# Detection of Minerals in Buffalo and Cow Milk Samples.

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***Abstract*: - Milk contains many nutrients that are needed by the body to be able to function and build new cells. Think of it as millions of tiny building blocks. Some of these wear out and they continuously need to be renewed to make you feel well and get the most out of life. Construction of cells is happening all day, every day and the need for the right nutrition is almost the same throughout your life. Milk's nutrients can be found in many of dairy products. Fruit yogurt for example contains 85-90 per cent milk and provides a good source of vitamins and minerals. Cheese is rich in protein, calcium and vitamin B12, and many of them do not contain lactose. In this paper quality of milk and comparative study of various minerals present in the milk was done. Various milk samples was analyzed and found that value of Calcium (Ca) was higher and Iron (Fe) was lower and Sodium (Na) was in between Ca and Fe. Analysis explained that these values were .negligible as compared to its World Health Organization recommended value while Fe was found very low value.**

***Keywords- Minerals, nutrients, Fruit yogurt.***

## I. INTRODUCTION

Milk is a white liquid produced by the mammary glands of mammals. All mammals, including humans, will normally produce milk to feed their offspring, weaning those offspring onto solid food as they get older. Early-lactation milk contains colostrums, which carries the mother's antibodies to its young and can reduce the risk of many diseases. Milk is important part of human life has been a good source of various nutrients including different minerals. The fraction of milk contains calcium, magnesium, sodium and potassium for the main cations and inorganic phosphate, citrate and chloride for the main anions. In milk, these ions are more or less associated between themselves and with proteins. Depending on the type of ion, they are diffusible, cases of sodium, potassium, Iron and chloride or partially associated with casein molecules, cases of calcium, magnesium, phosphate and citrate. Since milk is generally viewed as nutritious food with lots of vitamins, minerals, fats, proteins etc thus used for drinking purpose. There are different sources of milk samples available, however sufficient information regarding their mineral present, especially protein, fat etc. Milk is processed into a variety of dairy products such as cream, butter, yogurt, kefir, ice cream, and cheese. Modern industrial processes use milk to produce casein, whey protein, lactose, condensed milk, powdered milk, and many other food-additives and industrial products. The study between the different types of milk is not available much, so present study was carried out to distinguish the Buffalo and Cow milk samples containing different minerals present in the milk and to check the quality of milk.

## II. MATERIALS AND METHODS

For this Buffalo and Cow milk samples were used (each type four samples).All these samples were collected from Anandnagar, Dhyari, Hadapsar, Katraj around Pune in Maharashtra. The samples were kept refrigerated at 4°C and transported to the laboratory within 24 hours, prior to refrigeration. All the milk samples were stored at -20°C until analysis.

*Determination of Calcium in the Milk*

*Procedure-* Pipette an aliquot 20 to 100 ml of the ash solution. Add 25 to 50 ml of water. Add 10ml of saturated ammonium oxalate solution and 2 drops of methyl red indicator. Make the solution slightly alkaline by the addition of dilute ammonium hydroxide and then slightly acid with few drops of dilute acetic acid until the colour is faint pink (pH 5.0).Heat the solution to the boiling point. Allow to stand at room temperature for at least 4 hr/preferably overnight. Filter through Whatmann filter paper No. 42. And wash with hot water till the filtrate is oxalate free. Break filter paper and put in to the flask containing 60 ml dilute $H_2SO_4$ (1:4).Heat the solution to the boiling point and titrate while still hot (temp 70 to $80^0$C) with 0.01/0.1M $KMnO_4$ to first permanent pink colour appear.

*Calculation-*

Calcium mg/100g =

$$\frac{\text{B.R}\times 0.2\times \text{Total volume of ash solution} \times 100}{\text{Volume taken for estimation} \times \text{weight of sample taken for ashing}}$$

If $KMnO_4$ Standard solution is not exactly 0.01M, use the following Calculation

Calcium mg/100g =

$$\frac{\text{B.R} \times \text{N of } KMnO_4 \times 20 \times \text{Total volume of ash solution} \times 100}{\text{ml of ash solution taken estimation weight of the sample taken for ashing}}$$

Where, B.R=Burette Reading.

*Determination of Iron in the Milk*

*Procedure-*

*Sample Preparation* - Metals in milk do the total ash then make up it in 100 ml with distilled water. For all samples acidify to pH 2 by Conc. $HNO_3$ as all our CRMS are in Nitric acid matrix. For lower concentrations, take 500 ml water sample, add 10ml of 2N HNO3, concentrate the sample to 50ml volume. Aspirate the sample directly in AAS Flame.
When determining Fe, mix 100 ml sample or standard with 25 ml Calcium solution before aspirating.

*Standardization-* Select at least 3 concentrations of each standard metal solution to bracket the expected metal concentration of the sample. Rinse nebulizer by aspirating blank (1.5ml conc. $HNO_3$/L). Auto zero the instrument. Then aspirate each standard as well as samples in turn into the flame and record absorbance. A linear calibration curve is obtained automatically, with absorbance of standards versus their concentration. AAS gives the direct read out of the concentration of samples.

*Calculations-*

$$\text{Conc. In ppm} = \frac{\text{Conc. In ppm from AAS X 100}}{\text{Weight of sample}}$$

$$\text{Conc in mg/100g} = \frac{\text{Conc. In ppm}}{10}$$

*Determination of Sodium in the Milk*

*Procedure-*

*Potassium* - Prepare 1, 2,3,4,5 ppm Standard solutions from 1000ppm CRM using nitric acid solution to make up the volume.

*Sodium-* Prepare 0.1,0.2,0.5 ,0.8 & 1.0 ppm Standard solutions from CRM using nitric acid solution to make up the volume.

**Select EMISSION MODE** and then select the element of interest. Ignite the flame and go to set up and set the optimum instrument conditions using Maximum standard concentration, so that it gives Emission above 60%.
Then take the Emission of standards in increasing concentration, to give a linear graph. The sample can be used as it is acidified with 1-2 drops of conc. $HNO_3$ or which has been diluted using $HNO_3$ solution depending upon the pilot reading of the sample.

Bracket the sample in such a way that it reads Emission % in the Standard concentration range. Apply appropriate dilution factor to arrive at the final result. Repeatability is done using 0.1 ppm Sodium Standard Solution & 1 ppm K Std solution at least 6 times and standard deviation Select at least 3 concentrations of each standard metal solutions to bracket the expected metal concentration of the sample. Rinse nebulizer by aspirating blank (1.5ml conc. $HNO_3$/L). Auto zero the instrument. Then aspirate each standard as well as samples in turn into the flame and record Emission. A linear calibration curve is obtained automatically, with emission %of standards versus their concentration. AAS gives the direct read out of the concentration of samples.

*Calculation-*

$$\text{Conc. In ppm} = \frac{\text{Conc. In ppm from AAS X 100}}{\text{Weight of sample}}$$

$$\text{Conc in mg/100g} = \frac{\text{Conc. In ppm}}{10}$$

III. OBSERVATION TABLE

| Samples / Mineral in mg | $B_1$ | $B_2$ | $B_3$ | $B_4$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ |
|---|---|---|---|---|---|---|---|---|
| Calcium | 203 | 198 | 216 | 209 | 116 | 116 | 127 | 107 |
| Iron | 0.70 | 0.92 | 0.73 | 1.10 | 2.68 | 0.69 | 0.91 | 0.93 |
| Sodium | 50.30 | 51.20 | 53.20 | 55.36 | 41.20 | 46.30 | 46.50 | 46.80 |

*Note-*
(1) Buffalo milk samples-$B_1$, $B_2$, $B_3$, $B_4$ and Cow milk samples-$C_1$, $C_2$, $C_3$, and $C_4$.
(2)Chemical Analysis was done per 100 gm.
(3)Range of Calcium in Buffalo sample is 198 to 209 mg and Cow sample is 107 to 127mg.
(4)Range of Iron in Buffalo sample is 0.70 to 1.10 mg and Cow sample is 0.69 to 2.68 mg.

(5)Range of Sodium in Buffalo sample is 50.30 to 55.36 mg and Cow sample is 41.20 to 46.80 mg.

## IV. RESULTS AND DISCUSSION

*Health benefits of Calcium*

Calcium is crucial for strong bones and teeth, and it is especially important for children and young adults to bone up on the mineral. Calcium absorption and bone development is at its peak up to age 20, and then decreases at around age 30 when a draining process begins. An adequate intake of calcium, plus an appropriate intake of vitamin D, can significantly increase bone mass in both growing children and young adults, and it can decrease bone loss during aging. Research suggests that calcium may prevent weight gain because it promotes more fat to be burned and less fat to be stored. Experts suggest three servings of dairy every day while also reducing calories in other areas of your diet to accommodate your increased dairy intake.
Warning: Too much calcium, upwards of 2,000 milligrams or more, has been linked with an increased risk of heart disease, so rely on calcium-rich food sources for heart health.

*Health benefits of Sodium*

The problem of sunstroke can be attributed to the loss of salt and water from the body. Due to this the body is unable to maintain the normal temperature as a result of continuous exposure to very high temperatures. Sodium plays an important role in preventing sunstroke by replacing the loss of essential electrolytes. Therefore it is recommended to drink fluids containing salt and sugar to provide relief against sunstroke. Muscle cramps are largely caused due to electrolyte imbalance & dehydration and are quite common in the summer months. Sodium is responsible for muscle contraction and hydration. Sodium rich juices and fluids help to restore the amount of electrolyte. Sodium is an important element in the development of brain and improvement of brain functions. The change of sodium levels in body affects the brain leading to lethargy, confusion, dizziness, etc.

*Health benefits of Iron*

The main health benefit of a diet high in iron is the formation of hemoglobin. Hemoglobin is the principal carrier of oxygen throughout the body and gives the dark red color to blood. Iron is a vital element for muscle health and is found in myoglobin, a muscle protein. Myoglobin carries oxygen from hemoglobin and diffuses it throughout muscle cells. This is required for contraction of muscles. Our brain uses approximately 20% of the oxygen in our bloodstream. Iron helps supply oxygen to blood making it very important for brain health. When the body's iron levels become severely depleted, we may get anemia. Iron is also important in the treatment of iron deficiency anemia and helps cure general symptoms of anemia like fatigue, body weakness, headaches, and enhanced sensitivity to cold temperatures. A host of other chronic ailments including renal failure anemia and predialysis anemia are also helped by adequate iron intake.

*Intake recommendations*

*CALCIUM*

Adults EAR RDI Calcium Men
19–30 yr 840 mg/day 1,000 mg/day
31–50 yr 840 mg/day 1,000 mg/day
51–70 yr 840 mg/day 1,000 mg/day
>70 yr 1,100 mg/day 1,300 mg/day
Women
19–30 yr 840 mg/day 1,000 mg/day
31–50 yr 840 mg/day 1,000 mg/day
51–70 yr 1,100 mg/day 1,300 mg/day
>70 yr 1,100 mg/day 1,300 mg/day

*SODIUM*

Adults should consume less than 2,000 mg of sodium, or 5 grams of salt, and at least 3,510 mg of potassium per day, according to new guidelines issued by the WHO. A person with either elevated sodium levels and low potassium levels could be at risk of raised blood pressure which increases the risk of heart disease and stroke.

Sodium is found naturally in a variety of foods, including milk and cream (approximately 50 mg of sodium per 100 g) and eggs (approximately 80 mg/100 g). It is also found, in much higher amounts, in processed foods, such as bread (approximately 250 mg/100 g), processed meats like bacon (approximately 1,500 mg/100 g), snack foods such as pretzels, cheese puffs and popcorn (approximately 1,500 mg/100 g), as well as in condiments such as soy sauce (approximately 7,000 mg/100 g), and bouillon or stock cubes (approximately 20,000 mg/100 g).

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