

Chapter One

Introduction and Literature Review

1.1 Introduction:

Many scientific studies contradict the conventional wisdom that milk and dairy consumption help reduce osteoporotic fractures. Surprisingly, studies demonstrating that milk and dairy products actually fail to protect bones from fractures outnumber studies that prove otherwise. Even drinking milk from a young age does not protect against future fracture risk but actually increase it. Shattering the “savings account” calcium theory, Cumming and Kleinberg report their study findings as follows [1]. This research studies the physical properties of cow milk using XRF for many kinds of milk.

The analysis of milk is important because milk is an indicator of environmental contamination, a significant pathway for toxic metal intake by humans and a source of essential nutrients. Essential elements required by the human body include the four basic elements H, C, N and O; the quantity elements Na, Mg, K, Ca, P, S and Cl; and the essential trace elements Mn, Fe, Co, Ni, Cu, Zn, Mo, Se and I. Other trace elements include B, Ba, Co, Cr, Cu, Fe, Li, Mn, Mo, Ni, Sb, Se, Sn, Sr, V, W and Zn. These elements were detected previously in liquid milk and powdered milk using neutron activation analysis. The importance of trace elements in nutrition is widely recognized as essential for growth and development of human beings, especially during infancy. On the other hand, several elemental deficiency syndromes have been reported over the past decades.

Children in particular are susceptible to the effects of a trace element deficiency [2]. The determination of trace element levels in food-stuffs, especially milk, could play an important role in understanding a number of deficiency-related diseases [3].

X-Ray fluorescence is now an established analytical method for the examination of the elemental composition of bulk material and also for the characterization of coating systems. It covers a broad range of elements and can handle a wide spread weight fraction range from traces to pure elements. The physical form of analyzed samples ranges from solid sample to powders or particles and also liquids. The measured sample itself is not influenced by the measurement procedure i.e. the analysis within the measuring system is non-destructive and the samples can be archived for further investigations [4].

X-ray fluorescence (XRF) is the emission of characteristic "secondary" (or fluorescent) X-rays from a material that has been excited by bombarding with high-energy X-rays or gamma rays. The phenomenon is widely used for elemental analysis and chemical analysis, particularly in the investigation of metals, glass, ceramics and building materials, and for research in geochemistry, forensic science, archaeology and art objects[5] such as paintings and murals[6].

When materials are exposed to short-wavelength X-rays or to gamma rays, ionization of their component atoms may take place. Ionization consists of the ejection of one or more electrons from the atom, and may occur if the atom is exposed to radiation with an energy greater than its ionization potential. X-rays and gamma rays can be energetic enough to expel tightly held electrons from the inner orbitals of the atom. The removal of an electron in this way makes the electronic structure of the atom unstable, and electrons in higher orbitals "fall" into the lower orbital to fill the hole left behind. In falling, energy is released in the form of a photon, the energy of which is equal to the energy difference of the two orbitals involved. Thus, the material emits radiation, which has energy characteristic of the atoms present. The term fluorescence is applied to phenomena in which the absorption of radiation of a specific energy results in the re-emission of radiation of a different energy (generally lower) [5].

Milk is an emulsion of butterfat globules within a water-based fluid that contains dissolved carbohydrates and protein aggregates with minerals [7], because it is produced as a food source for the young, all of its contents provide benefits for growth. The principal requirements are energy (lipids, lactose, and protein), biosynthesis of non-essential amino acids supplied by proteins (essential amino acids and amino groups), essential fatty acids, vitamins and inorganic elements, and water [8].

As an agricultural product, milk is extracted from non-human mammals during or soon after pregnancy. Dairy farms produced about 730 million tons of milk in 2011, from 260 million dairy cows [9]. India is the world's largest producer of milk, and is the leading exporter of skimmed milk powder [10], yet she exports very few other milk products [11]. The ever increasing rise in domestic demand for dairy products and a large demand-supply gap could lead to India being a net importer of dairy products in the future [12]. New Zealand, the European Union's 28 member states, Australia, and the United States are the world's largest exporters of milk and milk products [13]. China and Russia were the world's largest importers of milk and milk products [14]. Both countries were self-sufficient by 2016 contributing to a worldwide glut of milk [15].

Throughout the world, there are more than six billion consumers of milk and milk products. Over 750 million people live within dairy farming households [16].

1.2 Literature Review:

j.e.kinsella in November (1987) study the physical properties of food and milk components, research needs to expand uses we found the increasing formulation and fabrication of food products, the need and demand for reliable functional ingredients will expand. the food processing industry will increasingly place a premium on obtaining functional ingredients with reliable, well-defined physical and functional properties to facilitate automated formulation of food products

and to ensure consistent product quality. Additionally, the satisfactory substitution of ingredients or simulation of traditional foods critically depends on knowledge of the physical properties of ingredients and of foods per se. hence, there is a need for the establishment of a data bank that contains reliable information on the physical and functional properties of milk components and dairy ingredients. where reliable data are not available, the needed research should be undertaken. In order to be successful in this endeavor, reliable, standardized testing methods need to be developed to measure those physical and functional properties related to quality attributes of foods.

B. Kot, R. Baranowski, A. Rybak (April 2000) Analysis of Mine Waters Using X-ray Fluorescence Spectrometry, In this paper investigations on the application of XRF method with the helium system for liquid analysis and for the determination of the composition of saline mine water have been presented. The applied procedure allows determination of various elements in broad concentration range of analyzed elements (g/dm³- mg/dm³).

Perring L, Andrey D (July 2003) , ED-XRF as a tool for rapid minerals control in milk-based products An ED-XRF method for the rapid determination of a series of analyses (phosphorus, sulfur, chlorine, potassium, calcium, iron, zinc) in milk-based products has been developed and validated. The investigated samples were commercial products obtained from various parts of the world. Reference values measured by inductively-coupled plasma-optical emission spectroscopy and by potentiometric for chloride were used to calibrate the ED-XRF. Calibrations were established with 30 samples, and validation was made using a second set of 30 samples. An evaluation of this alternative method was done by comparison with data from the reference methods. Pellets of 4 g were prepared under 2 tons of pressure. For each sample, 3 pellets were prepared and analyzed. Limits of quantification and repeat abilities were evaluated for the described analyses.

She Chen, Gerd Bobe, Shelly Zimmerman, Earl G. Hammond, Cindie M. Luhman, Terri D. Boylston, Albert E. Freeman, and Donald C. Beitz in(2004)study the Physical and Sensory Properties of Dairy Products from Cows with Various Milk Fatty Acid Compositions , Dairy products from milk of cows fed diets rich in polyunsaturated fatty acids have a more health-promoting fatty acid composition and are softer but often have oxidized flavors. Dairy products made from cow's milk that has more- or less-unsaturated fatty acid compositions were tested for differences in texture and flavor from those made from bulk-tank milk. The milk was manufactured into butter, vanilla ice cream, yogurt, Provolone cheese, and Cheddar cheese. The products were analyzed for fatty acid composition, physical properties, and flavor. Milk of cows with a more monounsaturated fatty acid composition yielded products with a more monounsaturated fatty acid composition that were softer and had a satisfactory flavor. Thus, selection of cows for milk fatty acid composition can be used to produce dairy products that are probably more healthful and have a softer texture.

Mohammad Imran, hamayun khan, syed shah hassan, and rasool khan(2008) the analyses physicochemical characteristics of various milk samples available in Pakistan, orphan definition the physical characteristics of various milk samples treatable acidity was measured by titrimetric method, and expressed as percent of lactic acid. Specific gravity, conductivity and viscosity were determined by the standard methods.

Galina Pashkova (December 2009) X-ray Fluorescence Determination of Element Contents in Milk and Dairy Products, The concentrations of minerals (Na, Mg, P, S, Cl, K, and Ca) and trace elements (Mn, Fe, Ni, Cu, Zn, Rb, Sr, and Br) in different types of milk, dairy products, and infant formulas have been determined using wavelength-dispersive X-ray fluorescence analysis (WDXRF). Freeze-dried samples pressed as tablets of 4g have been analyzed. Calibrations

have been established using both plant and milk standard reference materials. The matrix correction method based on the power function of Compton scattered intensity was applied. The paper provides calibration data, detection limits for each element, and testing the accuracy of the proposed technique. The elemental compositions of the samples obtained by WDXRF were compared with the previously reported data from different countries.

Ur-Rehman, Ishrat Rehana, Wasim Yawar in (2012), their study was to determination of inorganic elements in milk powder using wavelength dispersive X-ray fluorescence spectrometer. They found the concentration of calcium, magnesium, phosphorus, potassium and trace elements, bromine, copper, iron, rubidium and zinc in different brands of 3milk powder and infant formulas have been determined using a wavelength dispersive X-ray fluorescence spectrometer. moreover, ken r. morison , jack p. phelan & chris g. bloore in Aug. (2012) viscosity and non-newtonian behaviour of concentrated milk show to the analysis shows that the most significant contribution to changes in the viscosity of milk concentrates is the heat treatment of the proteins. this work shows the value of using relative viscosity, and highlights the need for compositional analysis and details of heat treatment before useful interpretation of viscosity data is possible. The main focus of this article is to investigate analyzed for their physical characteristics to know would milk cheated.

Ömersögüt, Tugbabali, Hasanbaltas and Gökhanapaydin (February 2013) Determination of Trace Elements in Ashes of Milk Samples by Using XRF Technique ,Energy dispersive X-ray fluorescence system has been used to determine the heavy metal ions present in cow's milk. Samples have been collected from farm and markets within the border of Kahramanmaraş as province, Turkey. An Epsilon 5 PAN analytical Almelo, the Nether Lands model energy dispersive X-ray fluorescence spectrometer has been used to analyze the samples. As a result of analysis of the samples, the various concentrations of

elements such as Na, Mg, Al, Si, P, S, Cl, K, Ca, Cr, Mn, Fe, Ni, Cu, Zn, As, Br, Rb, Sr, Y, Zr, I, Yb, Hf and Pb were found.

Jason C. Chan and Peter T. Palmer (August, 2013) Determination of Calcium in Powdered Milk via X-ray Fluorescence Using External Standard and Standard Addition Based Methods. A handheld energy-dispersive X-ray fluorescence (XRF) analyzer was used to determine calcium in powdered milk. Quantification was performed using two different methods (external standards and the method of standard additions) to illustrate a matrix effect as well as a means for compensating for it. Both methods require calibration of the XRF analyzer using authentic standards prepared by mixing known masses of calcium carbonate into known masses of cellulose or dry milk. The use of XRF for this application requires analysis times on the order of 1 min per sample, provides linear calibration curves, and gives good precision with %RSDs of 4% or less. External standard based calibration gave erroneously low results due to the attenuation of calcium fluorescence by potassium in the sample, whereas the method of standard additions gave 1.29% calcium, which is very close to the manufacturer's equivalent concentration of 1.3%. This experiment is well suited for an analytical chemistry course and provides an excellent example of the advantages and limitations of these two calibration methods for addressing matrix effects and deriving accurate quantitative results.

Mohammed Saeed El Badri and Kamal Mahir Sulieman (2015) study the chemical structure and optical properties of Zinc oxide samples were studied to be used as substituted material using X-Ray Fluorescence. Zinc metal, Zinc sulphide, zinc sulphate and commercial oxide in a powdered form were collected from different areas in Khartoum State, Sudan. These samples were subjected to heat treatment at 1000°C in furnace under ambient oxygen for 3, 6 and 9 hours respectively except the commercial oxide sample which was used as a control. These samples were pressed in a pellets form using press machine under 15 tons

pressure. The spectra are recorded at an incident angle θ 45 ± 5 with respect to the surface of the sample and revealed that the spectrum Zn K α is 8.638 KeV for all samples and Zn k β is 9.572 KeV lines and signals from the Cu source of the x-ray tube. Peaks of ZnO samples obtained from Zn annealed at 1000°C for 3 hours and from ZnS annealed at 1000°C for 9 hours represented sharp and smooth peaks, while the other samples represented sharp and rough peaks. Among the samples annealed at 1000°C for 3 hours, ZnO obtained from ZnSO₄ recorded the highest intensity value (9.9×10^3 a.u) followed by ZnO (8.1×10^3 a.u) obtained from Zn annealed at 1000°C for 9 hours and then ZnO (7.8×10^3 a.u) sample obtained from Zn annealed at 1000°C for 6 hours.

Abdul Kader, Mitu Deb, Md. Abdul Aziz, Md. Mehadi Hasan Sohag, Syeda Rumana Rahman (2015) study the physical, chemical and microbiological quality of liquid cow's milk collected from four different dairy farms in Sylhet, Bangladesh. Several milk compositions were examined and assessed to the Bangladesh Standards (BDS) and Food and Agriculture Organization (FAO). Results showed that tastes of all milk samples were slightly sweet and the mean specific gravity (1.029 ± 0.0025 to 1.032 ± 0.0015) was within standard range. The color of milk of sample 1 displayed similarity to sample 3, and likewise sample 2 to sample 4. However, all milk samples were normal except sample 2 which indicated cowy flavor and odor. The average statistics for fat (3.40 ± 0.26), protein (3.47 ± 0.11), total solids (12.16 ± 0.33), solid not fat (8.76 ± 0.32), acidity (0.19 ± 0.03) and pH (6.67 ± 0.10) were recorded. The Microbiological conclusion confirmed the presence of microbial population in all milk samples. The highest level of microbial quality in Standard Plate Count (SPC) was 38.1×10^6 cfu/ml in sample 3 and in logarithm the value is 7.58 cfu/ml. Grades of milk were evaluated by Methyl Blue Reduction Test (MBRT) and this phenomenon testified that milk of sample 2 was fair in qualities than others. Statistical analysis revealed that there was no significant difference ($P > 0.05$) in the average

values of acidity between results of milk samples to the BDS and FAO standards.

Teshome Gemechu^{1*}, Fekadu Beyene² and Mitiku Eshetu (2015) study the physical and chemical quality of raw cow's milk produced and marketed in Shashemene town, Ethiopia. A total of 48 samples of raw cow's milk were collected in the morning. All of the samples were collected using proportional random sampling method. The means for temperature, pH, specific gravity, titratable acidity, total solids, fat, solids-not-fat, protein, ash and lactose contents of milk samples were $22.83 \pm 1.22^{\circ}\text{C}$, 6.32 ± 0.07 , 1.030 ± 0.000 , $0.194 \pm 0.006\%$, $12.87 \pm 0.11\%$, $4.28 \pm 0.05\%$, $8.59 \pm 0.07\%$, $3.43 \pm 0.00\%$, $0.74 \pm 0.00\%$ and $4.43 \pm 0.06\%$, respectively. Significant differences ($P < 0.05$) were found for the values of temperature, pH, titratable acidity, total solids, fat, protein, ash and lactose contents between the sources of milk samples (dairy cooperative milk collection centers, hotels, small shops and small scale milk producers). Therefore, it was concluded that the chemical composition was adequate as compared to the standard level.

Sofia Zaichick, and Vladimir Zaichick (2016) have developed and validated an energy dispersive X-Ray fluorescence (EDXRF) method for the rapid determination of concentrations of key chemical elements (Br, Ca, Cl, Cu, Fe, K, Mg, P, S, Se, and Zn) in milk-based products. To demonstrate the utility of the EDXRF method for the chemical element determination in milk product, concentrations of chemical elements in two infant formulas (infant first milk and toddler milk) widely marketed in the UK were investigated. The infant first milk formula was found to have significantly high levels of Cu, Fe, Mg, Se and particularly high concentrations of Ca and P, which were nearly six and twenty times higher than the manufacturer's label declaration, respectively. By contrast, analysis of the chemical elements concentrations in the toddler milk formula was generally close to the values declared by the manufacturer with the exception of

Cu and Mg, which were about three and two times higher than declared on the label, respectively. We discuss the obtained results in the light of specific nutritional needs of infants and data reported in literature

H. Vaskova, M. Buckova, and L. Zalesakov (2016) verify the applicability of Raman spectroscopy for measuring the content of fat in milk and dairy products. Accurate monitoring of milk nutritional compositions is essential for producers of milk and also for milk and dairy products quality control. Raman spectroscopy enables effective material identification and offers rapid, non-contact, nondestructive, reagent free measurement and possibility to insert devices for automatization. These are the main benefits of this method comparing to traditional time-consuming techniques. The statistical method Principal component analysis was performed for large spectral datasets evaluation. For specific spectral information was used linear regression. Liquid milk samples as well as dried milk droplets with fat concentration range 0,1 % to 3,5 % and dairy products with 10 % and 82 % fat concentration were used for analyses by Raman spectroscopy. Röse-Gottlieb gravimetric method and butyrometric method served as a standard control methods for correlation with experimental spectroscopic data for milk fat analysis. Methods accuracy is discussed in the paper. Quite high agreement is obtained for Raman spectroscopy.

Abeer Abdelrhman Ibrahim in (2017) the Detection of Some Elements in Kapo Powder milk and Nido powder milk by Using X-Ray Fluorescence Device. This study deals with the applications of spectroscopy, which is the detection of some elements of the Nido powder milk and Kapo powder milk and the concentration of these elements by X-Ray Fluorescence device and the comparison between them and to see the pH of the two samples, in milk Nido element chromium and its concentration 0.03%, manganese element, concentration 0.00%, Iron element and its concentration was 0.11%, nickel element, its concentration <0.001%,

copper element, its concentration 0.00%, zinc element , its concentration 0.02 %and lead element and its concentration was 0.00%, and the PH of Nedo powder milk was 6.25.In Kapo powder milk sample this elements were found also but in different concentrations; which found chromium element, its concentration was 0.02%,manganese element, concentration 0.02%, Iron element and its concentration was 0.02%, nickel element, its concentration <0.00%,copper element, its concentration 0.00%, zinc element, its concentration 0.00%and lead element and its concentration was 0.01%,and the PH of Kapo powder milk was 6.39.they found Nedo powder milk and Kapo powder milk contain some important elements that which the human body need them, but Nedo powder milk contains some elements that their concentrations more than some elements in Kapo powder milk, like chromium element, iron element, zinc element and Kapo powder milk contains lead element that Nedo powder milk doesn't contain it, so Nedo powder milk is better than kapo powder milk.

J.Méndez-CidJuan A.CentenoSidoniaMartínezJavierCarballo (2018) The effect of storage at 4 °C or 12 °C on cow's milk butter manufactured without or with salt (2.1%) was examined. Storage of the butter for 9 months scarcely affected the fatty acid contents, and only the amounts of C18:3 *n*-3, C20:5 *n*-3 and C22:2 *n*-6 decreased significantly in the total lipid fraction. The total amount of free fatty acids increased significantly during storage (from 136–167 to 360–575 mg/100 g of fat), and both the addition of salt and the higher storage temperature enhanced the release of fatty acids from lipids. The free fatty acid contents (360–575 mg/100 g of fat) and the values of the parameters indicating lipolysis (acidity value: 1.89–2.18 mg KOH/g of fat; degree of acidity: 0.95–1.09% oleic acid) at the end of the storage period indicate that butter undergoes very slight lipolysis. The values of parameters indicating fat oxidation (peroxide value and TBA value) increased significantly during storage (from 0.38–0.39 to 0.90–3.75 meq. O₂/kg of fat, and from 0.084–0.1 to 0.093–0.220 mg

malondialdehyde/kg, respectively), and both the addition of salt and the increase in storage temperature had enhancing effects on the oxidative processes. The b^* values increased significantly during storage, while a^* and L^* values decreased. In conclusion, cow's milk butter was hardly modified during refrigerated storage, while both the addition of salt and the increase in storage temperature increased lipolytic and oxidative changes.

This research aims study of physical properties of cow's milk using XRF Fluorescence.

1.3 Research Problem:

Analysis the milk and water is very important at today living, because the contamination environment effectual the milk ,and this consider of problems global which suffer ones all countries global especially Sudan.

1.4 The Objective of this Thesis:

The study focused on the study of the physical properties and chemical composition of the four milk producing species as the most important in Sudan in terms of production and economic value.

Therefore, the research aims at:

- 1 – Study the physical properties of fresh milk, determination of the degree of density and surface tension, viscosity, freezing point, and boiling point.
- 2 - Verification of dispersion X - ray measuring the concentration of chemical elements of milk.
- 3 - Careful monitoring of the concentration of these elements of different dairy products for milk producers "quality control".
- 4 - The effect of changes in different temperatures on the concentrations of those elements.
- 5- Comparison of different milk concentrations in heating and without heating.

6 - Verification of the natural characteristics in the detection methods of cheating milk.

1.5 Thesis Layout:

This thesis is consist of four chapters, chapter one introduction and literature review ,and chapter two consist basic concepts of XRF and milk, chapter three consist experimental part (The materials and device and method), chapter four consist of results and discussion and conclusion, recommendations and references.

Chapter Two

Basic Concepts

2.1 Introduction:

Good sample preparation is by far the most important step in any analytical. The importance of sample preparation is especially relevant today as XRF analysis plays a growing role in the daily activities of producers around the world. Fortunately, XRF analysis usually doesn't require extensive sample preparation work, and methods are normally inexpensive, easy to learn and easy to use. So even when the need for sample preparation is taken into account, XRF spectrometry is still easier and quicker than almost all other chemical analysis techniques.

2.2 Spectroscopy:

Spectroscopy is study of the interaction between matter and electromagnetic radiation. Historically, spectroscopy originated through the study of visible light dispersed according to its wavelength, by a prism. Later the concept was expanded greatly to include any interaction with radioactive energy as a function of its wavelength or frequency.

Spectroscopic data is often represented by an emission spectrum, a plot of the response of interest as a function of wavelength or frequency. Spectroscopy and spectrograph are terms used to refer to the measurement of radiation intensity as a function of wavelength and are often used to describe experimental spectroscopic methods. Spectral measurement devices are referred to as spectrometers, spectrophotometers, spectrographs or spectral analyzers.

Daily observations of color can be related to spectroscopy. Neon lighting is a direct application of atomic spectroscopy. Neon and other noble gases have characteristic emission frequencies (colors). Neon lamps use collision of electrons with the gas to excite these emissions. Inks, dyes and paints include

chemical compounds selected for their spectral characteristics in order to generate specific colors and hues. A commonly encountered molecular spectrum is that of nitrogen dioxide.

Gaseous nitrogen dioxide has a characteristic red absorption feature, and this gives air polluted with nitrogen dioxide a reddish-brown color. Rayleigh scattering is a spectroscopic scattering phenomenon that accounts for the color of the sky.

Spectroscopic studies were central to the development of Quantum mechanics and included Max Planck's explanation of black body radiation, Albert Einstein's explanation of the photoelectric effect and Neil's Bohr's explanation of atomic structure and spectra. Spectroscopy is used in physical and analytical chemistry because atoms and molecules have unique spectra. As a result, these spectra can be used to detect, identify and quantify information about the atoms and molecules.

Spectroscopy is also used in Astronomy and remote sensing on Earth. Most research telescopes have spectrographs. The measured spectra are used to determine the chemical composition and Physical properties of astronomical objects (such as their Temperature and velocity).

One of the central concepts in spectroscopy is a resonance and its corresponding resonant frequency. Resonances were first characterized in mechanical systems such as pendulums. Mechanical systems that vibrate or oscillate will experience large amplitude oscillations when they are driven at their resonant frequency. A plot of amplitude vs. excitation frequency will have a peak centered at the resonance frequency. This plot is one type of spectrum; with the peak often referred to as a Spectral line, and most spectral lines have a similar appearance.

In quantum mechanical systems, the analogous resonance is a coupling of two quantum mechanical stationary states of one system, such as an atom, via an oscillatory source of energy such as a photon. The coupling of the two states is

strongest when the energy of the source matches the energy difference between the two states. The energy E of a photon is related to its frequency (ν) by:

$$E=h\nu$$

Where h is Planck's constant, and so a spectrum of the system response vs. photon frequency will peak at the resonant frequency or energy. Particles such as electrons and neutrons have a comparable relationship, the deBroglie relations, between their kinetic energy and their wavelength and frequency and therefore can also excite resonant interactions. Spectra of atoms and molecules often consist of a series of spectral lines, each one representing a resonance between two different quantum states. The explanation of these series, and the spectral patterns associated with them, were one of the experimental enigmas that drove the development and acceptance of quantum mechanics. The hydrogen Spectral series in particular was first successfully explained by the Rutherford-Bohr quantum model of the hydrogen atom. In some cases spectral lines are well separated and distinguishable, but spectral lines can also overlap and appear to be a single transition if the density of energy states is high enough. Named series of lines include the principal, sharp, diffuse and fundamental series [17].

2.3 Classification:

Spectroscopy is a sufficiently broad field that many sub-disciplines exist, each with numerous implementations of specific spectroscopic techniques. The various implementations and techniques can be classified in several ways.

2.3.1 Type of radioactive energy:

Types of spectroscopy are distinguished by the type of radioactive energy involved in the interaction. In many applications, the spectrum is determined by measuring changes in the intensity or frequency of this energy. The types of radioactive energy studied include:

Electromagnetic radiation was the first source of energy used for spectroscopic studies. Techniques that employ electromagnetic radiation are typically classified

by the wavelength region of the spectrum and include microwave, terahertz, infrared, near infrared, visible and ultraviolet, x-ray and gamma spectroscopy.

- Particles, due to their de Broglie wavelength, can also be a source of radioactive energy and both electrons and neutrons are commonly used. For a particle, its kinetic energy determines its wavelength.
- Acoustic spectroscopy involves radiated pressure waves.
- Mechanical methods can be employed to impart radiating energy, similar to acoustic waves, to solid materials.

2.3.2 Nature of the interaction:

Types of spectroscopy can also be distinguished by the nature of the interaction between the energy and the material. These interactions include: [18]

- Absorption occurs when energy from the radioactive source is absorbed by the material. Absorption is often determined by measuring the fraction of energy transmitted through the material; absorption will decrease the transmitted portion.
- Emission indicates that radioactive energy is released by the material. A material's black body spectrum is a spontaneous emission spectrum determined by its temperature; this feature can be measured in the infrared by instruments such as the Atmospheric Emitted Radiance Interferometer (AERI) [19]. Emission can also be induced by other sources of energy such as flames or sparks or electromagnetic radiation in the case of fluorescence.
- Elastic scattering and reflection spectroscopy determine how incident radiation is reflected or scattered by a material.
- Crystallography employs the scattering of high energy radiation, such as x-rays and electrons, to examine the arrangement of atoms in proteins and solid crystals.

- Impedance spectroscopy studies the ability of a medium to impede or slow the transmittance of energy. For optical applications, this is characterized by the index of refraction.
- Inelastic scattering phenomena involve an exchange of energy between the radiation and the matter that shifts the wavelength of the scattered radiation. These include Raman and Compton scattering.
- Coherent or resonance spectroscopy are techniques where the radioactive energy couples two quantum states of the material in a coherent interaction that is sustained by the radiating field. The coherence can be disrupted by other interactions, such as particle collisions and energy transfer, and so often require high intensity radiation to be sustained. Nuclear magnetic resonance(NMR) spectroscopy is a widely used resonance method and ultrafast laser methods are also now possible in the infrared and visible spectral regions.

2.3.3 Types of material:

Spectroscopic studies are designed so that the radiant energy interacts with specific types of matter.

1- Atomic spectroscopy:

Atomic spectroscopy was the first application of spectroscopy developed. Atomic absorption spectroscopy (AAS) and atomic emission spectroscopy(AES) involve visible and ultraviolet light. These absorptions and emissions, often referred to as atomic spectral lines, are due to electronic transitions of outer shell electrons as they rise and fall from one electron orbit to another. Atoms also have distinct x-ray spectra that are attributable to the excitation of inner shell electrons to excited states.

Atoms of different elements have distinct spectra and therefore atomic spectroscopy allows for the identification and quantitation of a sample's elemental composition. Robert Bunsen and Gustav Kirchhoff discovered new

elements by observing their emission spectra. Atomic absorption lines are observed in the solar spectrum and referred to as Fraunhofer lines after their discoverer. A comprehensive explanation of the hydrogen spectrum was an early success of quantum mechanics and explained the Lamb shift observed in the hydrogen spectrum, which further led to the development of quantum electrodynamics.

Modern implementations of atomic spectroscopy for studying visible and ultraviolet transitions include flame emission spectroscopy, inductively coupled plasma atomic emission spectroscopy, glow discharge spectroscopy, microwave induced plasma spectroscopy, and spark or arc emission spectroscopy. Techniques for studying x-ray spectra include X-ray spectroscopy and X-ray fluorescence (XRF).

2- Molecules:

The combination of atoms into molecules leads to the creation of unique types of energetic states and therefore unique spectra of the transitions between these states. Molecular spectra can be obtained due to electron spin states (electron paramagnetic resonance), molecular rotations, molecular vibration and electronic states.

Rotations are collective motions of the atomic nuclei and typically lead to spectra in the microwave and millimeter-wave spectral regions; rotational spectroscopy and microwave spectroscopy are synonymous. Vibrations are relative motions of the atomic nuclei and are studied by both infrared and Raman spectroscopy. Electronic excitations are studied using visible and ultraviolet spectroscopy as well as fluorescence.

Studies in molecular spectroscopy led to the development of the first maser and contributed to the subsequent development of the laser.

3- Crystals and extended materials:

The combination of atoms or molecules into crystals or other extended forms leads to the creation of additional energetic states. These states are numerous and therefore have a high density of states. This high density often makes the spectra weaker and less distinct, i.e., broader. For instance, blackbody radiation is due to the thermal motions of atoms and molecules within a material. Acoustic and mechanical responses are due to collective motions as well. Pure crystals, though, can have distinct spectral transitions, and the crystal arrangement also has an effect on the observed molecular spectra. The regular lattice structure of crystals also scatters x-rays, electrons or neutrons allowing for crystallographic studies.

4- Nuclei:

Nuclei also have distinct energy states that are widely separated and lead to gamma ray spectra. Distinct nuclear spin states can have their energy separated by a magnetic field, and this allows for NMR spectroscopy.

2.3.4 Other types

Other types of spectroscopy are distinguished by specific applications or implementations:

Acoustic resonance spectroscopy is based on sound waves primarily in the audible and ultrasonic regions

- Auger spectroscopy is a method used to study surfaces of materials on a micro-scale. It is often used in connection with electron microscopy.
- Cavity ring down spectroscopy
- Circular Dichroic spectroscopy
- Coherent anti-Stokes Raman spectroscopy(CARS) is a recent technique that has high sensitivity and powerful applications for in vivo spectroscopy and imaging.[20]

- Cold vapor atomic fluorescence spectroscopy
- Correlation spectroscopy encompasses several types of two-dimensional NMR spectroscopy.
- Deep-level transient spectroscopy measures concentration and analyzes parameters of electrically active defects in semiconducting materials.
- Dual polarization interferometry measures the real and imaginary components of the complex refractive index
- Electron phenomenological spectroscopy measures physicochemical properties and characteristics of electronic structure of multicomponent and complex molecular systems.
- EPR spectroscopy
- Force spectroscopy
- Fourier transform spectroscopy is an efficient method for processing spectra data obtained using interferometers. Fourier transform infrared spectroscopy (FTIR) is a common implementation of infrared spectroscopy. NMR also employs Fourier transforms.
- Hadron spectroscopy studies the energy/mass spectrum of hadrons according to spin, parity, and other particle properties. Baryon spectroscopy and meson spectroscopy are both types of hadron spectroscopy.
- Hyper spectral imaging is a method to create a complete picture of the environment or various objects, each pixel containing a full visible, VNIR, NIR, or infrared spectrum.
- Inelastic electron tunneling spectroscopy (IETS) uses the changes in current due to inelastic electron-vibration interaction at specific energies that can also measure optically forbidden transitions.

- Inelastic neutron scattering is similar to Raman spectroscopy, but uses neutrons instead of photons.
- Laser-Induced Breakdown Spectroscopy(LIBS), also called Laser-induced plasma spectrometry (LIPS)
- Laser spectroscopy uses tunable laser and other types of coherent emission sources, such as optical parametric oscillators for selective excitation of atomic or molecular species [21].
- Mass spectroscopy is an historical term used to refer to mass spectrometry. Current recommendations are to use the latter term. Use of the term mass spectroscopy originated in the use of phosphor screens to detect ions.
- Mossbauer spectroscopy probes the properties of specific isotopic nuclei in different atomic environments by analyzing the resonant absorption of gamma-rays. See also Mossbauer effect.
- Neutron spin echo spectroscopy measures internal dynamics in proteins and other soft matter systems
- Photo acoustic spectroscopy measures the sound waves produced upon the absorption of radiation.
- Photo emission spectroscopy
- Photo thermal spectroscopy measures heat evolved upon absorption of radiation.
- Pump-probe spectroscopy can use ultrafast laser pulses to measure reaction intermediates in the femtosecond timescale.
- Raman optical activity spectroscopy exploits Raman scattering and optical activity effects to reveal detailed information on chiral centers in molecules.
- Raman spectroscopy

- Saturated spectroscopy
- Scanning tunneling spectroscopy
- Spectrophotometry
- Spin noise spectroscopy traces spontaneous fluctuations of electronic and nuclear spins.
- Time-resolved spectroscopy measures the decay rate(s) of excited states using various spectroscopic methods.
- Time-Stretch Spectroscopy [17].
- Thermal infrared spectroscopy measures thermal radiation emitted from materials and surfaces and is used to determine the type of bonds present in a sample as well as their lattice environment. The techniques are widely used by organic chemists, mineralogists, and planetary scientists.

2.4 X-Ray Fluorescence (XRF):

X-ray fluorescence is the emission of characteristic "secondary" (or fluorescent) X-rays from a material that has been excited by bombarding with high-energy X-rays or gamma rays. The phenomenon is widely used for elemental analysis and chemical analysis, particularly in the investigation of metals, glass, ceramics and building materials, and for research in geochemistry, forensic science, archaeology and art objects[22] such as paintings and murals[23].

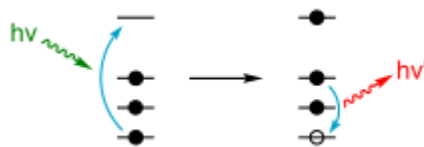


Figure (2.1) Physics of X-ray fluorescence in a schematic representation.

When materials are exposed to short-wavelength X-rays or to gamma rays, ionization of their component atoms may take place. Ionization consists of the

ejection of one or more electrons from the atom, and may occur if the atom is exposed to radiation with an energy greater than its ionization potential. X-rays and gamma rays can be energetic enough to expel tightly held electrons from the inner orbitals of the atom. The removal of an electron in this way makes the electronic structure of the atom unstable, and electrons in higher orbitals "fall" into the lower orbital to fill the hole left behind. In falling, energy is released in the form of a photon, the energy of which is equal to the energy difference of the two orbitals involved. Thus, the material emits radiation, which has energy characteristic of the atoms present. The term fluorescence is applied to phenomena in which the absorption of radiation of a specific energy results in the re-emission of radiation of a different energy (generally lower).

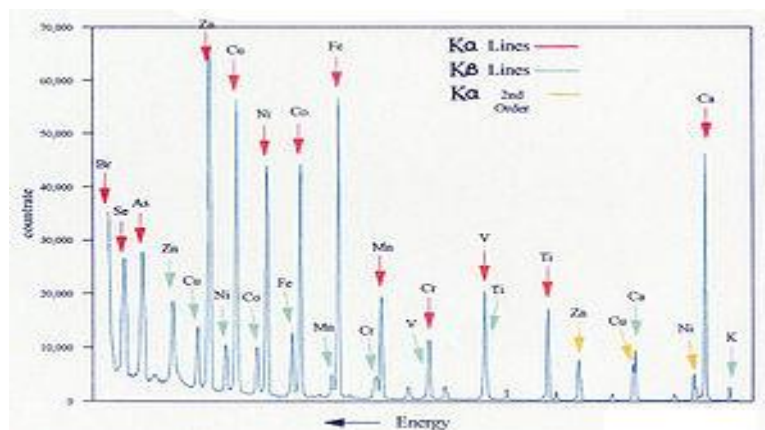


Figure (2.2): Typical wavelength dispersive XRF spectrum

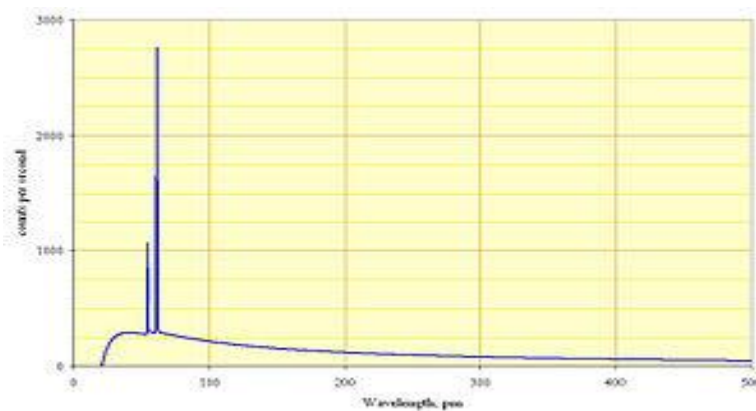


Figure (2.3): Spectrum of a rhodium target tube operated at 60 kV, showing continuous spectrum and K lines

2.4.1 Characteristic radiation:

Each element has electronic orbitals of characteristic energy. Following removal of an inner electron by an energetic photon provided by a primary radiation source, an electron from an outer shell drops into its place. There are a limited number of ways in which this can happen, as shown in Figure 1. The main transitions are given names: an L→K transition is traditionally called K_{α} , an M→K transition is called K_{β} , an M→L transition is called L_{α} , and so on. Each of these transitions yields a fluorescent photon with a characteristic energy equal to the difference in energy of the initial and final orbital. The wavelength of this fluorescent radiation can be calculated from Planck's Law.

The fluorescent radiation can be analyzed either by sorting the energies of the photons (energy-dispersive analysis) or by separating the wavelengths of the radiation (wavelength-dispersive analysis). Once sorted, the intensity of each characteristic radiation is directly related to the amount of each element in the material. This is the basis of a powerful technique in analytical chemistry. Figure (2.2) shows the typical form of the sharp fluorescent spectral lines obtained in the wavelength-dispersive method (see Moseley's law).

Primary radiation:

In order to excite the atoms, a source of radiation is required, with sufficient energy to expel tightly held inner electrons. Conventional X-ray generators are most commonly used, because their output can readily be "tuned" for the application, and because higher power can be deployed relative to other techniques. However, gamma ray sources can be used without the need for an elaborate power supply, allowing an easier use in small portable instruments. When the energy source is a synchrotron or the X-rays are focused by an optic like a polycapillary, the X-ray beam can be very small and very intense. As a result, atomic information on the sub-micrometer scale can be obtained. X-ray generators in the range 20–60 kV are used, which allow excitation of a broad

range of atoms. The continuous spectrum consists of "bremsstrahlung" radiation: radiation produced when high-energy electrons passing through the tube are progressively decelerated by the material of the tube anode (the "target"). A typical tube output spectrum is shown in Figure (2.3).

Dispersion:

In energy dispersive analysis, the fluorescent X-rays emitted by the material sample are directed into a solid-state detector which produces a "continuous" distribution of pulses, the voltages of which are proportional to the incoming photon energies. This signal is processed by a multichannel analyzer (MCA) which produces an accumulating digital spectrum that can be processed to obtain analytical data.

In wavelength dispersive analysis, the fluorescent X-rays emitted by the material sample are directed into a diffraction grating monochromator. The diffraction grating used is usually a single crystal. By varying the angle of incidence and take-off on the crystal, a single X-ray wavelength can be selected.

Detection:

In energy dispersive analysis, dispersion and detection are a single operation, as already mentioned above. Proportional counters or various types of solid-state detectors (PIN diode, Si(Li), Ge(Li), Silicon Drift Detector SDD) are used. They all share the same detection principle: An incoming X-ray photon ionizes a large number of detector atoms with the amount of charge produced being proportional to the energy of the incoming photon. The charge is then collected and the process repeats itself for the next photon. Detector speed is obviously critical, as all charge carriers measured have to come from the same photon to measure the photon energy correctly (peak length discrimination is used to eliminate events that seem to have been produced by two X-ray photons arriving almost simultaneously). The spectrum is then built up by dividing the energy spectrum into discrete bins and counting the number of pulses registered within

each energy bin. EDXRF detector types vary in resolution, speed and the means of cooling (a low number of free charge carriers is critical in the solid state detectors): proportional counters with resolutions of several hundred eV cover the low end of the performance spectrum, followed by PIN diode detectors, while the Si(Li), Ge(Li) and Silicon Drift Detectors (SDD) occupy the high end of the performance scale.

In wavelength dispersive analysis, the single-wavelength radiation produced by the monochromator is passed into a photomultiplier, a detector similar to a Geiger counter, which counts individual photons as they pass through. The counter is a chamber containing a gas that is ionized by X-ray photons. A central electrode is charged at (typically) +1700 V with respect to the conducting chamber walls, and each photon triggers a pulse-like cascade of current across this field. The signal is amplified and transformed into an accumulating digital count. These counts are then processed to obtain analytical data.

2.4.2 Advantages and disadvantages of X-ray spectrometry:

Advantages of X-ray spectrometry

- Simple spectra
- Spectral positions are almost independent of the chemical state of the analyses
- Minimal sample preparation
- It is non-destructive
- Applicable over a wide range of concentrations
- Good precision and accuracy.
- Can be used to measure solid, powdered and liquid samples.

Disadvantages of X-ray spectrometry

- X-ray penetration of the sample is limited to the top 0.01 - 0.1 mm layer.
- Light elements (below Na) have very limited sensitivity although C is possible on new instruments.

- Inter element (MATRIX) effects may be substantial and require computer correction.
- Limits of detection are only modest.
- Instrumentation is fairly expensive

2.4.3 Applications of XRF:

- Qualitative and quantitative elemental analysis of organic and inorganic compounds and materials such as:
 - ores, minerals, ceramics, cement, construction materials and soils
 - chemicals, pharmaceuticals, biomaterials and plastics
 - corrosion products, environmental contaminants and hazardous materials
 - metals and alloys
 - Control of raw material composition, technological processes and finished products.
 - Determination of the content of heavy metals in soil, food and other materials.
 - Authenticity verification of canvas, paint, metal objects, paper, pottery, etc.
 - Forensic and medical studies.
 - Analysis of precious metals.

2.5 Milk:

Milk is an emulsion of butterfat globules within a water-based fluid that contains dissolved carbohydrates and protein aggregates with minerals, because it is produced as a food source for the young, all of its contents provide benefits for growth. The principal requirements are energy (lipids, lactose, and protein), biosynthesis of non-essential amino acids supplied by proteins (essential amino acids and amino groups), essential fatty acids, vitamins and inorganic elements, and water [8].

Physical Composition of Milk

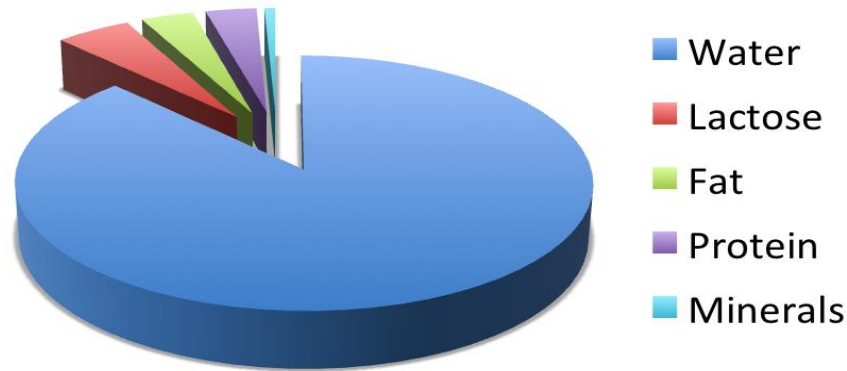


Figure (2.4) physical composition of milk

Milk is a nutrient-dense food. This means that it provides a high level of essential nutrients compared to its calories. In fact, each serving of milk provides 10% or more of the recommended daily intake for calcium, vitamin D (if fortified), protein, potassium, vitamin A, vitamin B, riboflavin and phosphorus.

Milk is an excellent source of calcium. Regardless of its fat content, milk provides about 300 milligrams (mg) of calcium per serving (8 fluid oz). The chart below provides information on the calcium content of fluid milk products per serving. An adequate intake of calcium helps to reduce the risk of osteoporosis, high blood pressure and colon cancer. It is difficult to obtain enough calcium without consuming milk (or other dairy foods). To help meet calcium needs, the following number of servings of milk (or its equivalent) is recommended each day[13].

2.5.1 Physical and chemical properties of milk:

Milk is an emulsion or colloid of butterfat globules within a water-based fluid that contains dissolved carbohydrates and protein aggregates with minerals. Because it is produced as a food source for the young, all of its contents provide benefits for growth [8]. The principal requirements are energy (lipids, lactose, and protein), biosynthesis of non-essential amino acids supplied by proteins

(essential amino acids and amino groups), essential fatty acids, vitamins and inorganic elements, and water.

We will cover the following physical properties.

- Milk color&taste and smell.
- Surface tension
- Density
- Viscosity
- Freezing Point & boiling Point

Milk color:

The natural color of the milk is the transparent white color that is yellowish. The color depends on the animal variety [24], the type of food and the amount of solids present in it.

The white color of the milk was the result of light reflection by the related substances in milk such as fat, protein and phosphorus salts.

If the white color is white, it means that the fat has been removed from it.

Yellow color indicates the presence of carotene dye, which is transmitted from green feed and concentrated in the fatty granules for their high ability to melt in fat. Green indicates that there is a type of bacteria

The taste and smell of milk:

The milk tastes a little sweet and smells special and distinctive, and loses milk smell after hours of milking process or after cooling. It has been observed that the sweet flavor of milk is closely related to the proportion of lactose and chloride, where the effect of the first on the flavor of the milk while the effect of chloride reverse [25].

Surface tension:

Is the tensile strength that appears on the fluid surface. Surface tension is affected by fatty content, ie by adding fat[30]. Milk is less superficial than water because of substances that reduce it, such as fatty proteins.

Viscosity:

Is the resistance that liquids make towards their flow. The water that flows easily with low viscosity, and the milk is slightly higher than in the water due to the presence of solids and milk proteins, which are in different physical conditions [31].

Viscosity is reduced when pasteurization and mixing and mixing for a long time, but acidification increases the viscosity.

Milk density:

They are physical properties and are used to compare the masses of different materials.

It is necessary to mention the temperature when measuring the density of milk, measured at a temperature of (15-20-25) °C because milk fat is in a fluid and homogeneous condition. Under these conditions, milk fat is crystalline and solid, making the assessment difficult [26].

Freezing of milk:

Is the degree to which milk is in equilibrium between liquid and solid state.

Freezing milk is less than freezing water due to dissolved milk components such as lactose and some minerals.

Boiling temperature:

Is the degree to which milk is in equilibrium between the liquid state and the gaseous state.

Boil the milk at a temperature higher than water because of the presence of soluble matter in it.

Factors that help to increase the boiling point of milk compared to water are the same responsible for the low degree of freezing of milk.

2.6 Milk Problems:

Problems of milk, including pollution, and sources of pollution for many milk: the animal source of pollution - the environment surrounding the animal - the means of transport - vessels, which preserves the milk.

Second is the biggest problem facing milk is the bacteria Les because is a good center for the growth of all kinds of bacteria cause?

1 - A high percentage of water (moisture needed by bacteria).

2 - All the nutrients needed by every organism, including bacteria (so it is a fast-damage center).

The big problem still remains in some people as they prolong the period of conservation, adding preservatives such as formaldehyde, the carcinogen, which is banned internationally. Praise be to God in Sudan is not present and not used. But sometimes antibiotics are added - and the antibiotic of the consumer is known only by the laboratories, the problem that it preserves the milk for longer periods, but negatively affects the human body especially young children and possible future non-response to antibiotics used in treatment. The reason is that bacteria form an immunity against antibiotics used in treatment.

2.7 There are Some Ways to Detect Milk Cheating:

By freezing point

Put the milk taken from the seller in a clean bag and put in the refrigerator until frozen after a period of time note that in the bag took two colors white and another color is transparent white means that the milk is good, but if the transparent white color any other color, such as green or yellow, the sample is not good.

By boiling

Place 5 cm of milk in a simple test tube and place it in a water bath at 100 ° C for 5 minutes. If the sample is tested, the milk is foamed if the sample does not get well.

Viscosity test

Small cup of less than half of the milk and closed and reversed and head back
Tania note the membrane back, the speed of the membrane on the glass will
appear the result:

- If the milk is reduced quickly meaning that low viscosity means the addition of a quantity of water.

- If the milk drops quickly, the simple meaning is that the milk is good.

- If the milk is reduced quickly, with a few grains in the cup, it indicates that the milk has a substance of association such as origin or any other substance bond.

2.8 Milk Test:

This test is important for detection of the amount of water added to milk.

The addition of 9% water to milk will raise the freezing point by 0.05 °C.

i.e., if milk freezing point is -0.34 °C, it means addition:

$$-0.34 - (-0.44) = -0.34 + 0.44 = +0.10$$

$$0.05 \rightarrow 9 \%$$

$$0.10 \rightarrow X$$

$$0.05 / X = 9 \times 0.1$$

$$= 18 \%$$

Where:

(-0.44) freezing point for the cow milk.

Chapter Three

Experimental Part

3.1 Introduction:

This chapter includes the materials used in this work and the following methods (sample preparation and setup) and the procedure.

3.2 Materials:

3.2.1 Study area:

The study was conducted on the north of the Aljazeera project in the village of Elnoba and the state of the Aljazeera, which is about 50 km from Khartoum, is located on the West Bank of the Blue Nile, located between the industrial city of Giad in the west and the city of Al Massed in the east .The people of the region depend on agriculture and cattle husbandry, cattle and sheep.

3.2.2 Milk:

Milk has long been a popular beverage, not only for its flavor, but because of its unique nutritional package. It also provides high-quality protein, vitamins and other minerals, we brought four kind of milk (cow-goat-sheep-camel) fresh from farm directly from udder cow non extras event for milk.

Physically

It is a transparent white emulsion that has a slightly sweet taste and is perishable.

3.2.3 Sites for sample collection:

Fresh milk was collected (4) samples taken from four types of cattle (**cow-camel-goat-sheep**) in a sterile manner from the dairy facility at Aljazeera farms south Khartoum, Sudan was aseptically collected then it was .Utilized as the raw material, and it was used in experiments within 1 hour and taken for analysis



Figure (3.1) Fresh milk collected (camel-goat-goat-cow)

3.3 Devices:

3.3.1 Surface tension measurement:



Figure (3.2): Surface tension Measuring Device

The method of measuring the hairs depends on the surface, the fluid is liquid to determine the tension of the tube inside the fluid. The measurement of its origin depends on the specific condition of the tube. If the outer surface of the container is placed in the tube, the pipe will rise and the walls will form walls if the top is wet.

The surface tension is given by the following relationship: The relationship between the height of the fluid in the hair tube $\gamma = (\rho g h d / 4)$

The radius of the hair tube (r) Ground gravity acceleration, (g) Liquid density, (d) Liquid height, (h).

Where:

$$\gamma = (fghd/4)$$

γ = Surface coefficient

f = Intensity of Milk (1.02kg/m³)

$$g = (10\text{m/s}^2)$$

h = High milk

d = the tube's diameter

The surface tension of the milk was measured using capillary tubes and a microscope to read the results - a tube holder - a glass of water, reading in the microscope first without milk in the cup and then the cup was filled with milk and reading the results for each sample.

3.3.2 Viscosity measurement:



Figure (3.3): Viscosity Measuring Device

The fluid to be set is placed in a measuring cylinder with a known radius. If a Hoover type is used from the viscosity measurements by the falling ball, a ball with a known radius drops in the liquid. The velocity of the ball's fall in the liquid is affected by a balance between gravity pulling down and the friction between the ball and the fluid. The continuous fall of the ball in the fluid is a constant velocity up to the bottom of the cylinder [27].

According to the Stokes Act, the fluid viscosity of the liquid is

Where

$$\eta = \frac{2}{9}gr^2(\rho_s - \rho_l)/v$$

η = Viscosity coefficient

$$g = (10\text{m/s}^2)$$

r = Ball Radius

ρ_s = Solid body density (7900kg/m³)

ρ_l = Intensity of liquid (1260kg/m³)

Micrometer consists of a fixed cylinder with a longitudinal gradation (up to the length of the cylinder) up to 25 mm in length and divided into 50 police. Half the number of this condition is from the top of the measurement line and is for the correct mallet units and the remaining half of this condition is below the measurement line, this device is fixed to the end of the hard drive.

Is a moving cylinder with a cavity inside, and the character of this cylinder a circular scale consisting of 50 police distributed evenly on the perimeter of the character of the cylinder fully moving and this classification of the division of the percentage of one millimeter, the measurement unit micrometer also deals with the decimal and the tenth half of a millimeter, The buckle and semi-fastener are installed with a movable moving jaw which moves with the moving cylinder. The fixed cylinder is inserted into the moving cylinder by a threaded bolt between the two cylinders until the zero dash applies to the beginning of the distributed staging on the moving cylinder with the zero dash at the beginning of the distributed staging on the fixed cylinder. At this moment the jaw end is also connected to the hard end of the jaw. Appropriate measurement.

The milk viscosity was measured using several devices. The size of the ball was measured (6.6 mm), the inserted blacksmith, the magnet and the stopwatch were filled with the different types of milk to measure each sample of the different

milk and the distance traveled by the ball was measured in the bucket and the time was calculated by the stopwatch when the ball was thrown Results.

3.3.3 Density measurement:



Figure (3.5): Density Measurement Device

Most high-precision scales and analytical scales from METTLER TOLEDO with readability of 1 mg or higher can be easily used to determine density via buoyancy using the density measurement kit installed on the scale in a few simple steps.

The determination of density using the scale is an easy and convenient process that provides very reliable results compared to other methods where the size of the part is determined independently of the weight. By converting the standard laboratory scale by adding a density measurement kit, you avoid the need to purchase a custom piece of equipment to perform this direct action [29].

This makes the purchase of a density measurement kit accessory a cost-effective investment. With the addition of a well-known glass submersible, a density measurement kit can also be used to determine the density of liquid samples.

Where

$$D=W/V$$

D=density of the liquid (milk).

W=weight of the liquid (milk)/g .

V=volume of the liquid (milk)/ml .

The density of the liquid cup was measured empty in the balance, then the milk cup was again measured and measured and the results were divided with some of the four samples of milk.

3.3.4 Freezing measurement:



Figure (3.6): Freezing Measuring Device

The degree of freezing of the milk was measured by placing the milk in a clean cup in the refrigerator for a period of time until it was frozen and after removing it, its freezing was measured by the meter and the meter for the four different types of milk.

3.3.5 Boiling measurement:

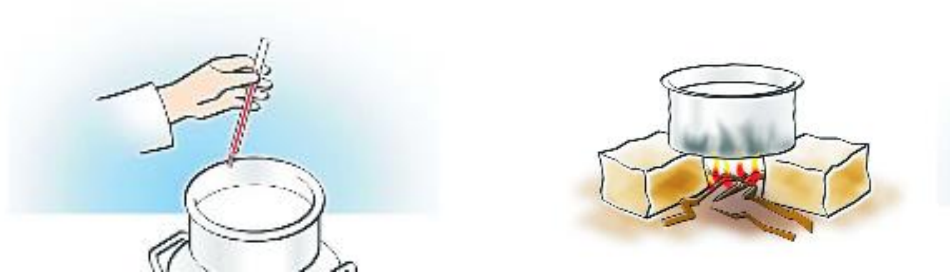


Figure (3.7):Boiling Measuring Device

The boiling point of the milk was measured by placing a cup of milk in the fire until it was removed. The thermometer was then placed to read the different samples.

3.3.6 X-ray fluorescence(XRF):

X-ray fluorescence is the emission of characteristic "secondary" (or fluorescent) X-rays from a material that has been excited by bombarding with high-energy X-rays or gamma rays. The phenomenon is widely used for elemental analysis and chemical analysis, particularly in the investigation of metals, glass, ceramics and building materials, and for research in geochemistry, forensic science, archaeology and art objects such as paintings and murals.[22]



Figure (3.8) X-ray fluorescence device

3.4 The Procedure:

- 1- Sixteen samples of milk were collected for different types of goats, sheep, camel, and cows at the North Al-Jazeera Dairy Farm.
- 2- The samples were carefully taken and the ureters were leaped at Aleppo samples so as not to contaminate the milk and change the jumps in each type. Place it from the animal's breast into a glass bottle with a perfect and sterile shape so that the milk does not change.
- 3-After the collected samples were extracted to the able physical properties to conduct physical experiments on it was measured viscosity of the four types of milk viscosity was measured surface tension of milk and refractive index and density was calculated in the lab of physical and chemistry, Finally, the boiling point and the degree of freezing of the milk were calculated.
- 4- The test was carried out, by placing the samples in the freezer until freezing and measuring the freezing degree for each milk type.
- 5- The experiment was done twice to find the average and stander deviation for each sample.

6-The different samples were mixed at the normal temperature (room temperature) and after your meal was placed in an ice bag so that the samples were not changed and stored directly to the lab. The uniform is one hour away from the dairy project.

7- Second we orphan collect the (16) samples from milk and taken to physical laboratory in ministry of& petroleum gas to produce detectability about element with device X-ray.

8- Orphan divided samples (16) samples to four groups, the first group includes four samples from different kind of milk and put it in tubes device, sterilized and put in device in room's temperature.

9- Second in putting the second group of different kind of milk which heated to (30) C° , and the third group which heated to (60)c°, and the last group which heated to (100)C°.

10- Finally after input all the samples to device and check the device and working, put the result for every group alone.

Chapter Four

Results and Discussion

4.1 Introduction:

This chapter summarize results obtained during the work. Results include photographs, figures and tables as shown below. Data fitting of experimental results was also shown, discussion and conclusion.

4.2 Results:

4.2.1 The physicals properties:

4.2.1.1 Estimation the value of surface tension of the milk samples

The results in Table (4.1) showed differences in the surface tension values of the four different samples of cattle (sheep-camel-goat-cow), with the highest concentration of sheep's milk followed by cow's milk and goats and the lowest concentration in camel milk. The reason is that surface tension is affected by fat and milk. Camels contain more fat than other dairy products and also contain a higher amount of unsaturated fatty acids for the intensity of fat granules and their association with protein compared to other milk.

We found that the butter extracted from camel milk contains a high proportion of unsaturated fatty acids, which earns a special nutritional importance compared to butter, cow, goat and lamb, making it especially useful to the elderly because it is less harmful than butter containing high proportion of saturated fatty acids that Crostrol is caused in the blood.

These results are similar to those studied by ABU-LEHIA (chemical and physical characterizes of camel milk).

Table (4.1) Values of surface tension of different kinds of milks.

Surface tension	Value(N/m ²)
Cow milk	0.0000235
Goat milk	0.0000235
Camel milk	0.0000178
Sheep milk	0.0000382

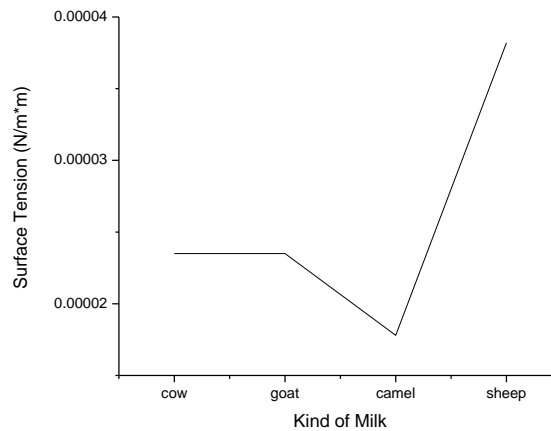


Figure (4.1) Values of surface tension of different kinds of milks.

4.2.1.2 Estimation the value of viscosity in milk

The results of the viscosity also showed differences in the four values of the different milk. The highest value in goat milk was to contain many solids, milk proteins (casein) and low viscosity in camel milk due to lower levels of solids and protein and cow's milk Sheep are less valuable than other dairy products due to lower levels of other solids.

This study is similar to the viscosity test conducted in the study COUAT (properties of milk).

Table (4.2) Values of viscosity of different kinds of milks.

Viscosity	Value(poss)
Cow milk	0.88
Camel milk	1.00
Goat milk	1.7
Sheep milk	0.80

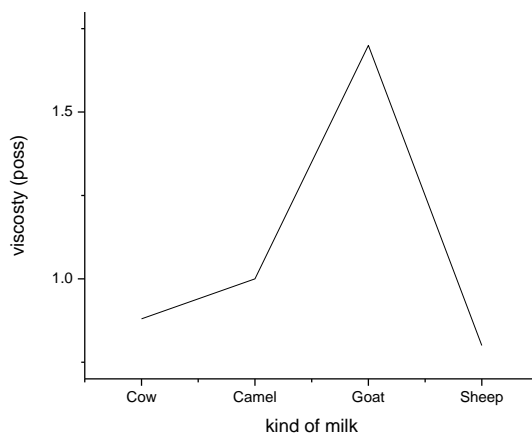


Figure (4.2) values of viscosity of different kinds of milks.

4.2.1.3 Estimation the value of density in milk.

The results showed different values for the four milk was the highest value of milk when the milk of goats and sheep, and this is due to contain less fat

compared to cow milk and water because it contains more fat and the more fat the more milk in the milk was less density and vice versa.

This is similar to the study by Dr.Ibrahim Boshara (chemical and physical properties of milk).

Table (4.3) Values of density of different kinds of milks.

Density	Value(gm /ml)
Cow milk	1.0496
Camel milk	1.0342
Goat milk	1.0586
Sheep milk	1.0563

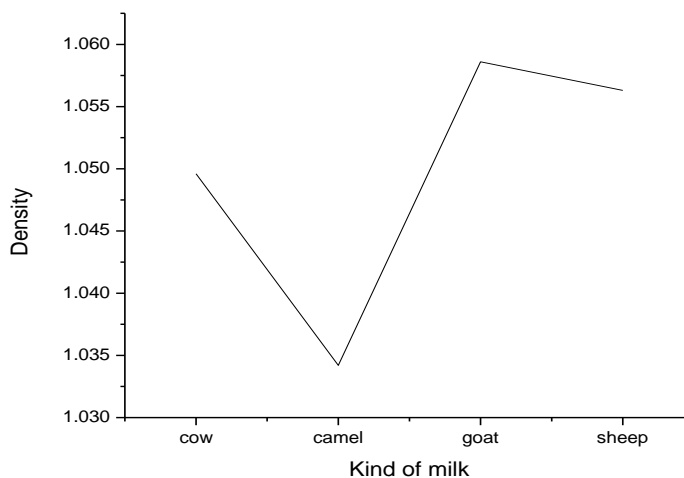


Figure (4.3) values of density of different kinds of milks.

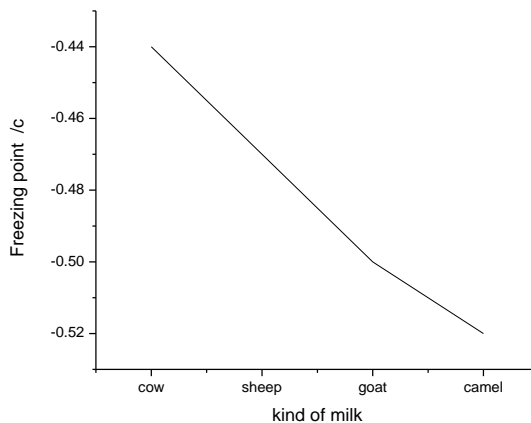
4.2.1.5 Estimation the value of freezing point in milk.

The results showed that the largest freezing value was in cow's milk and lamb due to the dissolved solids of lactose sugar and some minerals and salts, which in

turn contributed to the lower degree of freezing with less water, goat milk and camel milk.

Table (4.4) Values of freezing point of different kinds of milks.

Freezing point	Value
Cow milk	-0.44
Camel milk	-0.52
Goat milk	-0.50
Sheep milk	-0.47



Figure(4.4) values of freezing point of different kinds of milks.

4.2.1.5 Estimation the value of boiling point in milk.

The results showed that the highest value of boiling was in the milk of lamb and water and the reason is due to the soluble substances of salts and lactose sugar, we note that the reasons that led to the boiling point is the same that led to the low boiling point

Table (4.5) Values of boiling point of different kinds of milks.

Boiling Point	Value
Cow milk	139
Camel milk	152.5
Goat milk	151
Sheep milk	154.5

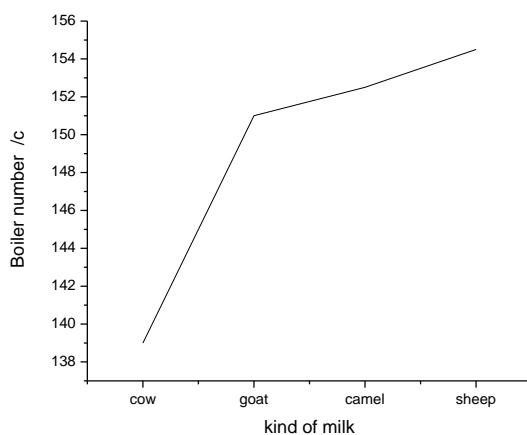


Figure (4.5) values of boiling point of different kinds of milks.

4.2.2 The Element Contents

Obtained results showed the effect of the wavelength dispersive X-ray fluorescence spectrometer on the different kinds of milk at different temperature, The elements in sixteen samples were found in different concentrations, which in first four sample referred as control (cow, camel, goat and sheep), and The other four samples were heated to 30°C and were exposed to wavelength dispersive X-ray fluorescence, The other four samples were heated to 60°C and were exposed to wavelength dispersive X-ray fluorescence, The other four samples were heated to 100°C and were exposed to wavelength dispersive X-ray fluorescence

for 12 minutes result showed that some elements decrease with increasing temperature and others increase with no concentration of some elements.

Table (4.6) Milk in Room Temperature of different kinds of milks.

Sample/ml	Cow Milk	Camel Milk	Goat Milk	Sheep Milk
Ba	0.0322	0.0322	0.0322	0.0322
Ca	0.1606	0.1572	0.1438	0.1565
Mg	0.0000	0.0005	0.0017	0.0000
p	0.0296	0.0425	0.0425	0.0000
Zn	0.0000	0.0000	0.0000	0.0000
Fe	0.2170	3.703	0.9780	0.9600
Mn	0.0640	0.4640	0.3480	0.2780

Table (4.7) Milk in 30°C Temperature of different kinds of milks.

Sample/ml	Cow Milk	Camel Milk	Goat Milk	sheep Milk
Ba	0.0322	0.0322	0.0322	0.0322
Ca	0.1501	0.1154	0.1188	0.1985
Mg	0.0020	0.0000	0.0000	0.0052
p	0.0245	0.0245	0.0336	0.0582
Zn	0.0000	0.0000	0.0000	0.0000
Fe	0.0250	2.9630	0.3120	0.8298
Mn	0.1520	0.4030	0.4551	0.2330

Table (4.8) Milk in 60°C Temperature of different kinds of milks.

Sample/ml	Cow Milk	Camel Milk	Goat Milk	sheep Milk
Ba	0.0322	0.0322	0.0322	0.0322
Ca	0.1421	0.1985	0.1209	0.1506
Mg	0.0000	0.0048	0.0015	0.0000
p	0.0177	0.0574	0.0368	0.0253
Zn	0.0000	0.0000	0.0000	0.0001
Fe	0.0012	2.1130	0.1053	0.0060
Mn	0.3312	0.2341	0.3019	0.2139

Table (4.9) Milk in 100°C Temperature of different kinds of milks.

Sample/ml	Cow Milk	Camel Milk	Goat Milk	sheep Milk
Ba	0.0322	0.0322	0.0322	0.0322
Ca	0.1163	0.1144	0.1286	0.2007
Mg	0.0000	0.0000	0.0015	0.0020
p	0.0254	0.0177	0.0366	0.0575
Zn	0.0001	0.0000	0.0000	0.0000
Fe	0.0000	1.782	0.0000	0.0000
Mn	0.2117	0.1845	0.1522	0.0988

4.2.2.1 Estimation the concentration of elements for cow milk

Table (4.10): statistical analysis of some elements in cow's milk in room temperature

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	1.0000	1.0000	.032200	.160600	.000000	.029600	.000000	0.07210000	.0640000

Table (4.11): statistical analysis of some elements in cow's milk at temperature 30°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	1.0000	2.0000	.032200	.150100	.002000	.024500	.000000	0.02500000	.1520000

Table (4.12): statistical analysis of some elements in cow's milk at temperature 60°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	1.0000	3.0000	.032200	.142100	.000000	.017700	.000000	0.0012000	.3312000

Table (4.13): statistical analysis of some elements in cow's milk at temperature 100°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	1.0000	4.0000	.032200	.116300	.000000	.025400	.000100	0.000000	.2117000

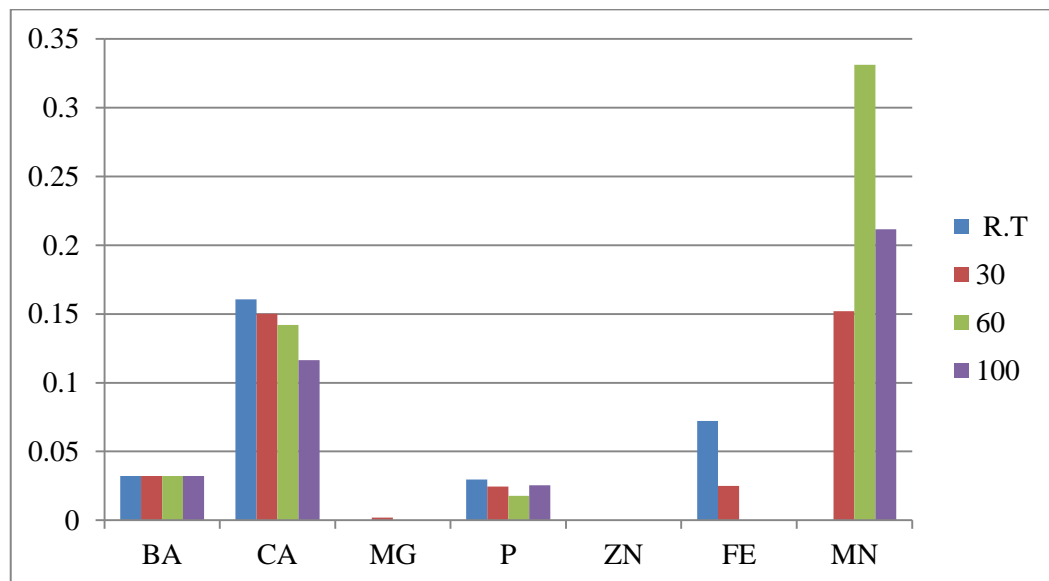


Figure (4.6). cow milk in relation to the means of elements according to the different temperature.

The results shown in Fig. 4.1 showed that in the case of cow's milk at room temperature (raw milk), some concentrations of milk elements took the highest concentration of milk. The highest concentration of calcium in cow's milk at room temperature was highest in comparison to other dairy products, because cow's milk was rich in calcium (84%) in other dairy products.

Calcium is one of the most necessary dairy products for the human body, which is a basic element in the human body and deficiency leads to bone and tooth problems and its increase leads to the formation of gravel.

Nutritionists globally identified a daily intake of 1000 mg of calcium. One cup of milk contained 502 mg of calcium.

This concentration of cow's milk seemed to decrease with the increase in different temperatures (30,60,100).

The iron component had the highest concentration at room temperature, which is also an important element in the milk and lack leads to anemia and the concentration of the element appears to decrease with heating (30).

The concentration of phosphorus is also the same as that of the iron component, an important component of thrombocytopenia which transforms the milk from the liquid to the cohesive jelly to the presence of phosphoric bonds that are affected by the natural content of phosphorus.

Manganese in cow's milk at room temperature did not have a concentration value but the concentration increased with increasing temperature and due to the presence of one of the manganese compounds that degrade by heat and give manganese element in the racist image.

Concentrations of magnesium and zinc were very low with heating and at room temperature.

The concentration of these elements for cow's milk is similar to what was studied in the study by jzhejiarg -2008 (physicochemical characteristics of various milk sample available).

4.2.2.2 Estimation the concentration of elements for camel milk

Table (4.14): statistical analysis of some elements in camel's milk in room temperature

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	2.0000	1.0000	.032200	.157200	.000500	.042500	.000000	3.703000	.4640000

Table (4.15): statistical analysis of some elements in camel's milk at temperature 30°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	2.0000	2.0000	.032200	.115400	.000000	.024500	.000000	2.963000	.4030000

Table (4.16): statistical analysis of some elements in camel's milk at temperature 60°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	2.0000	3.0000	.032200	.198500	.004800	.057400	.000000	2.113000	.2341000

Table (4.17): statistical analysis of some elements in camel's milk at temperature 100°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	2.0000	4.0000	.032200	.114400	.000000	.017700	.000000	1.782000	.1845000

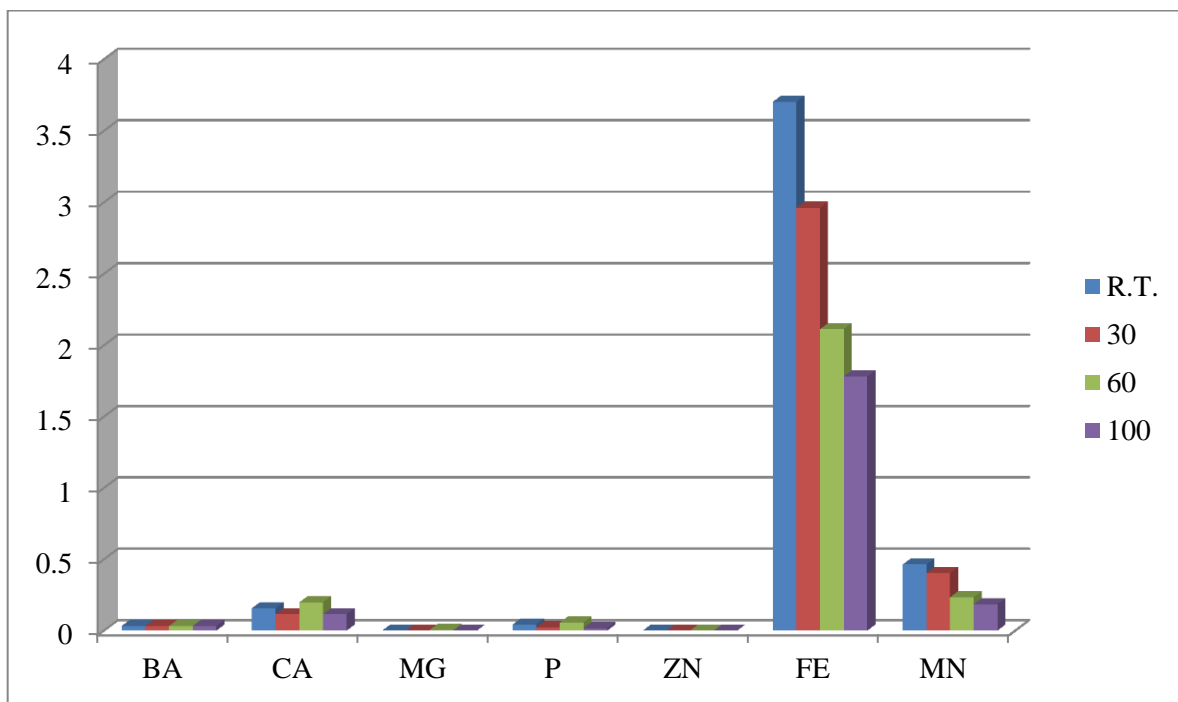


Figure (4.7). camel milk in relation to the means of elements according to the different temperature

The results shown in Figure (2) exposed to the dispersal x-ray machine showed that in the case of camel milk at room temperature (raw milk), some concentrations of the milk components took the highest value. And that the concentration of iron is the highest value for camel milk, because the element of iron is the main component of camel milk because of the valuable benefits in the

transport of oxygen in the blood and lack leads to anemia, especially in children, and iron richest compound in camel milk and its concentration In milk, three times as much milk as other proteins contains a high proportion of enzymes that bind to iron and inhibit the absorption of the body. It is an indicator to be used as an alternative to iron grains. As we observe in Figure, the concentration value decreases with the increase in temperature.

For the manganese element in camel milk at room temperature it has a higher concentration value. This element is important in camel milk as it works on the formation of enzymatic reactions. This concentration is higher than that of breast milk and other milk, but the concentration decreases with the increase in temperature. It analyzes vehicles and reduces their values.

Calcium and phosphorus also gave their highest concentrations at room temperature and concentrations began to decrease as the temperature increased.

Magnesium, zinc and barium concentrations were at their lowest values.

The concentrations of these values were similar to those studied by Ahmed Mamdooh (chemical and physical characterizes of camel milk).

4.2.2.3 Estimation the concentration of elements for goat milk

Table (4.18): statistical analysis of some elements in goat's milk in room temperature

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	3.0000	1.0000	.032200	.143800	.001700	.042500	.000000	0.9780000	.3480000

Table (4.19): statistical analysis of some elements in goat's milk in temperature 30°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	3.0000	2.0000	.032200	.118800	.000000	.033600	.000000	0.3120000	.4551000

Table (4.20): statistical analysis of some elements in goat's milk in temperature 60°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	3.0000	3.0000	.032200	.120900	.001500	.036800	.000000	0.1053000	.3019000

Table (4.21): statistical analysis of some elements in goat's milk in temperature 100°C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	3.0000	4.0000	.032200	.128600	.001500	.036600	.000000	.00000000	.0152200

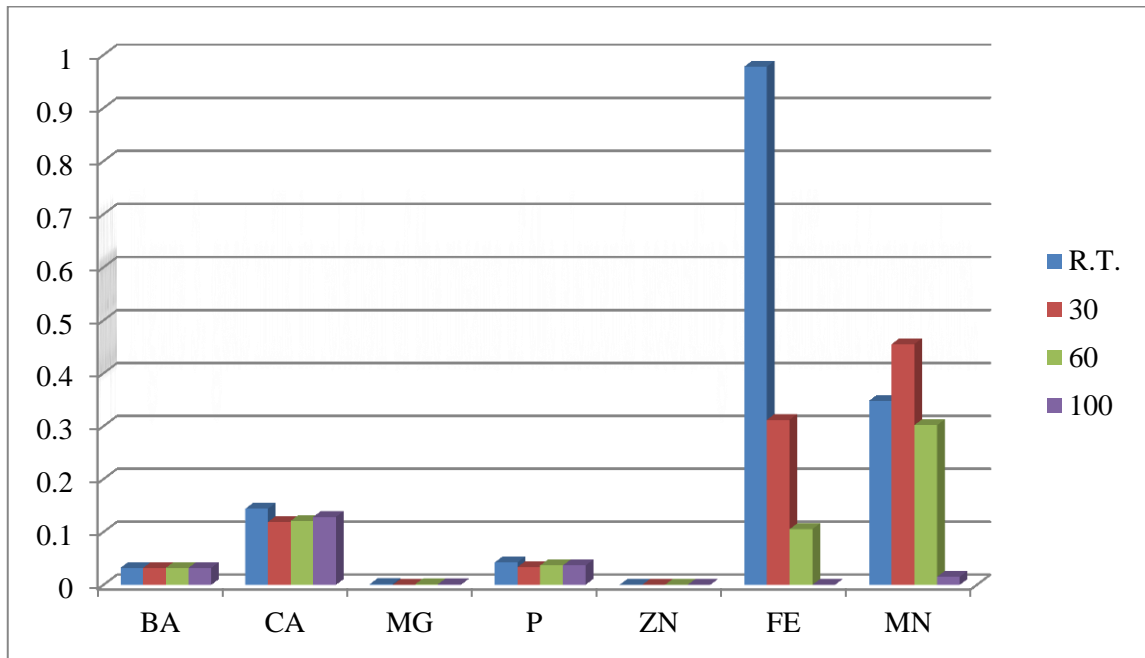


Figure (4.8). goat milk in relation of the means of the elements according to the different temperature.

The results shown in Fig. 4.8 exposed to the x-ray diffused from goats' milk showed that goat milk at room temperature showed that most of the concentrations of the elements were at their highest values (iron, calcium and phosphorus). Concentrations began to decrease with increasing heating.

The manganese compound, at room temperature, had a lower concentration and appeared to increase in temperature. [30] The reason was that one of the manganese compounds that degrade in heat and give manganese in the racist image and appeared to decrease with increasing heating.

The zinc and magnesium compounds were at their lowest values to contain goat milk at lower concentrations. This is recommended by Sudanese doctors. Goat milk is the closest to breast milk in terms of concentrations.

The chemical composition of goats' milk is similar to that of cow's milk, except for hybrid breeds that have a much richer composition, with a slight reduction of some concentrations due to the fact that goat's milk in its granules and compounds is smaller than cow's milk.

The concentration of these elements for cow's milk is similar to what was studied in the study (comparison of chemical composition and physico-chemical characters of shami goat colostrum and milk).

4.2.2.4 Estimation the concentration of elements for sheep milk

Table (4.22): statistical analysis of some elements in sheep's milk in room temperature

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	4.0000	1.0000	.032200	.156500	.000000	.000000	.000000	0.9600000	.2780000

Table (4.23): statistical analysis of some elements in sheep's milk in temperature 30 °C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	4.0000	2.0000	.032200	.198500	.005200	.058200	.000000	.82980000	.2330000

Table (4.24): statistical analysis of some elements in sheep's milk in temperature
60 °C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	4.0000	3.0000	.032200	.150600	.000000	.025300	.000100	.006000	.2139000

Table (4.25): statistical analysis of some elements in sheep's milk in temperature
100 °C

	THE MILK	TEMPERATURE	BA	CA	MG	P	ZN	FE	MN
N Valid	1	1	1	1	1	1	1	1	1
Missing	0	0	0	0	0	0	0	0	0
Mean	4.0000	4.0000	.032200	.200700	.002000	.057500	.000000	.0000000	.0988000

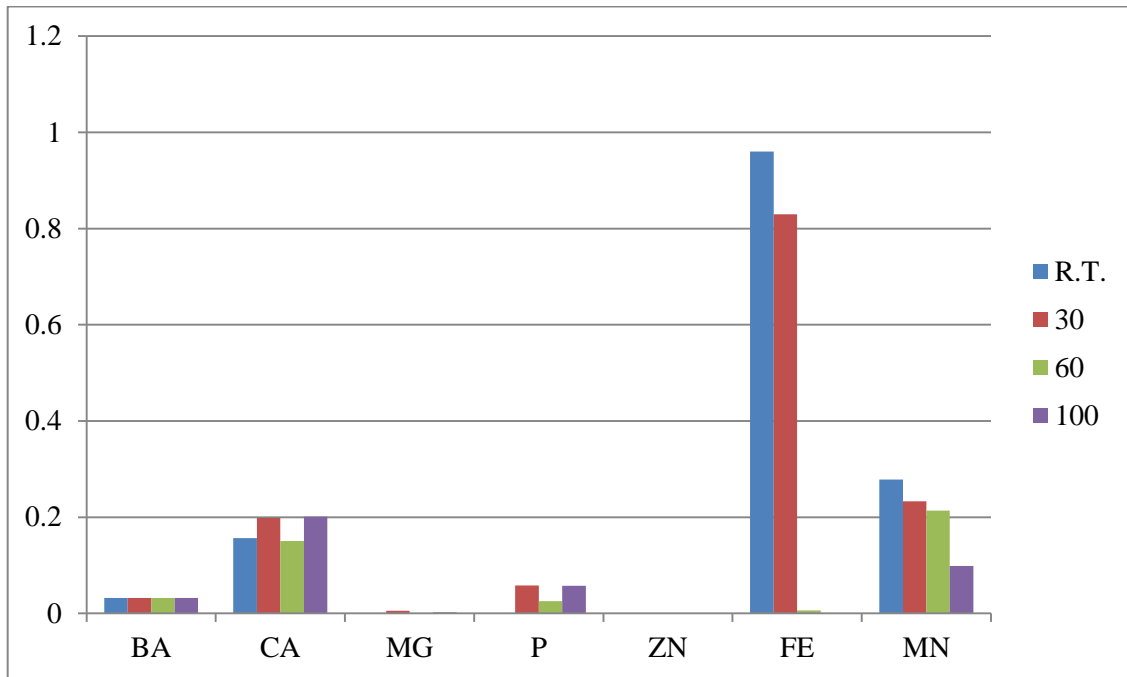


Figure (4.9) sheep milk in relation to the means of different elements according the different temperature

The results were shown in Figure (4.9) exposed to the scattered x-ray machine. In the case of sheep's milk, the concentrations of the elements were higher in the manganese compound, the iron compound and the phosphorus compound, because the sheep's milk was rich in those elements and these concentrations began to decrease with the increase in temperature, When heating at a temperature of (100) °C it seemed to increase due to the presence of some phosphorus compounds that degrade by heat.

The calcium element at room temperature was less concentrated, but when the heating increased it appeared to increase its concentration and is because one of the calcium compounds in the milk of the sheep to decompose heat and give calcium in the image of racism.

Concentrations of manganese, zinc and barium were lower at room temperature and heating to contain sheep's milk on manganese and zinc at lower concentrations.

Goat milk helps keep the iron component in the milk added to the fruit juice and transfer it to the cells.

The concentrations of these values were similar to those studied in HELMUT K.MAYER 2012(physical and chemical characterizes of sheep and goat milk).

Table (4.26): statistical analysis of some elements milk in different Temperature

Sample/ml	Ba	Ca	Mg	P	Zn	Fe	Mn
1	0.0322	0.1606	0.0000	0.0296	0.0000	0.7210	0.0640
2	0.0322	0.1501	0.0020	0.0245	0.0000	0.0250	0.1520
3	0.0322	0.1421	0.0000	0.0177	0.0001	0.0012	0.3312
4	0.0322	0.1163	0.0000	0.0254	0.0000	0.0000	0.2117
5	0.0322	0.1572	0.0005	0.0425	0.0000	3.703	0.4640
6	0.0322	0.1154	0.0000	0.0245	0.0000	2.963	0.4030
7	0.0322	0.1985	0.0048	0.0574	0.0000	2.1130	0.2341
8	0.0322	0.1144	0.0000	0.0177	0.0000	1.782	0.1845
9	0.0322	0.1438	0.0017	0.0425	0.0000	0.9780	0.3480
10	0.0322	0.1188	0.0000	0.0336	0.0000	0.3120	0.4551
11	0.0322	0.1209	0.0015	0.0368	0.0000	0.1053	0.3019
12	0.0322	0.1286	0.0015	0.0366	0.0000	0.0000	0.1522
13	0.0322	0.1565	0.0000	0.0000	0.0000	0.9600	0.2780
14	0.0322	0.1985	0.0052	0.0582	0.0000	0.8298	0.2330
15	0.0322	0.1506	0.0000	0.0253	0.0000	0.0060	0.2139
16	0.0322	0.2007	0.0020	0.0575	0.0000	0.0000	0.0988
Average \bar{x}	0.0322	0.148313	0.0012	0.033113	0.0000062	0.906206	0.257838
Standard Deviation Σ	0	0.028956	0.001633	0.01555	0	1.123279	0.115702

These concentrations are less than concentrations in the (chemical properties of the concentrations of milk - Kordofanian), which were estimated by (IBRAHIM BOSARA), this difference in concentrations may be due to differences in the type and pattern of nutrition of the animal and even off spring.

4.3 Conclusion

As a conclusion, proposed the value was successfully used to analyses by Physical properties in different kinds of milk (cow,camel,goat,sheep), some the data could be fitted within experimental milk fudge, The analysis shows that the most significant contribution to physical properties to milk in room temperature compare with water physical properties in room temperature, This work shows the value of surface tension, viscosity, density ,refractive index, freezing point and boiling point and test of color. The using of Physical properties of the best ways to know cheat milk and thus know the added value of water for milk.

The physical and chemical qualities of the collected raw cow's milk were within the recommended levels of European Union and FAO established quality standards. These findings may be helpful for the concerned governmental regulatory bodies to monitor the quality of the commercial milk products in the market. It would be a great interest if further investigations are to be carried out to examine other microbial quality and safety of cow milk and milk products. The similar study will create awareness among community or consumers level in the town of Shashemene.

In this study, different milk samples of cows, camels, goats and sheep were analyzed using the energy-dispersion X-ray fluorescence system. The elements (Ca, Fe, and Mn) showed the highest concentration of the elements at 0°C without heating in all milk, the concentration of the elements in the decrease began to appear with some elements stabilized. At the temperature of (100) °C some elements began to decrease and most of the concentration of the elements ended at the heating. Higher, so answer the different types of milk without high heating so as not to lose those elements value.

4.4 Future Work

- 1-Comparison of fresh milk and dried milk in terms of physical properties (surface tension - viscosity - density - freezing degree - boiling point).
- 2 - Use of dispersion X - ray device in comparison between concentrations of fresh milk and milk dried at different temperatures.
- 3 - Use the Raman dispersion device to find the concentrations of elements for different fresh milk (goat - cow - goat - sheep).
4. Study the physical properties and concentration of elements of different fresh milk used for a long time and compare with fresh.

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