

Chapter one

Introduction

1.1 Introduction

Senna alexandrina is a medicinal herb used in the past in many countries. It is used in the form of boiled Senna flour. The Senna alexandrina grows in Sudan during the autumn on the Nile River and many other areas used Senna alexandrina as a pleasant moisturizing treatment for constipation. And it contains sennoside, it are laxative of intestines and many organic substances that treat colon problems. As with other plants, the Senna alexandrina contains various mineral elements containing iron, magnesium, chromium and others.

There are many ways to study the quality and quantity of metal elements in the material, but X-ray fluoridated (XRF) is the most prominent and simplest is the automatic issuance of X-ray secondary (or fluorescent) of the material, when exposed to a high source of energy leads to irritation or excitement, such as High-energy x-ray.

1.2 Literature Review

Bekri Melka Abdo in 2017 they study was to Sennosides Determination of Ethiopian Senna Alexandrina, Senna Alexandrina leaves and pods have been used in herbal medicine since ancient times[1]. The pods and leaves extracts of this plant contains anthraquinone glycosides that have a significant laxative effect. In this study the leaf, pod and flowers of Senna Alexandrina were collected from potential areas of Ethiopia and determined their sennosides content (hydroxyanthracene glycosides) calculated as sennoside B via spectrophotometric method. Medicinal Herbal tea preparation also standardized

based on sennoside concentration. As a summary, the yields of total sennoside being to be appeared 1.08-1.76% in the leaf, 1.43-2.62% in the pod and 0.08-0.15% in the flower parts of *Senna Alexandrina*, located at different areas of Ethiopia with two types of Var. For herbal tea consumption, decoction of 1.5 mg powder of senna in 300 mL water for 10 minutes (pod) and 30 minutes (leaf) were optimized for sennoside extract and Standardized according to the WHO monographs of daily intake of sennosides, twice a day for pod and once a day for leaf herbal tea [1].

B. B. Basak •R. Nagaraja Reddy in 2017 they study was to Elemental Analysis of Different Cultivar of *Senna* (*Cassia angustifolia*) using Microwave Digestion and Flame Atomic Absorption Spectroscopy,

Senna (*Cassia angustifolia* Vahl.) is known worldwide for its laxative properties. Essential element content in senna leaf and pod is important as they preferred as an ingredient of herbal tea, functional food and dietary supplements. So, elemental (Ca, Mg, K, Na, Fe, Mn, Zn and Cu) content in the leaf and pod samples of four different cultivar of senna were determined by Flame Atomic Absorption Spectroscopy after digestion in the closed vessel environment through a microwave digestion system. Powdered leaf and pod samples were digested with high-purity concentrated nitric acid (HNO₃)[2]. The overall reproducibility of the method obtained from spiking experiment was within the range and recovery data indicated accurate and precise. The elemental content in the leaf and pod sample followed the order Ca>K>Mg>Na>Fe>Zn>Mn>Cu. While elemental content in pod samples were found lower as compared to leaf samples except potassium. Calcium content was found higher than other elements and level of Copper was the least among all elements in the leaf and pod samples. Significant differences were observed for elemental content among the cultivars. The cultivar KKM-1 recorded higher elemental content compared

to other cultivars. This basic information generated from the study can be used for the varietal development of senna with improved nutritional quality apart from its medicinal properties[2].

Deise Elizabeth Souza et al in 2010 their study was an experimental model to study the effects of a senna extract on the blood constituent labeling and biodistribution of a radiopharmaceutical in rats.

Cassia angustifolia Vahl (senna) is a natural product that contains sennosides, which are active components that affect the intestinal tract and induce diarrhea. Authors have shown that senna produces DNA (deoxyribonucleic acid) lesions in *Escherichia coli* cultures and can act as an antifungal agent. Natural drugs can alter the labeling of blood constituents with technetium-99m (^{99m}Tc) and can affect the biodistribution of radiopharmaceuticals. In this work, we have evaluated the influence of a senna extract on the radio labeling of blood constituents and on the biodistribution of the radiopharmaceutical sodium pertechnetate ($\text{Na}^{99m}\text{TcO}_4$) in Wistar rats. Twelve animals were treated with senna extract for 7 days. Blood samples were withdrawn from the animals and the radio labeling procedure was carried out. The senna extract did not modify the radio labeling of the blood constituents. A biodistributional assay was performed by administering $\text{Na}^{99m}\text{TcO}_4$ and determining its activity in different organs and in blood. The senna extract altered the biodistribution of $\text{Na}^{99m}\text{TcO}_4$ in the thyroid, liver, pancreas, lungs and blood. These results are associated with properties of the chemical substances present in the aqueous senna extract. Although these assays were performed in animals, our findings suggest that caution should be exercised when nuclear medicine examinations using $\text{Na}^{99m}\text{TcO}_4$ are conducted in patients who are using senna extract[3].

M. A. Morales et al in 2009 their study was is Senna Laxative Use Associated to Cathartic Colon, Genotoxicity, or Carcinogenicity

Due to their natural origin, apparent low oral toxicity, effectiveness, and accessibility without a medical prescription, the anthranoid laxatives are a popular remedy for constipation and are frequently used abusively. Therefore, it is important to characterize its harmful and/or toxic effects. The sennosides, main active metabolites of senna, exhibit a very low toxicity in rats, and its genotoxic activity in bacterial strains as well as mammal cells was classified as weak in those cases where it was shown to be significant. The toxicological and mutagenic status of the crude extract of senna, however, is not as well characterized, and it is necessary to do so since it is frequently, and at the same time incorrectly, believed that the chronic use of anthranoid laxatives is a risk factor for the development of colorectal cancer. The objective of this article was to review the information that arises in various scientific medical databases using key words such as senna, *Senna alexandrina*, *Cassia angustifolia*, sennosides, laxative toxicity, mainly ISI and non-ISI articles of journals with an editorial committee. Web pages of products or companies that publicize or commercialize this type of laxative were not included. This analysis establishes that (1) there is no convincing evidence that the chronic use of senna has, as a consequence, a structural and/or functional alteration of the enteric nerves or the smooth intestinal muscle, (2) there is no relation between long-term administration of a senna extract and the appearance of gastrointestinal tumors or any other type in rats, (3) senna is not carcinogenic in rats even after a two-year daily dose of up to 300mg/kg/day, and (4) the current evidence does not show that there is a genotoxic risk for patients who take laxatives containing senna extracts or sennosides[4].

Ismaila Y. Sudi Et Al in 2011 their study Nutritional and phytochemical screening of *Senna obtusifolia* indigenous to Mubi, Nigeria.

Nutritional and phytochemical screening of leaves and seeds of *Senna obtusifolia* were investigated. Phytoconstituents present in the seeds and leaves observed were tannins, flavonoids, steroids and phylobatannins. Terpenoids and alkaloids were found only in the plant leaves. Saponins were only found in the seeds. Flavonoids were observed to be more abundant in seed extract (99%) than in leaves extract (66%). Alkaloids absent in seeds and only 33% in leaves. Both leaves and seeds showed sufficient mineral elements: - Ca, N, Cu, and Na with good nutritive value and rich in carbohydrates and proteins but low in fat. The seeds and leaves of this plant showed high nutritive value with maximum percentages of important minerals. This can be used in healthcare during anemic conditions. The high percentage of carbohydrate in seeds than leaves can be exploited in feed formulation for livestock[5].

1.3 Research Problem

Senna alexandrina is used as a herbal remedy for many health problems most notably constipation and colon problems but does senna contain dangerous mineral element?

1.4 Objective of Research

The main objective of this research is to identify the mineral element of both the sample peeled fruits of *Senna alexandrina* and grain of fruits *Senna alexandrina*, and to determine the standard ratios and comparison between them, and to know if these elements are toxic or dangerous to humans and what are desired benefits of eating.

1.5 Thesis Layout

This search contains four chapters, in the first chapter is general introduction, review studies and problem and objectives of research, in second chapter shows the nature of the sample under study, in third chapter discusses in detail the work of device used and in fourth chapter discusses the practical side, the results, discussion and recommendation.

Chapter Two

Senna Alexandrina

2.1 Introduction

Constipation is a common complaint in 1-6% of the middle-aged population and 20-80% of the elderly people. One of the most commonly used groups of drugs used in the correction of functional disorders of the digestive system, are laxatives. The most widely used herbal remedies are containing Anthraquinone derivatives, and the popular source are two species of Cassia Senna or Alexandrian senna and Tinnevely senna with a family (Fabaceae/Leguminosae). The active constituents in both senna leaf and fruit are dianthrone glycosides (hydroxyanthracene glycosides) principally sennosides A and B. There are also small amounts of aloemodin and rhein 8-glucosides, mucilage, flavonoids, and naphthalene precursors. Senna Alexandrina is originated from Mali eastwards to Somalia and Kenya, much of it from wild plants. It is also native in Asia from the Arabian Peninsula to India and Sri Lanka. Two varieties are distinguished in Senna Alexandrina. The first is var. *obtusata* (Brenan) Lock, restricted to Eritrea, Ethiopia, Somalia and northern Kenya, the second is var. *alexandrina*, which is the more widespread variety. In Sudan, Ethiopia, Somalia and Kenya both leaves and pods are used as a purgative. Decoction of the pods is drunk to get rid of intestinal worms and to cure difficulties in breathing. The infusion of the pods is recommended as a purgative for pregnant women and also to suppress fever. An infusion of the leaves is drunk to overcome flatulence and convulsions and to stop nosebleed[1].

Senna leaves: The herbal substance contains not less than 2.5% of hydroxyanthracene glycosides, calculated as sennoside B ($C_{42}H_{38}O_{20}$; Mr863). The material complies with the European Pharmacopoeia monograph Senna leaf

The active constituents are the anthranoids that are present in the leaf of the herbal substance as dianthrone (75–80%) and as anthrone (20–25%) The herbal substance also contains small quantities of other dianthrone diglycosides, monoanthraquinone glycosides and aglycones.

Senna pods: Alexandrian senna pods consist of the dried fruit of *Cassia senna*. They contain not less than 3.4 % of hydroxyanthracene glycosides, calculated as sennoside B ($C_{42}H_{38}O_{20}$; Mr863) with reference to the dried herbal substance[6].

2.2 Senna types and discretions

1. *Cassia angustifolia* Vahl

The *Cassia angustifolia* Vahl is a plant of the Leguminous family and *Senna* genus, it is commonly known as "Narrow Leaf Cassia Senna", or "Xia Ye Fan Xie", herbaceous shrubs, about 1m high. Stipules ovate-lancelet, 2-4 mm in length; even pinnate, alternate; with short stems; leaflets 5-8 pairs, leaf blade ovate-lancelet to linear-lancelet, 2-4 cm wide 0.7-1.2 cm, apex acute, base slightly asymmetric, glabrous or glabrous. Racemes axillary or terminal; flowers 6-14, pedicel base with an ovoid easily falling bracts; sepals 5, long ovate, slightly unequal; petals 5, yellow, ovate, below two larger; Stamens 10, upper 3 small, sterile, central 4 equidistant, the lowermost 3 curved downward, longer on both sides, anther slightly tetragonal, base arrow-shaped, 4 rooms; pistil curved like sickle, child Room handle, was sparse hair Pods rectangular, flat, 4-6cm long, 1-1.7cm wide, apex slightly pointed, not significant, hairy when young; seed 4-7, the seed coat brownish green, with fine thread-shaped stalk, as shown in figure (2.1)[7]. with warts Wrinkles Flowering from September to December, fruiting in March of the following year. Ecosystem: The *Cassia angustifolia* Vahl grows in wild or cultivated. Geographical distribution: This species mainly

distributed in tropical Africa and also cultivated in China provinces Guangxi, Yunnan, Taiwan, etc.

2. *Cassia acutifolia* Delile

The *Cassia acutifolia* Delile, is a plant of the Leguminous family and *Senna* genus, it is commonly known as "Sharp Leaf Cassia Senna", or "Jian Ye Fan Xie", the leaf was lancelets or long oval, slightly curly, 1.5 ~ 5cm, wide 0.4 ~ 2cm, entire, the tip of the tip short or slightly protruding, leaf base asymmetric, both sides Slim and furry Slightly raised veins, leathery, weak and specific gas, slightly bitter taste. Pointed leaves *Senna*, leaf surface of the lower surface of single-cell non-glandular hair length 64 ~ 280 μ m, apex slightly pointed wall with small verrucous protrusions, stoma cells 2 to 4. Difference with the *Cassia angustifolia* Vahl. is: 4-6 pairs of small leaves, long ovoid, apex acute, base asymmetric, gray-green leaves on the back; flowers smaller; pod oval, width 2-2.5cm. Ecosystem: The *Cassia acutifolia* Delile., grows in wild or cultivated. Geographical distribution: This species distributed in Egypt, and mainly distributed and cultivated in China provinces Hainan, Yunnan, Taiwan, etc.[7]



Figure 2.1: Senna Alexandrina

Chapter Three

Basic Concepts

3.1 Spectroscopy

Is the study of the interaction between matter and electromagnetic radiation, by measurement of radiation intensity, the various implementations and techniques of spectroscopy can be classified in several ways based on

3.1.1 Type of radiation energy

- Electromagnetic radiation techniques that employ electromagnetic radiation are typically classified by the wavelength region of the spectrum and include microwave, near infrared, x-ray and gamma ray.
- Particles due to their de Broglie wavelength can also be a source of radiation energy and both electron and neutron are commonly used for particle its kinetic energy determines its wavelength.
- Acoustic spectroscopy involves radiated pressure wave.
- Mechanical methods can be employed to impart radiating energy.

3.1.2 Nature of the interaction

- Absorption occurs when energy from the radiation source is absorbed by material its often determined by measuring the fraction of energy transmitted through the material.
- Emission indicates that radiation energy is released by the material, emission can be induced by source of energy such as flames or spark or electromagnetic radiation in the case of fluorescence[8].

- Elastic scattering determine how incident radiation is reflected or scattered by a material.
- Inelastic scattering phenomena involve an exchange of energy between the radiation and matter that shifts the wavelength of the scattered radiation.
- Impedance spectroscopy studies the ability of a medium to impede or slow the transmittance of energy.
- Coherent are techniques where the radiation energy couples to quantum states of the material in a coherent interaction that is sustained by radiating field.

3.1.3 Type of material

- Atom atomic spectroscopy was the first application of spectroscopy developed, it often referred to as atomic spectral line are due to electronic transition 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 quantization of a sample's elemental composition, techniques for studying X-ray spectra include X-ray spectroscopy and X-ray fluorescence (XRF).
- 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, molecular rotations, molecular vibration and electronic states.
- 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[8].

- **Crystals** these states are numerous and therefore have a high density of states this high density often makes the spectra weaker and less distinct, pure crystals though can have distinct spectral transitions and the crystal arrangement also has an effect on the observed molecular spectra [8].

3.2 Spectrometers

Is a scientific instrument originally used to split light into an array of separate colors, spectrometers were developed in studies of physics, astronomy and chemistry, and it can be classified to several methods.

3.2.1 Optical Spectroscopy

Is an instrument used to measure properties of light over a specific portion of the electromagnetic spectrum, the theoretical description of light can be given in two ways: light can be regarded as a stream of corpuscles (photons) or as an electromagnetic wave. In the case of the corpuscle description, the behavior of the photons, and in particular the interaction between photons and molecules, may be described by the laws of quantum optics. In the case of the electromagnetic wave description, the interaction of the electromagnetic wave with a medium is described by the electromagnetic theory comprising Maxwell's equations [9]. As shown in figure 3.1

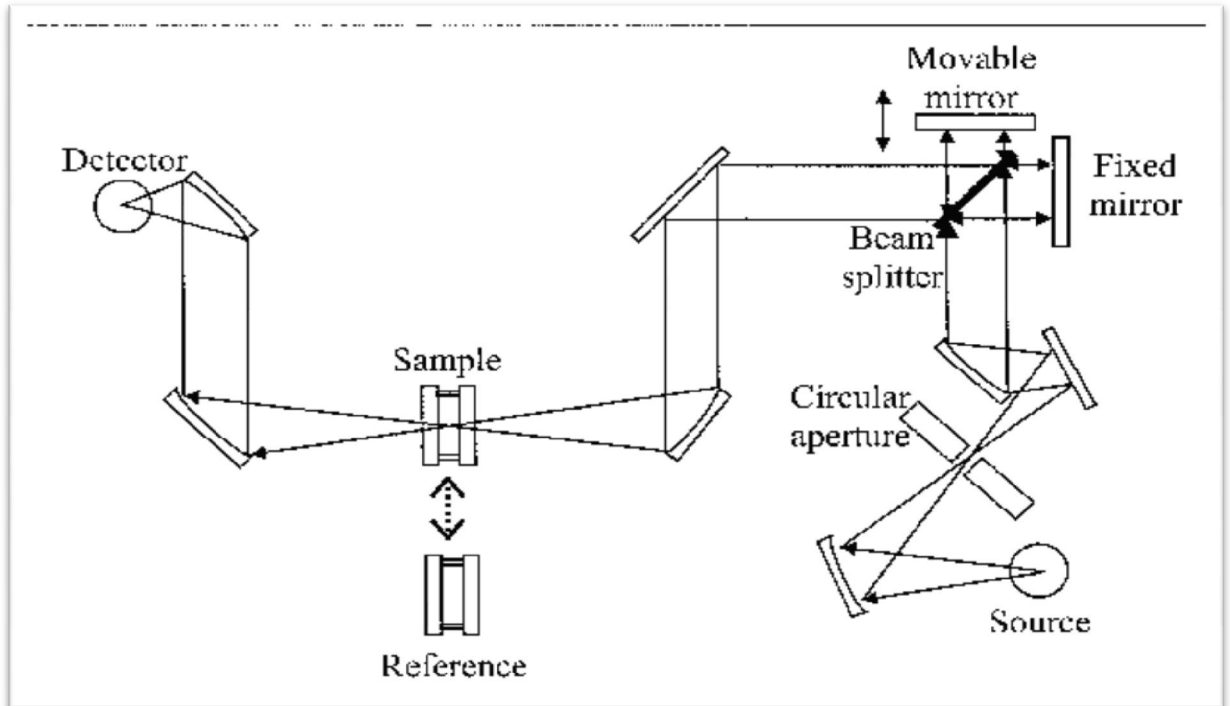


Figure 3.1: graphic form of Optical Spectrometer

3.2.2 Nuclear Magnetic Resonance Spectroscopy

The nuclei of all elements possess mass and charge. One or more isotopes of most nuclei also have spin, i.e., angular momentum. Since spinning charge creates a magnetic field, there is a magnetic moment associated with the angular momentum. It is this property of matter that is exploited in nuclear magnetic resonance (NMR) spectroscopy [9].as shown figure 3.2

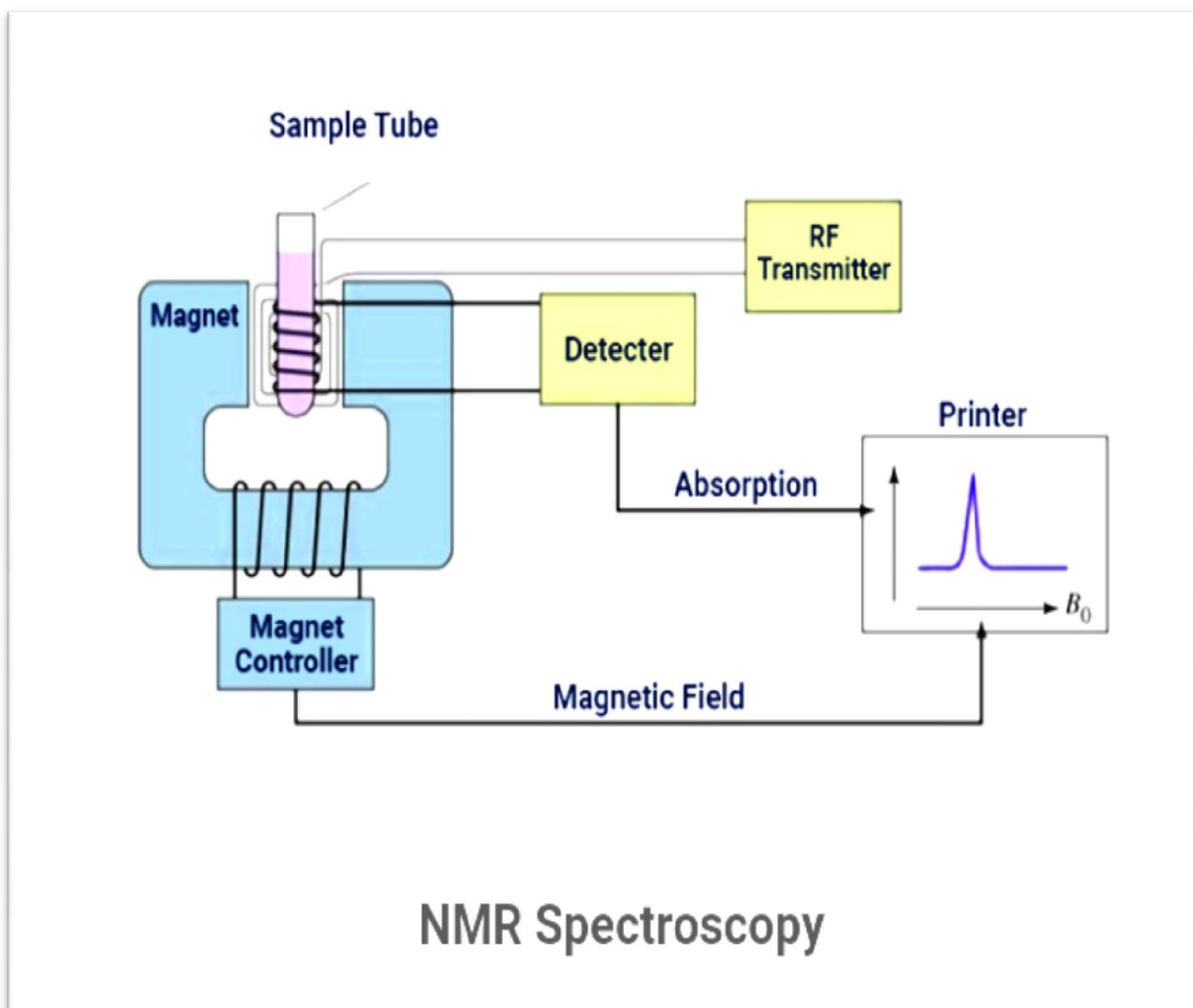


Figure 3.2: graphic form of NMR Spectrometer

3.2.3 Mass Spectrometer

Mass spectrometry (MS) is an analytical method in which free gaseous ions are produced and subsequently subjected to magnetic and electric fields in a high vacuum for analysis of mass/charge ratios[9]. As shown figure 3.3

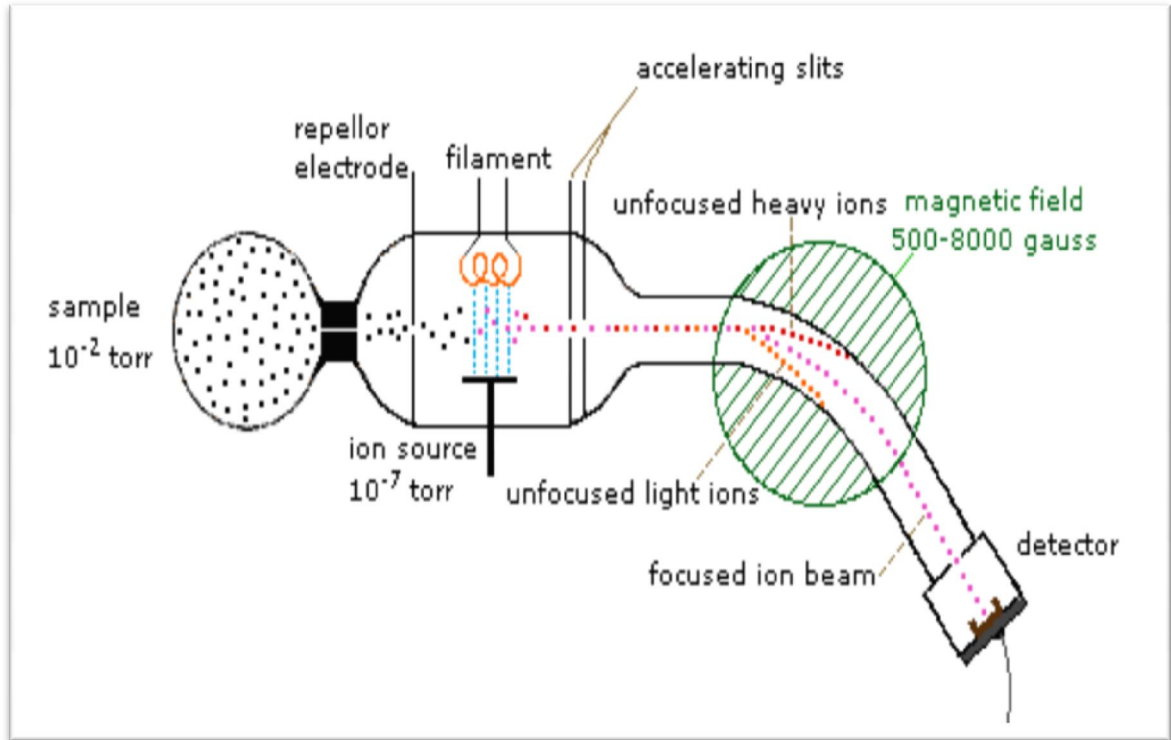


Figure 3.3: graphic form of Mass Spectrometer

3.2.4 Elemental Analysis

a powerful analytical tool for determining the chemical elements of all the materials present in a sample, the most important of these tools is X-Ray fluorescence (XRF). [9]

3.3 X-Ray fluorescence (XRF)

Is an analytical method to determine the chemical composition of all kinds of materials the materials can be in solid, liquid, powder, filtered or other form, XRF can also sometimes be used to determine the thickness and composition of layers and coatings, The advantages of this method are fast, accurate and non-destructive, and usually require only a minimum of sample preparation, XRF is a very sensitive technique and samples must be clean. Even fingerprints on a sample can affect the result of the analysis [10].

3.3.1 X-rays

X-rays can be seen as electromagnetic waves with their associated wavelengths, or as beams of photons with associated energies. Both views are correct, but one or the other is easier to understand depending on the phenomena to be explained. Other electromagnetic waves include light, radio waves and gamma rays, X-rays have wavelengths and energies between gamma rays and ultra violet light. The wavelengths of X-rays are in the range from 0.01 to 10 nm, which corresponds to energies in the range from 0.125 to 125 keV. The wavelength of X-rays is inversely proportional to its energy, according to $E \times \lambda = h \times c$. E is the energy in keV and λ the wavelength in nm. The term hc is the product of Planck's constant and the velocity of light and has, using keV and nm as units, a constant value of 1.23985[10].as shown figure 3.4

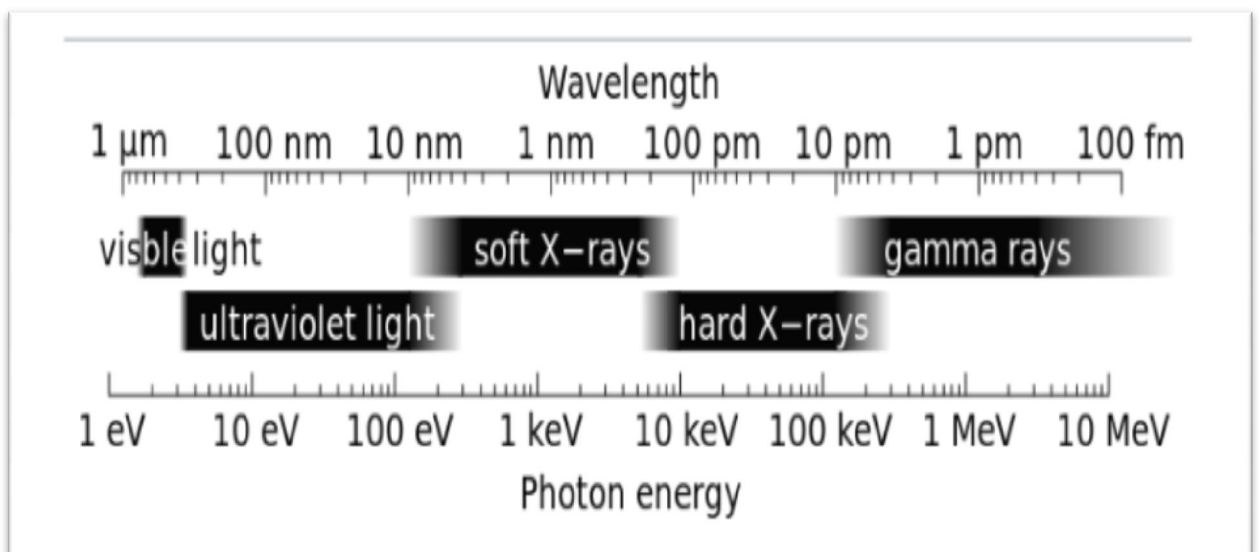


Figure 3.4 Range of X-ray

There are three main interactions when X-rays contact matter: Fluorescence, Compton scatter and Rayleigh scatter, if a beam of X-ray photons is directed towards a slab of material a fraction will be transmitted through, a fraction is

absorbed (producing fluorescent radiation) and a fraction is scattered back. Scattering can occur with a loss of energy and without a loss of energy.

The first is known as Compton scatter and the second Rayleigh scatter. The fluorescence and the scatter depend on the thickness (d), density (ρ) and composition of the material, and on the energy of the X-rays. The next sections will describe the production of fluorescent radiation and scatter.

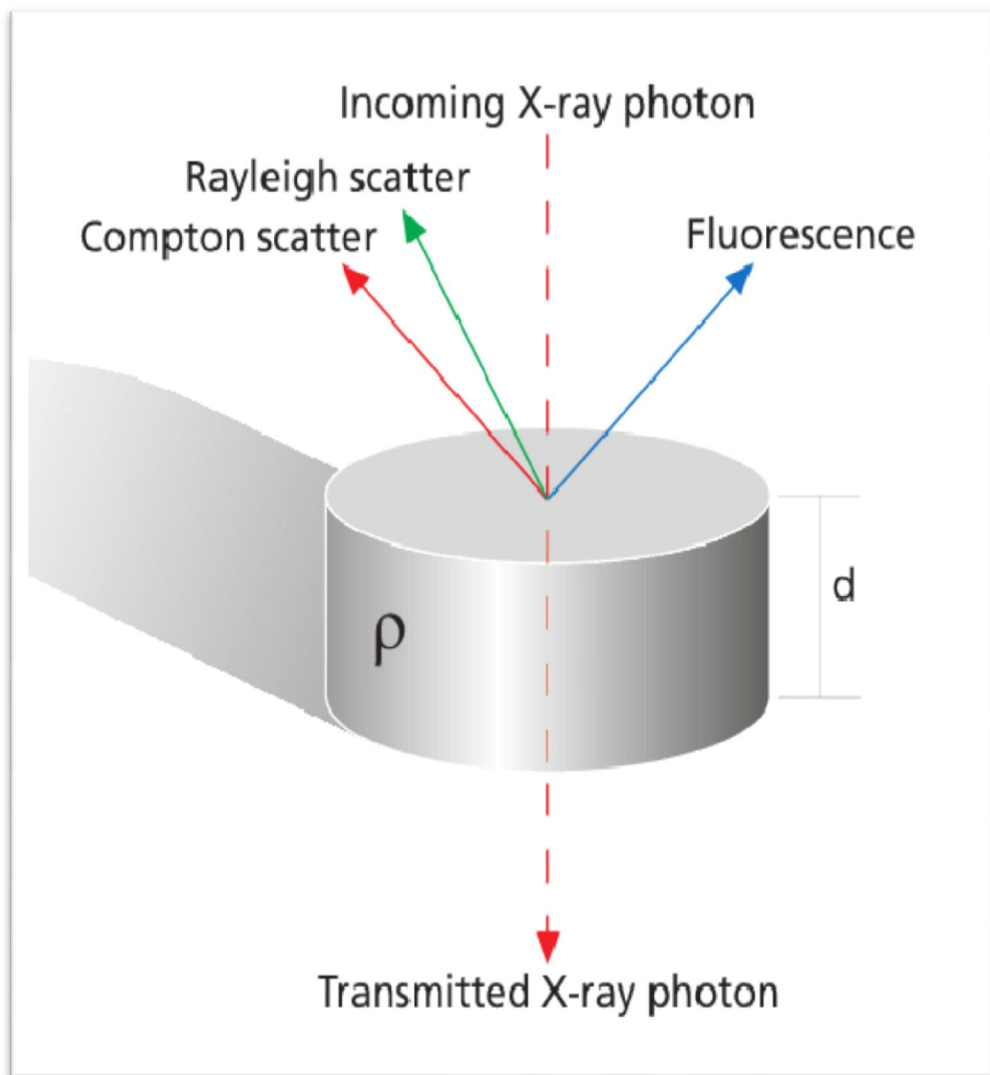


Figure 3.5: Three Main Interactions of X-Rays with Matter

3.3.2 Basics of XRF

In XRF, X-rays produced by a source irradiate the sample, in most cases, the source is an X-ray tube but alternatively it could be a synchrotron or a radioactive material. The elements present in the sample will emit fluorescent X-ray radiation with discrete energies (equivalent to colors in optical light) that are characteristic for these elements. A different energy is equivalent to a different color[10]. By measuring the energies (determining the colors) of the radiation emitted by the sample it is possible to determine which elements are present. This step is called qualitative analysis. By measuring the intensities of the emitted energies (colors) it is possible to determine how much of each element is present in the sample. This step is called quantitative analysis.[10]

3.3.3 Production of Fluorescent Radiation

XRF radiation is induced when photons of sufficiently high energy, emitted from an X-ray source, impinge on a material. These primary X-rays undergo interaction processes with the analyze atoms. High-energy photons induce ionization of inner shell electrons by the photoelectric effect and thus electron vacancies in inner shells (K, L, M) are created. The prompt transition of outer shell electrons into these vacancies within some 100 μ s can cause the emission of characteristic fluorescence radiation.

Not all transitions from outer shells or sub shells are allowed, only those obeying the selection rules for electric dipole radiation. The creation of a vacancy in a particular shell results in a cascade of electron transitions, all correlated with the emission of photons with a well-defined energy corresponding to the difference in energy between the atomic shells involved. The family of characteristic X-rays from each element including all transitions allows the identification of the element.

Next to this radioactive form of relaxation, a competing process can take place: the emission of Auger electrons. Both processes have Z-dependent probabilities that are complementary: the Auger yield is high for light elements and the fluorescence yield is high for heavy elements.[9]. As shown 3.6

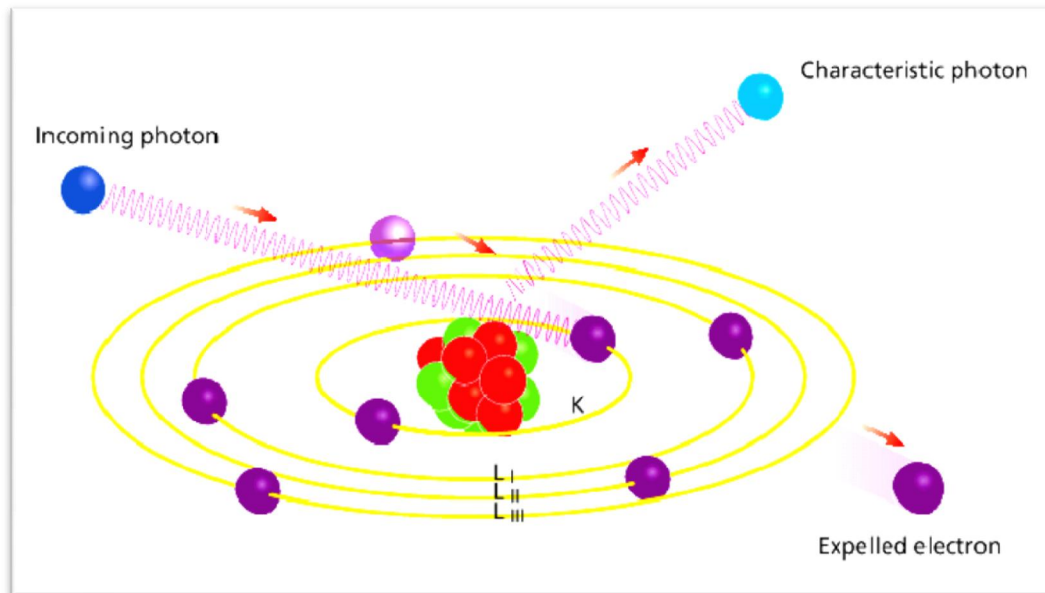


Figure 3.6: Production of Fluorinated X-Ray

3.3.4 Working Principle

The working principle of XRF analysis is the measurement of wavelength or energy and intensity of the characteristic photons emitted from the sample. This allows the identification of the elements present in the analytic and the determination of their mass or concentration all the information for the analysis is stored in the measured spectrum, which is a line spectrum with all characteristic lines superimposed above a certain fluctuating background. Other interaction processes, mainly the elastic and inelastic scattering of the primary radiation on sample and substrate, induce the background. [9]

3.4 The XRF Spectrometer

Spectrometer systems can be divided into two main groups: energy dispersive systems (EDXRF) and wavelength dispersive systems (WDXRF). The elements that can be analyzed and their detection levels mainly depend on the spectrometer system used. The elemental range for EDXRF goes from sodium to uranium (Na to U). For WDXRF it is even wider, from beryllium to uranium (Be to U). The concentration range goes from (sub) ppm levels to 100%. Generally speaking, the elements with high atomic numbers have better detection limits than the lighter elements

In most XRF applications the size of the samples is around one centimeter giving the average composition of the samples. For some application the local composition at different spots on the sample is required like spots on a chip wafers or on magnetic disks. For other applications, only a very small sample is available like a sliver of paint. Typical required spot diameters are between 50 μm and a few millimeters. An option is to use pinholes between tube and sample and/or between sample and detector but the sensitivity is very low. In most cases, lenses are used for small spot analysis [10]. As shown figure 3.7

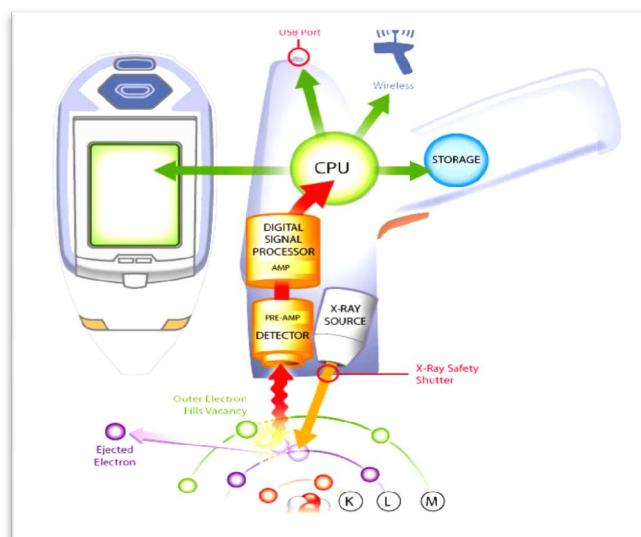


Figure 3.7: a Schematic Diagram of the Work of the Machine

3.4.1 Type of XRF

I-EDXRF Spectrometers with 2D optics:

The tube irradiates the sample directly, and the fluorescence coming from the sample is measured with an energy dispersive detector. An alternative is to place a secondary target between the tube and the sample. The tube irradiates the secondary target and this target will emit its characteristic radiation. The advantage of a secondary target is that it emits (almost) monochromatic radiation but its disadvantage is that energy is lost. Using different secondary targets can achieve optimum excitation for all elements. The detector is able to measure the energies of the incoming radiation directly. Besides the fluorescence, scattered tube radiation will reach the detector, which results in a background profile and background noise. Due to this background, it is difficult to detect low peaks and as a result to determine low concentrations. The X-ray path is in one plane, so is 2-dimensional, and the X-ray optics are called 2D optics [10].

II-EDXRF Spectrometers with 3D optics:

The X-ray path is not in one plane but in two perpendicular planes, and the optics for this type of spectrometers are called 3D optics. The tube irradiates a secondary target which emits its characteristic X-rays and scatters a part of the incoming X-rays. The radiation coming from the target is used to irradiate the sample, so for the sample the target behaves like a source. The sample emits its characteristic radiation, which is measured by an energy dispersive detector. The advantage of this geometry is that scattered tube radiation cannot reach the detector because of polarization. To reach the detector, the tube radiation must scatter in 2 perpendicular directions; the X-rays vanish after two perpendicular reflections. As a consequence, the radiation coming from the tube will not reach the detector. This will result in a very low background to the spectrum and makes it possible to detect very weak peaks, and hence to determine very low

concentrations. The characteristic radiation of the target is partly scattered by the sample and reaches the detector. This radiation is scattered in only one direction and so it will not vanish.

III-WDXRF Spectrometer:

The first part of a WDXRF spectrometer is equivalent to an EDXRF spectrometer with 2D optics and without a secondary target. The tube irradiates a sample and the radiation coming from the sample is detected. The detection system is however different from EDXRF spectrometers. For WDXRF, the detection system is a set of collimators, a diffraction crystal and a detector. The X-rays coming from the sample fall on the crystal, and the crystal diffracts (reflects) the X-rays with different wavelengths (energies) in different directions. (This is equivalent to a prism that separates white light into all the different colors). By placing the detector at a certain angle, the intensity of X-rays with a certain wavelength can be measured. It is also possible to mount the detector on a goniometry and move it through an angular range to measure the intensities of many different wavelengths. Spectrometers that use a moving detector on a goniometry are called sequential spectrometers because they measure the intensities of the different wavelengths one after another. Simultaneous spectrometers are equipped with a set of fixed detection systems. Each detection system has its crystal and detector, and each system measures the radiation of a specific element. The intensities are measured all at the same time, explaining why these are called simultaneous spectrometers. Combined systems having a moving detector and fixed detectors are also manufactured [10].

Chapter four

Practical

4.1 Introductions

This section discusses the practical aspect of determining mineral element in the sample of Senna Alexandrian and its quantitative ratios by means of a fluorinated X-ray.

4.2 Devices and Materials

Sample of Senna Alexandrina (peel fruits of Senna Alexandrina and grain of fruits SennaAlexandrina), sweat, and XRF device, as shown figure (4.1, 4.2 and 4.3).



Figure4.1: Grain of Fruits Senna Alexandrina



Figure 4.2: Peels Fruits of Senna Alexandrina



Figure 4.3 XRF Device

4.3 Method

Dried the fruits of Senna Alexandrina away from the direct sunlight and then grinded by electric sweat and then tested by the XRF device.

4.4 Results

The tables 4.1 and 4.2 show the concentration of Senna Alexandrina (peels and grains) results obtained from sampling the XRF, the first column present elements and the second column present concentration of elements in peels and grains fruits.

Table 4.1 the Results of Peel Fruits of Senna Alexandrina

Element	Concentration
Cr	0.10
Mn	0.07
Fe	0.23
Ni	0.01
Cu	0.00
Zn	0.01
Pb	0.00

Table 4.2 the Result of Grain of Fruits Senna Alexandrina

Element	Concentration
Cr	0.05
Mn	0.00
Fe	0.07
Ni	0.00
Cu	0.00
Zn	0.00
Pb	0.00

4.5 Discussions

The sample of the peels of Senna Alexandrina containing Chromium (Cr) at a rate of 0.10%, Magnesium (Mn) at rate of 0.07%, Iron (Fe) at rate of 0.23% and very small rate of Nickel (Ni) and Zinc (Zn) by 0.01%, and in sample of the grain of Senna Alexandrina have lower proportions of elements compared to peels where it contains Chromium (Cr) at a rate of 0.05% and Iron (Fe) at a rate of 0.07%.

Besides the organic substances contains in Senna Alexandrina that treat constipation also contain mineral elements have other benefits, Chromium works mainly with hormone oncllin in the distribution sugar to the cells and also contributes to the treatment of depression accompanied by long sleep attacks, but the daily percentage shall not exceed 25%. Magnesium acts as a catalyst for

inflammation in the human body and contributes to the production of collagen and prevents constipation and many benefits but excessive causes a decrease in the rates of calcium and the retention of fluids in the body. It is known that Iron protects from anemia as it increases the rate of hemoglobin, it also carries oxygen to the body organs and prevents hair loss, but if it is high the body stores it in the liver and the heart muscles and testicles in man which affects their functions. Zinc preserves the levels of the hormones testosterone, which contributes to increase of fertility for both sexes and also strengthens the immune system, but the excessive elements causing health problems such as hair loss and reduce cholesterol levels. A small amount of Nickel is necessary, but its increase in the human body causes great health risks, causing skin rash and asthma and it also increases the risk of lung cancer and prostate cancer and nose cancer.

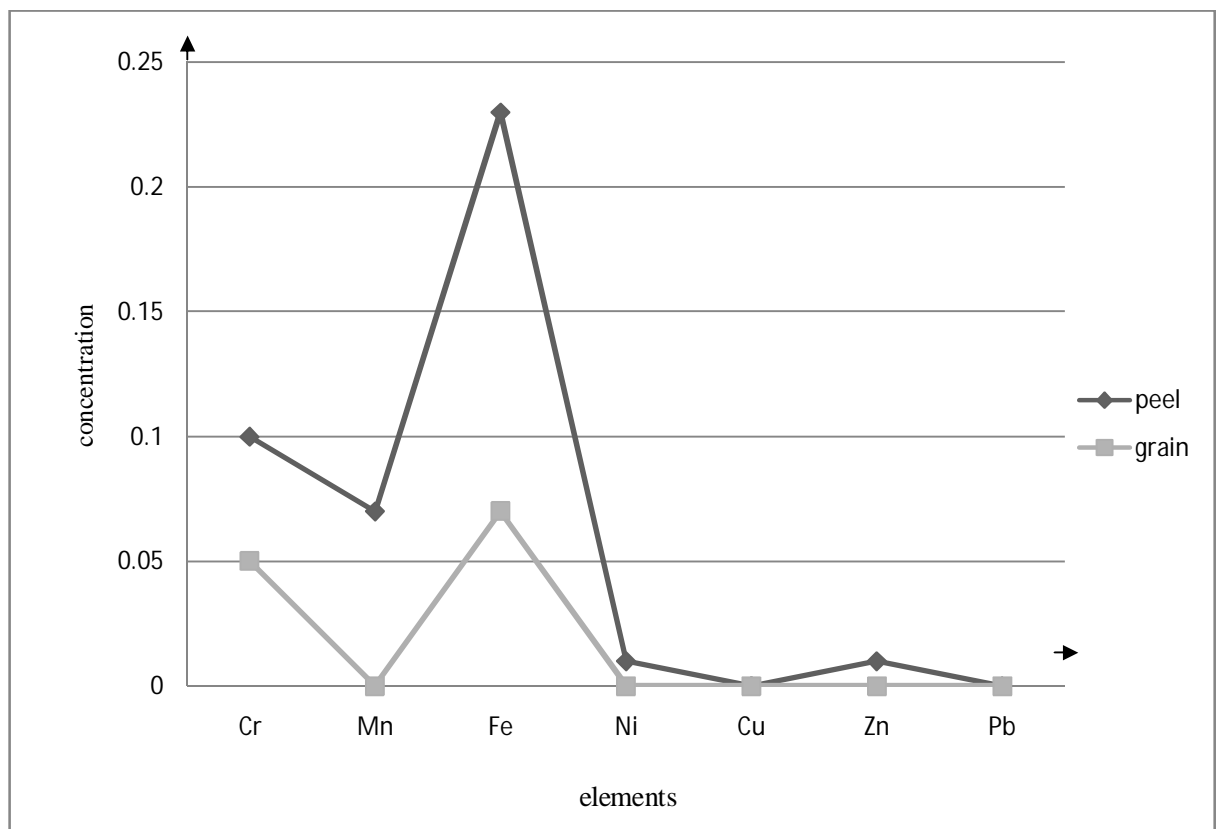


Figure 4.3: A graph showing the comparison elements in the Peels and Grains

4.6 Conclusions

The mineral elements were determined in both sample peels of senna Alexandrina and grains of senna Alexandrina, the peels of senna were found to contain higher levels of minerals, including chromium, iron, zinc, nickel and magnesium.

4.7 Recommendation

The further studies in this research problem could be done using other devices like Raman spectroscopy or X-ray diffraction (XRD) for more extensive results,

References

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