a beneficial effects on the body :

- It increases alternes serves as a " Bronchial Dialator".

It stimulates metabolism and contributes an increase in " Dopamine levels in the Blood"

INTRODUCTION

- Caffeine is an alkaloid.
- It is found in coffee, tea based beverages and energy drinks.
- Caffeine is an stimulant of the Methylxanthine class which acts as CNS.
- There are many mechanisms which explains the effect of caffeine.
- Caffeine is mostly used to improve mental alertness and many other uses.
- It is also used in preventing simple headaches.
- Caffeine is a naturally occuring stimulant found in leaves,seeds,fruits and many more plant species of group containing compound called “Trimethylxanthine”.

PROPERTIES OF CAFFEINE

SYSTEMATIC NAME :1,3,7-Trimethyl-1H-Purine-2,6(3H,7H)-Dione

OTHER NAME :1,3,7-Trimethylxanthine

MOLECULAR FORMULA :$C_8H_{10}N_4O_2$.

MELTING POINT :238^0C

MOLECULAR MASS :194.19g/mole

SOLUBILITY IN WATER : slightly soluble

TEA:

It belongs to the family “Camelliaceae” is an aromatic beverages widely used in the house-hold. It is originated in South-Western China where it is used as Medicinal drink.It was popular drink during the Chinease Tang Dynasty.Tea drinking spread to Eastern Asian countries later it was introduced to West during 16th century,During the 17th century drinking tea became eligant among Bratain. Later who started commercialisation and large scale production of plants in India.

PRODUCTION OF TEA POWDER FROM TEA LEAVES

Fresh tea leaves

↓

Withering

↓

Bruising

↓

Oxidation

↓

Fixing

↓

Rolling

↓

Drying

ADVANTAGES OF TEA:

- There is plenty of research showing that drinking tea can actually improve your health
- Tea has the antioxidants .
- Tea has less caffeine than coffee.
- Tea may reduce your risk of heart attack and stroke.
- Tea may help in weight loss.
- Tea helps in boosting the immune system,fight off inflammation,even ward off cancer and heart disease.
- Tea may help with weight loss.
- Herbal tea may soothe the digestive system.
- Tea may help battle cancer.
- Tea has the ability to lower blood pressure.
- Tea contains the highest amounts of polyphenols, and

catechin.

COFFEE:

Coffee is widely used as beverage. It is prepared from coffee beans obtained from coffee plant.Coffee plants are found in sub-trophical regions like Africa and southern parts of Asia .Coffee is classified under “Rubiaceae family”.Coffee beans are of desired flavours .It contains 1-2% of caffeine concentration along with glucose,fats and proteins.Coffee is slightely Acidic and as stimulating effects in Humans due to presence of caffiene. The two most commonly grown coffee beans types are C.Arabica and C.Robusta.They are being cultivated in over 70 Countries.The Coffee has became a vital economy producing crop for many Countries.It as became primary source of income for 100 million people in the developing countries.

Goat Herder Kaldi discovered the coffee beans after eating the berries by seeing his goats being so energetic and did not sleep at night.

PRODUCTION OF COFFEE POWDER FROM COFFEE BEANS:

Selection of coffee plant

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Screening

↓

Blending

↓

Storage & Handling

↓

Roasting

↓

Cooling

↓

De-stoning

↓

Equilibration

↓

Grinding

↓

Packaging

ADVANTAGES OF COFFEE:

- Coffee boosts the energy levels.
- It supports the brain health.
- Coffee may promote weight management.
- It is linked to a lower risk of depression.
- Coffee could protect against liver conditions.
- It supports heart health.
- Coffee could increase longevity.
- It may enhance athletic performance.

CAFFEINE:

Caffeine is called ”Thein” was first discovered in tea in 1827.

It is a purine,a heterocyclic compound .

Caffeine is named as 1,3,7-Trimethylxanthine .

It has a bitter taste.

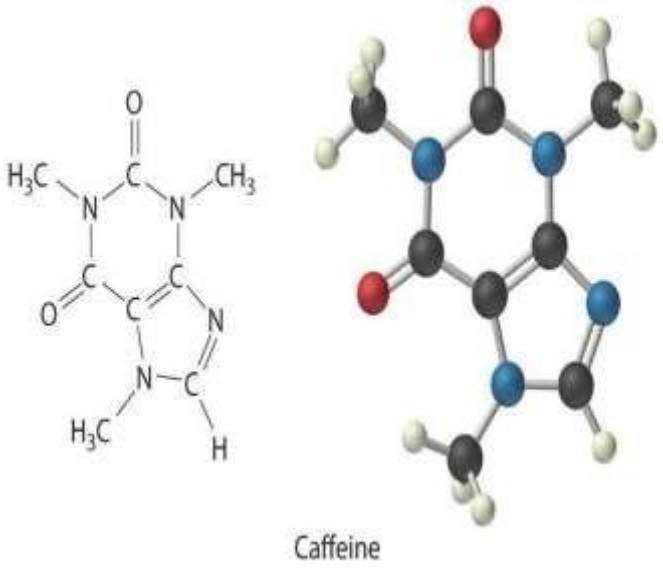
The compound caffeine comprises carbon,nitrogen,hydrogen and oxygen atoms .

It is made up of 8 -carbons

10-hydrogens

4-nitrogens

2-oxygens



Caffeine

CHEMICAL FORMULA :$C_8H_{10}N_4O_2$

CAFFEINE PRODUCTS:

COFFEE:

The main source of caffeine is ''coffee'' beans from which the coffee is brewed. The caffeine content depend upon various types of coffee beans and the method of preparation. For example arabica variety ''ESSPRESO'' is one type of coffee which ranges from 80 to 100 milligram.

SOFT DRINKS:

Caffeine is a common ingredient in soft drinks such as cola, prepared from kola nuts. Soft drink contain 0 to 55mg caffeine per 12 ounce serving. The caffeine in the soft drinks is either produced by the ingredients used for it is an additive derived by chemical synthesis.

TABLETS:

Tablets have many advantages over coffee and tea. These tablets are commonly used by students studying for their exams and by people who work or drive for long hours.

Some beverages combine alcohol with the caffeine. So the stimulant effect of caffeine will reduce the depressant effects of alcohol and potentially reducing the awareness of intoxication.

OVERDOSE:

Consumption of caffeine more than 1.5g per day causes the condition called caffeinism. It causes the unpleasant symptoms including nervousness, Restless, headaches and palpitations. Overdose of caffeine in CNS cause caffeine in toxication. This symptoms includes restlessness, fidgeting, anxiety, excitement, Increased urination, gastro intestinal disturbances, muscle twitching, irritability and irregular rapid heartbeat. Massive overdose sometimes leads to death. Treatment of intoxication includes haemo dialysis and haemo filtration.

SIDE EFFECTS:

Physical:

These symptoms arises by the caffeine consumption which includes anxiety and reduced co-ordination. The caffeine can cause anxiety and panic disorder s at the higher at the higher dose i.e. 300mg. But at low doses of caffeine can increase alertness and decreased fatigue.

During pregnancy:

During pregnancy, the consumption of caffeine doesn't increase risk of miscarriage or retardation of growth. The pregnant women should limit their caffeine intake to less than 200mg a day. In some cases consumption of caffeine is harmful during pregnancy. The metabolical activitity decreases which causes hormonal imbalance during pregnancy showing longterm affects

AIM:

To study the Extraction of caffeine from various tea powder and coffee powder.

Objectives:

- Isolation of caffeine from Tea powder.
- Isolation of caffeine from Coffee powder.
- To determine the adulteration in Tea powder and Coffee powder.

Apparatus:

TEA POWDER

SEPARATING FUNNEL

BURNER

EVAPOURATING DISHES

COFFEE POWDER

WATER

4-BEAKERS

CHEMICALS REQUIRED:

- **CHLOROFORM**

- **SODIUM SULPHATE**

PROCEDURE:

EXTRACTION OF CAFFINE FROM THE BREWED TEA:

- Take 20 ml of deionized water into 50 ml beaker .
- And the tea powder into beaker and continue heating upto 20-30 minutes.
- Stirr the material with the help of the glass rod.
- the excessive evapouration of the water occurs add more distilled water as required.

Then after boiling ,filter the boiled powder from the water into a beaker.

- The tea solution is poured into a separating funnel and 20 ml of chloroform is added to it.The mixture will separate into two layers.The top layer is tea layer and the bottom layer is chloroform.Since it is denser than tea.

- Keep your fingers on the stopper and carefully shake the separating funnel.When the contents have been sufficiently shaken then placed the separating funnel on the ring stand .And let the two layers separete.
- Drain the bottom layer into the conical flask because the caffeine is extracted into chloroform layer.

Cover the mouth of the conical flask to avoid the evapouration of the solution.

- Then add the sodium sulphate into the conical flask for the purification of the caffeine solution.
- Then add the solution into the evapourating dish and place it in dry place for 24 hours.

EXTRACTION OF CAFFEINE FROM COFFEE POWDER

Take 20 ml of deionized water into a 50 ml beaker and add coffee powder to it.

And heat the beaker for 15-20 minutes.After boiling filter the coffee powder from the solution.

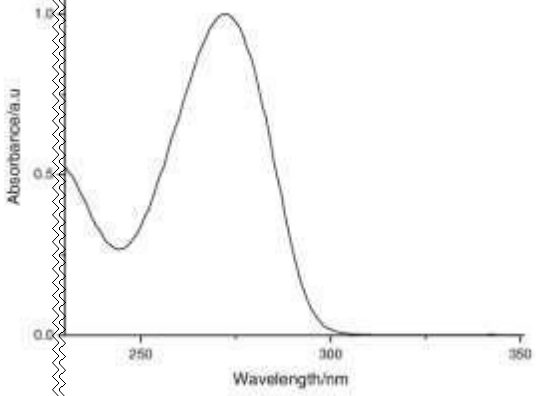
Then transfer the coffee solution into the separating funnel and add the chloroform solution to it.

Then place the separating funnel on the ring stand and let the two layers separate.Drain the bottom layer into the conical flask because the caffeine is extracted into chloroform layer.

Cover the mouth of the conical flask to avoid the evapouration of the solution.

Then add the sodium sulphate into the conical flask for the purification of the caffeine solution then add the solution into the evapourating dish and place it in a dry place for 24 hours.

UV SPECTRUM:



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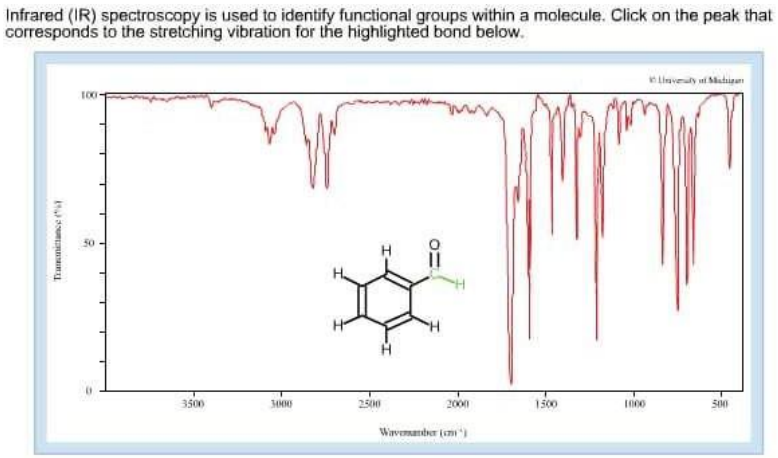

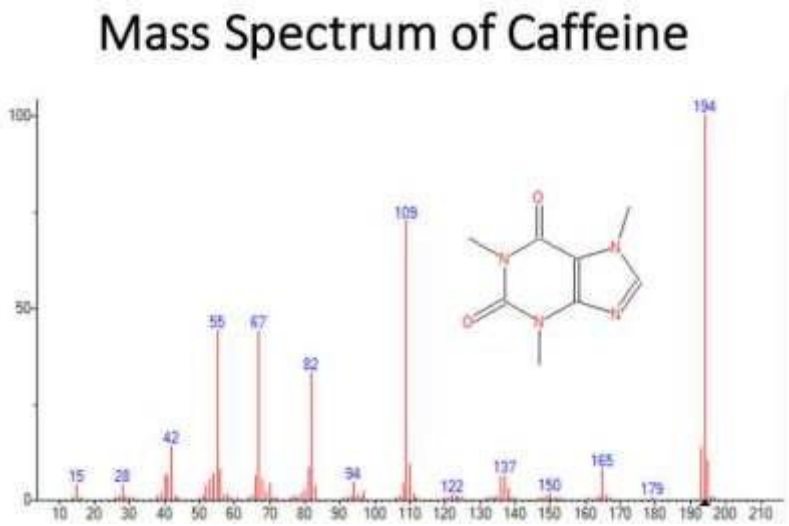

CONCLUSION :

The caffeine was successfully extracted from tea powder and coffee powder.

Caffeine Is extracted by liquid - liquid extraction by recrystallization.

About 80% of world’s population consumes caffeine on daily basis.

The coffee is relatively high as compared to other beverages.

Caffeine is highly soluble in Dichloromethane.

Caffeine is most used psychoactive drug in the world.