A PROJECT REPORT

ON

DETERMINATION OF AMOUNT OF HEAVY METAL IRON IN TEA SAMPLES USING FLAME ATOMIC ABSORPTION SPECTROMETER (FAAS)

SUBMITTED BY

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At last but not the least, I would like to express my sincere gratitude to faculty members of Chemistry Department, especially Dhrubajit Borah, Head of Nanda Nath Saikia College for recommending me for this winter research training at Tocklai Tea Research Institute.

With regards,

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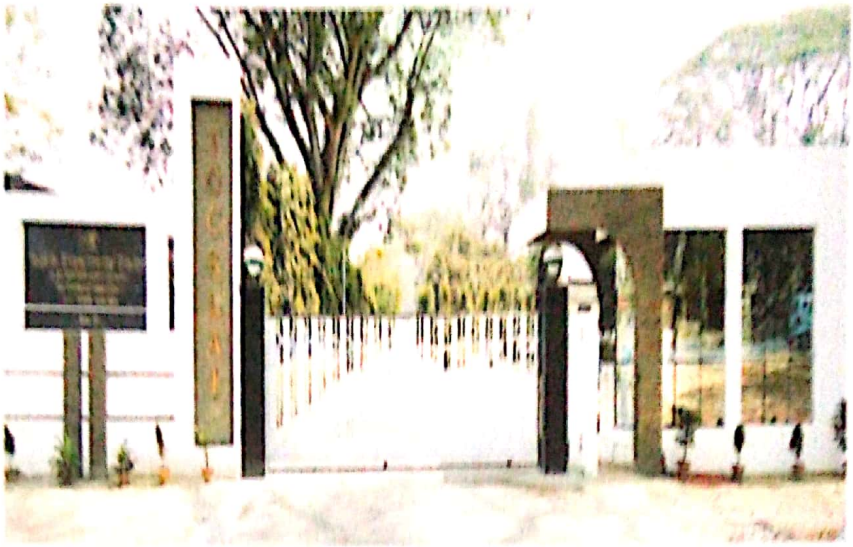
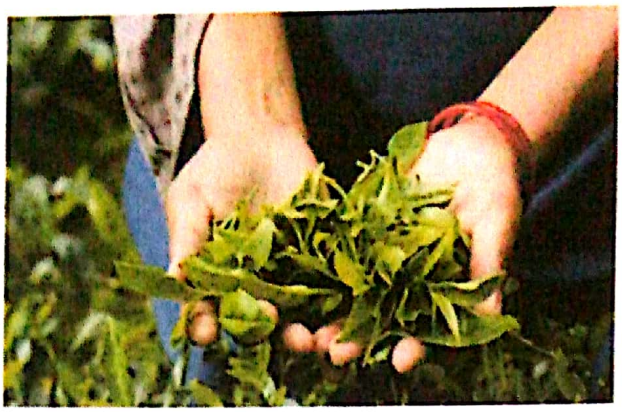
ABSTRACT

The project work entitled **"Determination of The Amount of heavy metal Iron in Tea using Flame Atomic Absorption spectrometer(FAAS)"** was carried out at Analytical service Department, Tocklai Tea Research Institute, Jorhat .The work describe about the determination of the amount of heavy metal (Fe) present in Tea samples. The amount of heavy metal in Tea has been of great concern because of their toxic effect when their concentration is more than the permissible level. These metals enter in the environment by different ways such as Industrial activities, soil pollution, vehicle emission, paints, organic manure, fertilizers .We have used flame atomic absorption spectrometer technique to determine the concentration of heavy metals (Fe) in different type of Tea samples.

1. INTRODUCTION



The Tocklai Tea Research Institute (formerly Tocklai Experimental Station) was established in 1911, at a site near the River Tocklai in Jorhat, Assam. Tocklai is the oldest and the largest Tea research institute in the world. It is a pioneer in the research and development of tea and an innovator in providing extension services to the tea industry. Research on all aspects of tea cultivation and processing is carried out at Tocklai Experimental station, Jorhat the oldest and the largest research station of its kind in the world. The Analytical Services department undertakes analysis of soils, soil amendments and other agricultural inputs like synthetic fertilizers, organic manures, micronutrients, pesticide residues and heavy metals. Samples received from tea estates are promptly analysed and reports sent enabling the estates to carry out the agricultural operations in time. Analytical laboratory is accredited by National Accreditation Bureau for Testing and Calibrating Laboratories (NABL) under ISO 17025.



Tea is one of the most popular and lowest cost beverages in the world and consumed by a larger number of people. Globally, Tea is cultivated in 3.94 million hectares with an annual production of 4162 million kg.(1) India's rank second in terms of area (0.58 million hectares) and production (966 million kg).Tea is one of the most popular alcohol-free and caffeinated beverages in the world.

It is made from new tea leaves and then brewed with boiling drinking water to get a tea infusion. Tea trees are mainly grown in some Asian and African countries, such as China, India, Sri Lanka, Kenya and Zimbabwe, etc. Because tea contains tea polyphenols (catechins), amino acids, tannic acid, and other antioxidants drinking tea is considered beneficial to human health, including the prevention of many diseases since it has been proven to prevent Alzheimer's disease, high blood pressure, and obesity . In addition, the essential trace elements in humans can be supplemented through drinking tea because tea leaves contain potassium, manganese, selenium, boron, zinc, strontium and copper.

It has been suggested that green Tea and black Tea may protect against cancer, though the catechins found in green Tea are thought to be more effective in preventing certain obesity – related cancer such as liver and colorectal cancer.

Negative effects of Tea drinking are centered around the consumption of sugar used to sweeten the Tea. Those who consume very large quantities of brick Tea may experience fluorosis.

Presence of excess of heavy metals (like Fe, Cu,Hg, Cd) affecting the development of children, intentionally high uptakes of copper may cause liver and kidney damage and even death.

2. OBJECTIVE OF THE PROJECT WORK

The objective of the project work is to determine the amount of heavy metal iron in tea samples using flame atomic absorption spectrometer(FAAS).

3.METHODOLOGY

The work was carried out at the analytical service department, Tocklai Tea Research Institute, Jorhat, Assam.

Duration of project work: From 1st of December, 2017 to 31st of December, 2017

4. EQUIPMENT, APPARATUS AND REAGENTS

1) BALANCE

2) ATOMIC ABSORPTION SPECTROMETER

3) STANDARD STOCK SOLUTION OF IRON

4) FUME CHAMBER

5. INSTRUMENTATION

INTRODUCTION TO ATOMIC ABSORPTION SPECTROSCOPY:-

Atomic absorption (AA) is a process that occurs when ground state of atom absorbs energy in the form of light of a specific wavelength and is elevated to an excited state .The amount of light energy absorbed at this wave length will increase as the number of atoms of the selected element in the light path increases.

The basic instrumentation for atomic absorption requires a primary light source , an atom source, a monochromator, a detector to measure the light accurately ,electronics to treat the signal ,and a data display to show the result .The light source normally used is either a hollow cathode lamp or an electrode less discharge lamp.

The atom source used in the system just described must produce free analyte atoms from the sample .The source of energy for free atom production is heat, most commonly in the form of an air acetylene flame .The sample is introduced as an aerosol into the flame .This system is referred to as flame sampling .The flame burner head is aligned so that the light beam passes through the flame, where the light is absorbed.

6. MATERIALS AND METHOD

SAMPLE COLLECTION:

The Tea samples were collected in summer season i.e. June to July 2017. A Total of 12 Tea samples were collected during this season from randomly selected areas of Jorhat city .The Tea sample were collected and preserved for analysis.

Method of Preparation:

Element: Iron

Reference Standard used: 1001 mg/L4 mg/L

- Stock standard solution:

  Pipette out 10.0 ml of the above reference standard of iron in a 100 ml volumetric flask and make up the volume with 0.2% Solution (A).
  The concentration of the stock solution (A) so obtains 100 mg/

- Working standard solution :

  The working standards were prepared by suitably diluting the stock solution (A).Preparation of working standard solution from stock (For 1.5 gm tea sample)

Working Standard Solution	Volume of Stock Solution Taken(ml)	Final Volume (ml)	Final Concentration Of working Standard Solution (mg/L)
1	0.5	50	1.0
2	1.0	50	2.0
3	2.0	50	4.0
4	4.0	50	8.0
5	8.0	50	12.0

Digestion (Method for Di-Acid digestion):

Accurately weigh test portion (1.5 gm Made Tea sample) in to 100 ml conical flask added 17ml and 4ml then place on hot plate . Evaporate to near dryness to obtain clear solution and then cool .Transfer to 25 ml volumetric flask and make up the volume with de-ionized water.Prepared reagent blank containing same amounts of acids taken from same lots, evaporated as above.

7. RESULTS

Sample extraction:

Sample code	Concentration (mg/kg)
Blank-1	0.434
Blank-2	0.427
Blank-3	0.417
Sample-1	14.59
Sample-2	13.14
Sample-3	7.011
Sample-4	7.745
Sample-5	6.230
Sample-6	14.54
Sample-7	5.513
Sample-8	10.39
Sample-9	15.42
Sample-10	11.28

8.CONCLUSION

As an undergraduate of the Nanda Nath Saikia College I would like to say that this training program is an excellent opportunity for us to get to the ground level and experience the things that we would have never gained through going straight into a job. I am grateful to the ***Nanda Nath Saikia College*** and ***Tocklai Tea Research Association*** for giving me this wonderful opportunity .

Tea is the most common beverage used in everyday life by everyone. It must follow the UL recommended by WHO for heavy metals. In present study 12 tea samples were analysed for Fe. All Tea samples tested in this study were well below the FSSAI MLc (maximum limits)of 150 mg/kg for Fe in made Tea sample.

I have gained lots of knowledge and experience needed to be successful in a great research challenge.

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