Analysis of Elemental Concentration In Kye Pe (*Plukenetia Volubilis*) Samples by Using Edxrf Technique

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Abstract

In this research work, we have analyzed the concentration of elements in three kinds of samples which are fruits (M1), leaves (M2) and stems (M3) for Kye Pe or Sacha Inchi plant. The concentration of elements in these samples was determined by using EDXRF (energy dispersive X-rays fluorescence) technique. All measurements have been done in drying condition. According to the experimental results, eighteen elements are contained in fruit samples and stem samples, seventeen elements are contained in leaf samples. These elements are Magnesium (Mg), Aluminum (Al), Silicon (Si), Phosphorus (P), Sulfur (S), Chlorine (Cl), Potassium (K), Calcium (Ca), Titanium (Ti), Vanadium (V), Manganese (Mn), Iron (Fe), Nickel (Ni), Copper (Cu), Zinc (Zn), Rubidium (Rb), Strontium (Sr) and Lead (Pb) elements in fruits sample (M1). Magnesium (Mg), Aluminum (Al), Silicon (Si), Phosphorus (P), Sulfur (S), Chlorine (Cl), Potassium (K), Calcium (Ca), Titanium (Ti), Manganese (Mn), Iron (Fe), Copper (Cu), Zinc (Zn), Bromine (Br), Rubidium (Rb), Strontium (Sr) and Lead (Pb) elements in leaves sample (M2). Magnesium (Mg), Aluminum (Al), Silicon (Si), Phosphorus (P), Sulfur (S), Chlorine (Cl), Potassium (K), Calcium (Ca), Titanium (Ti), Vanadium (V), Manganese (Mn), Iron (Fe), Copper (Cu), Zinc (Zn), Bromine (Br), Rubidium (Rb), Strontium (Sr) and Lead (Pb) elements these elements are contained in stems sample (M3). The concentration of Silicon (Si) is large in leave (M2) samples. The concentration of Potassium (K), Calcium (Ca) and Magnesium (Mg) are largest in this research sample. The concentration of elements in Kye Pe can prevent diabetes, hypertension, cancer cell and heart disease. Health benefits of Kye Pe include improving digestion, aiding in weight loss, managing diabetes and stimulating cognition. Kye Pe plant is a medicinal plant.

Introduction

Everybody, human health is very important. If everybody has good health, everybody will make everything. Nowadays, people would like to use fresh air, clean water, hygienic food and good medicine for health but human activities are causing harm. Plants are not only the major source of energy-rich foods in our societies, but are also an indispensable source of vitamin and other substances promoting healthy growth. They have played an important role in traditional medicine in Myanmar since ancient time. Human health, natural safeguard and minimizing the damages of human activities to Earth are the environmental study today. The aim of this research is to analysis of the concentration of elements in Sacha inchi or Kye Pe samples by using EDXRF(energy dispersive X-rays fluorescence) technique. We have collected the fruits, leaves and stems of Sacha inchi or Kye Pe plant. These samples were collected from Kyun Hla village, Myittha Township, Mandalay Region.

History of Myanmar Traditional Medicine

Everybody, human health is very important. If everybody has good health, everybody will make everything. Nowadays, people would like to use fresh air, clean water, hygienic food and good medicine for health but human activities are causing harm. Plants are not only the major source of energy-rich foods in our societies but also an indispensable source of vitamin and other substances promoting healthy growth. They have played an important role in traditional medicine in Myanmar since ancient time. Human health, natural safeguard and minimizing the damages of human activities to Earth are the environmental study today. The aim of this research is to analysis of the concentration elements in Sacha inchi or Kye Pe samples by using EDXRF (energy dispersive X-rays fluorescence) technique. We have

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collected the fruits, leaves and stems of Sacha inchi or Kye Pe plant. These samples were collected from Kyun Hla village, Myittha Township, Mandalay Region.

Experimental Procedure

Sample Collection

In this research, we analyzed the three samples in Sacha inchi or Kye Pe plant samples by using EDXRF. We collected three samples which are fruits, leaves and stems. To analysis the elemental concentration of these samples, they were sent to Department of Physics, Taunggyi University. The concentrations of elements contained in three samples were analyzed by EDXRF technique.

Sample Preparation

Sample preparation is very important process to experiment. In the first step, three samples were dried under the shade of any roof. These samples were ground in order to get fine powders. The lists of sample are shown in Table (3.1). The characters of three samples are shown in Figure (3.1) through to Figure (3.9). The fine powders of three samples were shown in Figure (3.10). These powders were sent to Experimental Nuclear Laboratory at the Physics Department, Taunggyi University.

Sample preparation is important in the EDXRF analysis because it is required to get flat, smooth and homogeneous samples for best results. To obtain reliable results in X-ray emission spectrometry, proper sampling is taken and sample storage and sample preparation prior to measurement are conducted.

Table (3.1) The list of Kye Pe plant samples.

Local Name	Kye Pe
English Name	Sacha inchi
Scientific Name	*Plukenetia Volubilis*
Family Name	EUPHORBIACEAES
First Sample Code	M1 (fruits)
Second Sample Code	M2 (leaves)
Third Sample Code	M3 (stems)

Figure (3.1) The Kye Pe plants from Myittha Township, Kyun Hla village, Mandalay region.

Figure(3.4)The photograph of dried fruits (M1) in Kye Pe plant.

Figure (5) The photograph of dried leaves in Meze plant (M2).

Figure (7) The photograph of dried cortices in Meze plant (M3).

Figure (4) The fine powder of dried flowers in Meze plant (M1).

Figure (6) The fine powder of dried leaves in Meze plant (M2).

Figure (8) The photograph of dried cortices in Meze plant (M3).

Then hydraulic press machine (PP-25, Retsch, Gmbh) and a 32 mm diameter die set including a die body, base and two polished metal disks were used for pellet sample in our research work. Prior to pelletizing all parts of the die set was carefully cleaned with methylated spirit to prevent contamination. Initially each sample was weighed using digital balance (PW-254) to obtain the needed amount (5g). Binding agent is added to form stable pellet of the samples. Therefore, binder (1g) was added to the samples (5g) and they were mixed to homogenize with each other. After that weighed sample were poured into the die set (mould) and pressed with 17 tons for 15 minutes by using hydraulic press machine (PP25). The pellet was then removed from the die set, taking care not to creak it in the process. The hydraulic press machine (PP25) is shown in Figure (3.11). After getting the pellet, each of these samples is weighed again and whose weight is exactly 5g is used in this experiment. In making pressed pellets for each sample, these samples were weighted by using the digital balance. The density of each pellet is 0.2 gcm^{-3}. The pellet samples are shown in Figure (3.12). The digital balance is shown in Figure (3.13) for preparation procedure. X-ray fluorescence technique is a multi-elemental quantities determination and it can provide concentration of many elements contained in the sample by a single measurement. Three samples were analyzed by using energy dispersive X-ray fluorescence system. All of the pellet samples were analyzed 600 sec for four secondary targets with Rigaku system and the measurement of atmosphere is helium purge. It is used 50 kV bias voltage and tube current is automatically adjusted by hardware. The analyzed range is 0-50 keV. The X-ray spectrum is analyzed with the help of computer to obtain the concentration of each element in the sample. This research was done in the Physics Department, Taunggyi University in Figure (3.14). The basic characteristic of the EDXRF is shown in Figure (3.15).

Figure (3.11) The photo of 25 tons pellet manual press at the Physics Department, Taunggyi University.

Fruit samples (M1) Leaf samples (M2) Stem samples (M3)

Figure (3.12) The photograph of the pellet samples.

Figure (3.13) The photograph of the digital balance for preparation procedure.

Figure (3.14) Energy Dispersive X-ray Fluorescence spectrometer (Rigaku) in the Department of Physics, Taunggyi University.

Results, Discussion and Conclusion

Experimental Results

In this research work, three samples of fruits (M1), leaves (M2) and stems (M3) for *Plukenetia Volubilis* or Kye Pe or Sacha Inchi were analyzed with an EDXRF technique in the nuclear laboratory at the department of physics, Taunggyi University. Elemental concentrations of sample contained in the three samples were measured by EDXRF technique and their results are expressed in Table (4.1). The graphs of these samples are shown in Figure (4.1).

Discussion

The concentration of elements was analyzed for three samples. The three samples are M1, M2 and M3. The concentration of elements for three samples is shown in Table (4.2) and the concentration of elements graph is in Figure (4.2). According to the experimental results, the sample of fruit (M1) is contained eighteen kinds of elements. They are Magnesium (Mg), Aluminum (Al), Silicon (Si), Phosphorus (P), Sulfur (S), Chlorine (Cl), Potassium (K),

Calcium (Ca), Titanium (Ti), Vanadium (V), Manganese (Mn), Iron (Fe), Nickel (Ni), Copper (Cu), Zinc (Zn), Rubidium (Rb), Strontium (Sr) and Lead (Pb) elements. According to the experimental results, Lead (Pb) element is minimum concentration. The samples of leaf (M2) are contained seventeen kinds of elements. According to the experimental results, Bromine (Br) element is very small concentration. The samples of stem (M3) are contained eighteen kinds of elements. They are Magnesium (Mg), Silicon (Si), Aluminum (Al), Phosphorus (P), Sulfur (S), Chlorine (Cl), Potassium (K), Calcium (Ca), Vanadium (V), Copper (Cu), Zinc (Zn), Bromine (Br), Rubidium(Rb), Manganese (Mn), Titanium (Ti), Iron (Fe), Strontium (Sr) and Lead (Pb) elements. According to the experimental results, the concentration of Bromine (Br) element is very small in M3 samples.

Conclusion

According to the experimental result, the concentration of potassium (K) is larger in sample M3 than M2 and M1. The potassium is highest concentration in M3. This element is needed for many essential process including enzyme activation photosynthesis. Potassium is one of the seven essential macrominerals. Potassium (K) participates actively in the maintenance of the cardiac rhythm. High levels of potassium in the blood have been linked to pressure, heart and kidney disorders, and other health problems.

The concentration of calcium (Ca) measured in M1 is small and measured in M2 is larger than M3. Calcium is the main constituent of the skeleton, bone and dental health and important for regulating many vital cellular activities such as nerve and muscle function and lowers the blood pressure. The concentration of magnesium (Mg) measured in M3 is large and measured in M2 and M1 is small. Magnesium is essential for both plant and animal growth and health. Magnesium is also included in some remedies for heartburn and upset stomach due to acid indigestion. The concentration of phosphorus (P) measured in M1 and M3 is large and measured in M2 is small. Phosphorus is required in most of the body's bio-chemical process including cell growth and converting food to energy is also required for metabolism of fats and carbohydrate to produce energy. The main function of P is to bind with calcium to make healthy teeth and bones.

It is also necessary for the synthesis of protein for repair and growth of tissue and cells. Other key functions help the body to utilize vitamin B complex and support proper nerve and muscle functioning, maintaining, calcium balance and preventing high blood calcium levels. The concentration of sulfur (S) measured is larger in sample M2 than M1 and M3 is smaller than M1. This element aids the liver in bile secretion and maintains oxygen balance for proper brain function and is involving in the clotting of blood. It assists in the fight against bacterial infection by disinfecting the blood helping the body resist bacterial, and protecting. The concentration of Iron (Fe) measured in M1 and M3 is smaller than M2. This element is an essential element for human beings and animals and component of hemoglobin. It facilitates the oxidation of carbohydrates, protein and fat to control body weight, which is very important factor in diabetes.

The concentration of Lead (Pb) measured in three samples is very small. Lead is a useful and common metal that has been used by humans for thousands of years. Lead in the body is distributed to the brain, liver, kidney and bones. It accumulates over time. Lead in bone is released into blood during pregnancy and becomes a source of exposure to the developing fetus. The concentration of Potassium (K), Calcium (Ca) and Magnesium (Mg) are largest in this research sample. The concentration element in Kye Pe can be prevented diabetes, hypertension, cancer cell and heart disease. Health benefits of Kye Pe include improving digestion, aiding in weight loss, managing diabetes and stimulating cognition. Kye Pe plant is a medicinal plant.

Table (4.1) The comparison of elemental concentration for M1, M2 and M3 in Kye Pe samples.

Atomic number (Z)	Symbol	Element	Concentration (ppm)		
			M1	M2	M3
12	Mg	Magnesium	3700.00	4400.00	5400.00
13	Al	Aluminum	655.00	1450.00	1140.00
14	Si	Silicon	1450.00	32200.00	2940.00
15	P	Phosphorus	3120.00	2660.00	3160.00
16	S	Sulfur	2680.00	4090.00	1840.00
17	Cl	Chlorine	203.00	377.00	390.00
19	K	Potassium	42800.00	43200.00	53700.00
20	Ca	Calcium	8290.00	54600.00	21500.00
22	Ti	Titanium	24.00	93.00	50.00
23	V	Vanadium	3.00	-	4.00
24	Cr	Chromium	-	-	-
25	Mn	Manganese	23.00	86.00	39.00
26	Fe	Iron	173.00	462.00	245.00
27	Co	Cobalt	-	-	-
28	Ni	Nickel	3.00	-	-
29	Cu	Copper	20.00	23.00	17.00
30	Zn	Zinc	39.00	42.00	36.00
33	As	Arsenic	-	-	-
34	Se	Selenium	-	-	-
35	Br	Bromine	-	2.00	2.00
37	Rb	Rubidium	10.00	7.00	10.00
38	Sr	Strontium	17.00	139.00	50.00
40	Zr	Zirconium	-	-	-
50	Sn	Tin	-	-	-
51	Sb	Antimony	-	-	-
52	Te	Tellurium	-	-	-
53	I	Iodine	-	-	-
55	Cs	Cesium	-	-	-
56	Ba	Barium	-	-	-
57	La	Lanthanum	-	-	-
72	Hf	Hafnium	-	-	-
73	Ta	Tantalum	-	-	-
80	Hg	Mercury	-	-	-
82	Pb	Lead	2.00	4.00	4.00
83	Bi	Bismuth	-	-	-

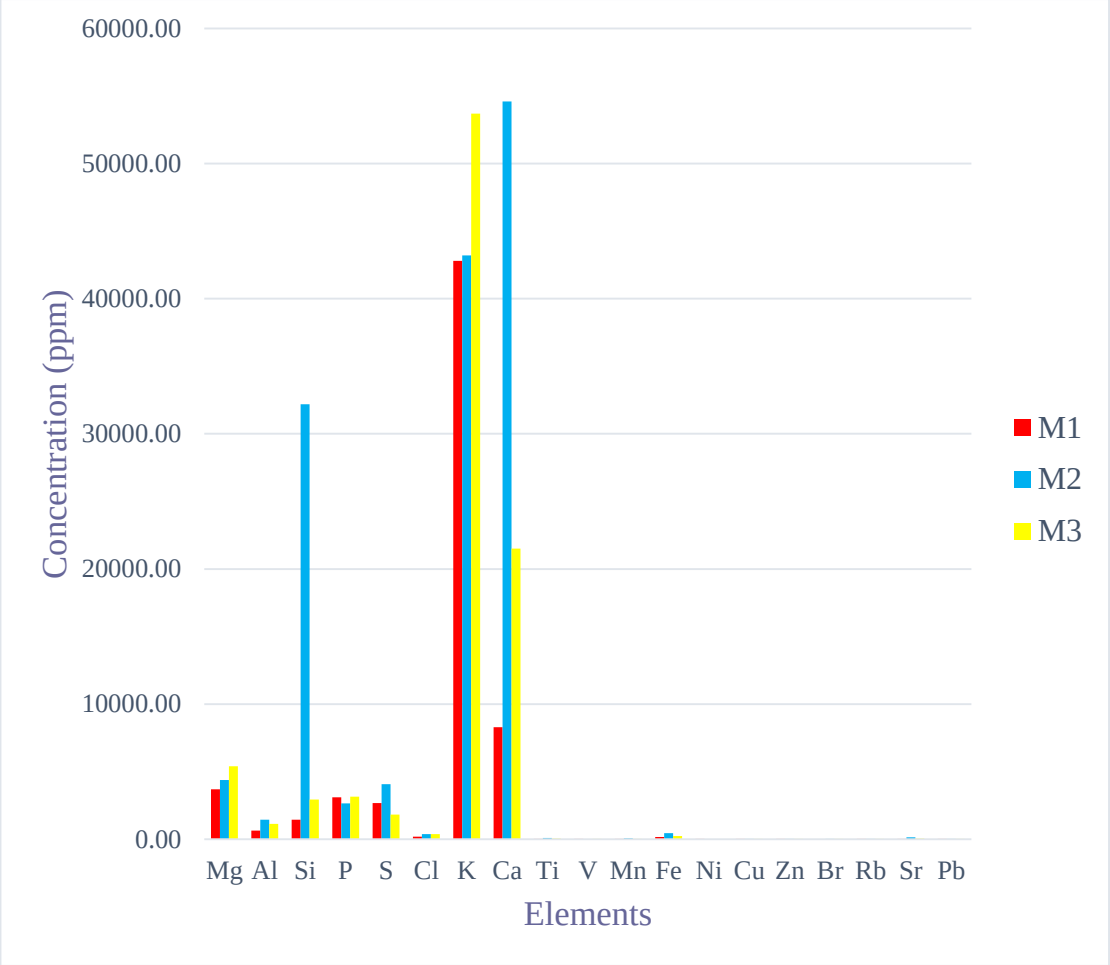

Figure (4.1) The experimental results of elemental concentration in M1, M2 and M3 samples.

Table (4.2) The comparison of elemental concentration in M1, M2 and M3 samples.

Symbol	Concentration (ppm)		
	M1	M2	M3
K	42800.00	43200.00	53700.00
Ca	8290.00	54600.00	21500.00
Mg	3700.00	4400.00	5400.00
P	3120.00	2660.00	3160.00
S	2680.00	4090.00	1840.00
Si	1450.00	32200.00	2940.00
Al	655.00	1450.00	1140.00
Cl	203.00	377.00	390.00
Fe	173.00	462.00	245.00
Zn	39.00	42.00	36.00

Ti	24.00	93.00	50.00
Mn	23.00	86.00	39.00
Cu	20.00	23.00	17.00
Sr	17.00	139.00	50.00
Rb	10.00	7.00	10.00
V	3.00	-	4.00
Ni	3.00	-	-
Pb	2.00	4.00	4.00
Br	-	2.00	2.00

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