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Elemental Analysis of Myanmar Natural Thanakha Samples by Using EDXRF

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Abstract

The quality control or quality check (QC) of toxicity in Myanmar natural Thanakha bark samples from different production places was mainly observed by using Energy Dispersive X-ray Fluorescence detection technique and the Shimadzu EDX-700 analysis software. The concentrations of elements contained in these samples were compared. According to the results obtained, it was found that calcium (Ca) was a major element in all samples. Moreover, toxic elements such as cadmium (Cd), nickel (Ni), mercury (Hg), lead (Pb), arsenic (As) and so on, were not found in all samples analyzed in this work.

Key words: EDXRF, Thanakha bark, toxicity.

Introduction

Every society has its own notion of beauty. In modern day Myanmar, people still use the traditional cosmetic known as Thanakha, as a daily cosmetic and skin conditioner.

Thanakha, (*Limonia acidissima* Linn.) is a tree that grows in Sri Lanka, the southern and western parts of India, the north-western part of the Himalayas and in Myanmar. Thanakha is a very useful plant and it plays a great part in the field of Myanmar indigenous medicine – the leaves are used as remedy for epilepsy in some regions and the cosmetic form cures pimples and acne. The hard yellowish sweet-smelling Thanakha wood is also used to make handicrafts such as combs, boxes and many other products.

Myanmar people like Thanakha because of its fragrance. It also makes one feel fresh and cool. It is said that Thanakha agrees with Myanmar's natural environs and it is recognized to be of great help to bear the heat of the sun or to protect from the wind especially for those who have to work under direct sun light or in windy condition.

To make Thanakha cosmetic, the bark is ground with a little water on a circular flat stone. Thanakha liquid or paste has a nice fragrance and it makes the skin cool, smooth and fresh. No matter how much modern cosmetic and make-up are in abundance today, Thanakha is still a favorite beautifier of Myanmar. Therefore, finding the elemental concentrations is essential for human health.

In the present work, four Thanakha bark samples were analyzed by EDXRF spectrometer Shimadzu EDX-700 at Universities' Research Centre (URC), Yangon to find out the elemental concentrations quantitatively.

Materials and Method

Facts of Thanakha trees

Thanakha trees originally grow in western and southern India, *Punjab* State, and the regions up to 4,000 feet high in northwestern *Himalaya* Mountains, *Assam* State, *Orihssa* and dry plains in *Dakhina* highlands, *Zinmay*, Thailand and the arid regions from Shwebo District

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in central Myanmar to *Pyay* in south. They also thrive in the dry forest in Myanmar (www.The Wonderful Thanakha Tree).

Thanakha trees are small trees that can grow up to three feet in girth. They belong to deciduous species. Branches are strong and there are thorns on the twigs. The straight thorns are from half to one inch long. Leaves of Thanakha trees are whitish green and flowers are white and fragrant. There are tiny oil bags like clear water drop on the petals which can be seen in the bright sunlight. The fruits are berries with soft skin and measures half an inch in diameter. These fruits are said to be used in tonic and antidotes.

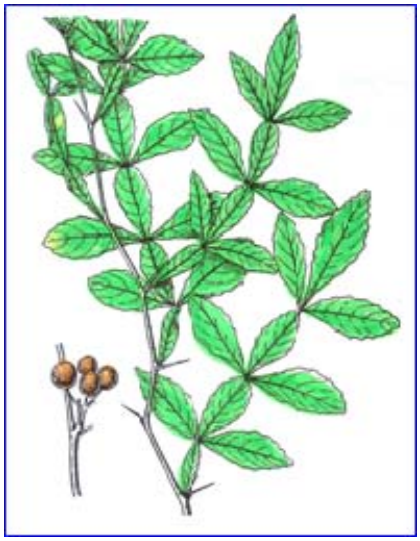

Figure 1. Thanakha (*Limonia acidissima* Linn.) tree.

Thanakha

Botanical Name	:	*Limonia acidissima* Linn.
English Name	:	Chinese box tree
Myanmar Name	:	Thanakha
Family Name	:	Rutaceae
Habit	:	Small tree
Distribution	:	Bago, Magway, Mandalay, Sagaing, Monywa, Shwebo, and Pakokku Districts of Upper Myanmar, Throughout India
Common Names	:	Sansph-ka, Thanakha, Thi-ha-yaza
Status	:	Thanakha, a small tree of citrus family, is a native of semi-arid region of Myanmar.
Comments	:	The tree is 7 to 8 m high with pale grey or whitish bark and branch at the age of 10-15 years. It grows in the forests of the semi-arid regions in central plains of Myanmar.

Sample collection and preparation

In the present research work, four Thanakha bark samples were personally collected from different production places in Myanmar. The names of the collected Thanakha bark samples are shown in Table 1.

Table 1. The names of Thanakha bark samples studied

Sample	Name of Thanakha Bark	Location
T 1	Monywa Thanakha Bark	Sagaing Region
T 2	Pakokku Thanakha Bark	Mandalay Region
T 3	Myinmu Thanakha Bark	Sagaing Region
T 4	Shwebo Thanakha Bark	Sagaing Region

The guiding sample for specimen preparation techniques are reproducibility, accuracy, simplicity, low cost and rapid preparation. First, Thanakha bark samples were washed with water. And then, they were dried under the room temperature. The dried barks were crushed and ground into fine powder by using grinding machine. And then, these powders were poured into a die, made of steel and pressed into pellet in 4 tons weight of Hydraulic press, SPECAC, Cambridge Electric Industries. Then the pellet was weighed with Sartorius, MC1 Scientific balance. The diameter of pellet is 2.5cm. Finally the powdered sample pellets were placed in sample chamber of Shimadzu EDX-700 system. Pellet samples of various Thanakha barks are shown in Figure 2.

Monywa Thanakha bark | Pakokku Thanakha bark | Myinmu Thanakha bark | Shwebo Thanakha bark

Figure 2. Pellet samples of four Thanakha barks.

Experimental Procedure

The EDXRF system (Tertian & Claissem, 1982) is composed of two parts: the spectrometers and personal computer (PC). The spectrometer contains: the x-ray generating elements; X-rays tube, sample chamber, Si(Li) detector, detector electronics, microprocessor controller, liquid nitrogen (LN_2) cooling system and associated power supplies. The personal computer (PC) includes the data memory board and other standard PC elements. The collected spectra were analyzed using EDX-700 qualitative and quantitative analysis software. The Fundamental Parameter (FP) method was used for the elemental analysis (Dziunikowski, 1989).

The EDXRF spectrometer EDX-700 can provide information of element from silicon to uranium (Si-U). The X-rays tube was operated at 50 kV, 27 μA in air. The X-rays beam from rhodium (Rh) target, which was set to pass through the 10 mm collimator, was allowed to excite the samples and were detected by the Si(Li) detector. The vacuum pressure was about (38 Pa) and the detector temperature is about (-17°C), the EDX-700 was put into operation. Each sample was run for about 100 sec. The X-rays spectra displayed on the

monitor of computer was analyzed by using performance FP (Fundamental Parameter) software.

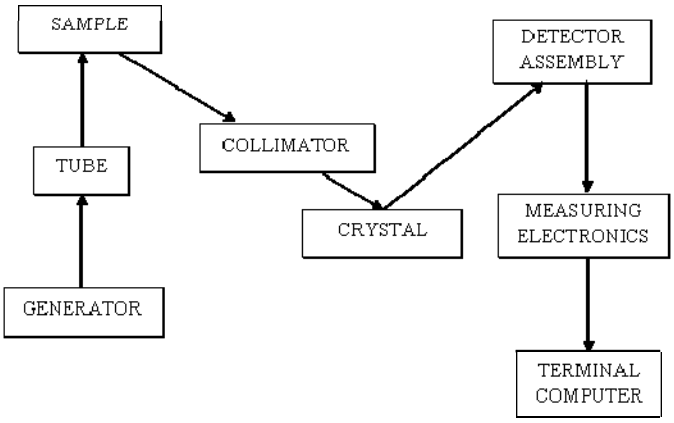

Figure 3 Schematic diagram of X-ray spectrometer.

Results and Discussion

Experimental measurements of Shimadzu EDX-700 Spectrometer for four kinds of Thanakha bark samples were performed at Universities' Research Centre (URC), Yangon.

According to the results obtained, calcium (Ca) is the highest in all samples as a major element. The elemental comparison graphs of four Thanakha bark samples are shown in Figure 4 to Figure 12.

Figure 5 shows the concentrations of element in Monywa Thanakha bark sample. According to this figure, calcium (Ca) is found as a major element. Other elements: potassium (K), zinc (Zn), copper (Cu) and strontium (Sr) are found as minor elements in this Thanakha bark sample.

Figure 7 shows the concentrations of element in Pakokku Thanakha bark sample. According to this figure, calcium (Ca) is found as a major element. Other elements: potassium (K), zinc (Zn), phosphorus (P), copper (Cu) and strontium (Sr) are found as minor elements in this Thanakha bark sample.

Figure 9 shows the concentrations of element in Myinmu Thanakha bark sample. According to this figure, calcium (Ca) is found as a major element. Other elements: potassium (K), zinc (Zn), phosphorus (P), copper (Cu), sulphur (S) and strontium (Sr) are found as minor elements in this Thanakha bark sample.

Figure 11 shows the concentrations of element in Shwebo Thanakha bark sample. According to this figure, calcium (Ca) is found as a major element. Other elements: potassium (K), zinc (Zn), copper (Cu) and strontium (Sr) are found as minor elements in this Thanakha bark sample.

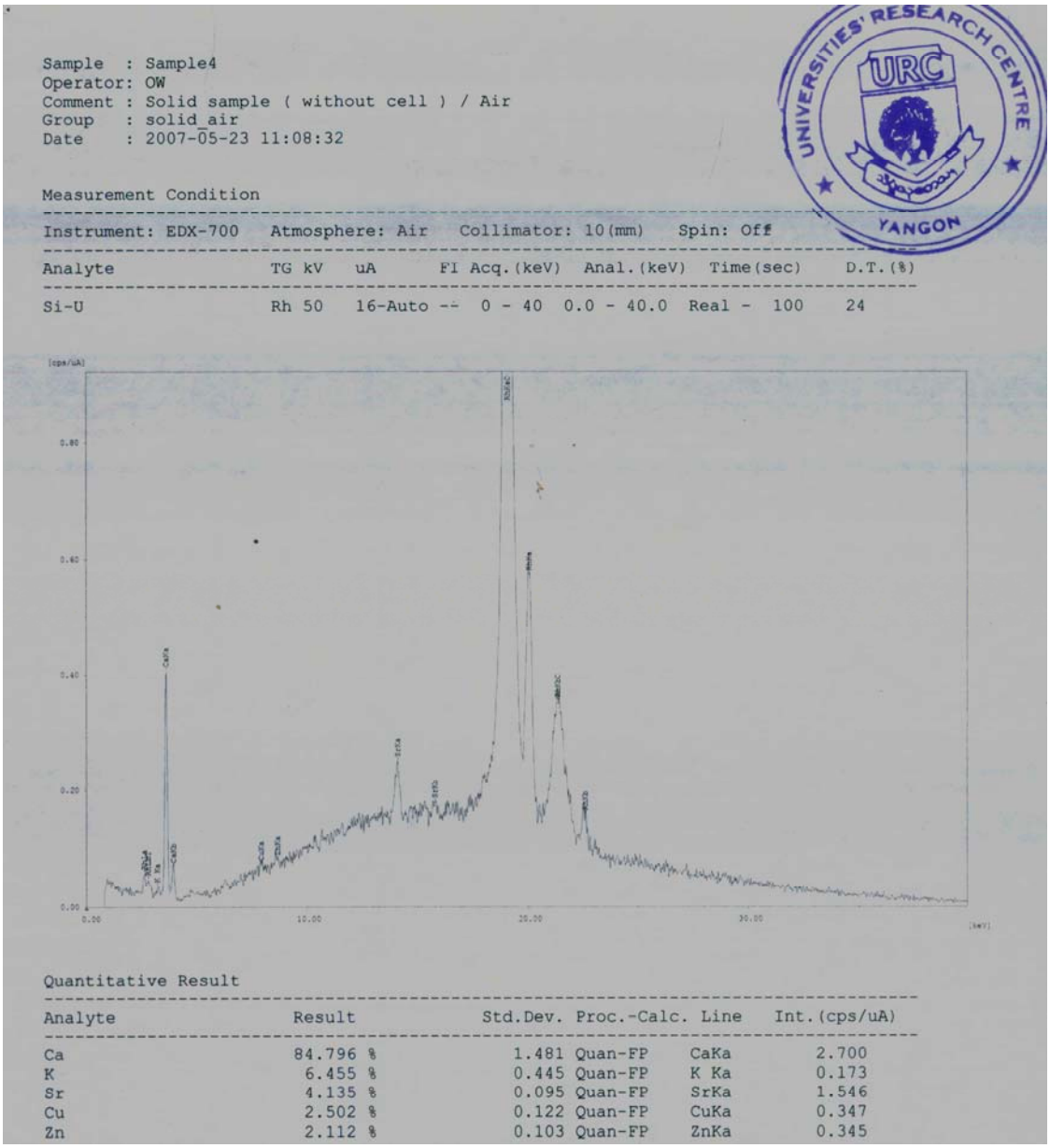

Figure 4. Spectrum for Monywa Thanakha bark sample

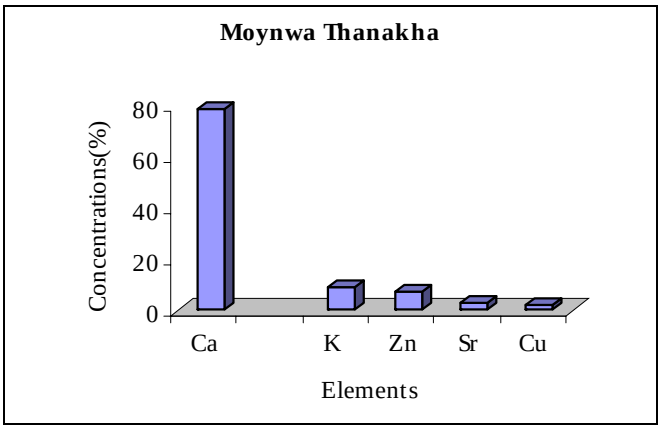

Figure 5. Comparison of elemental concentrations in MonywaThanakha.

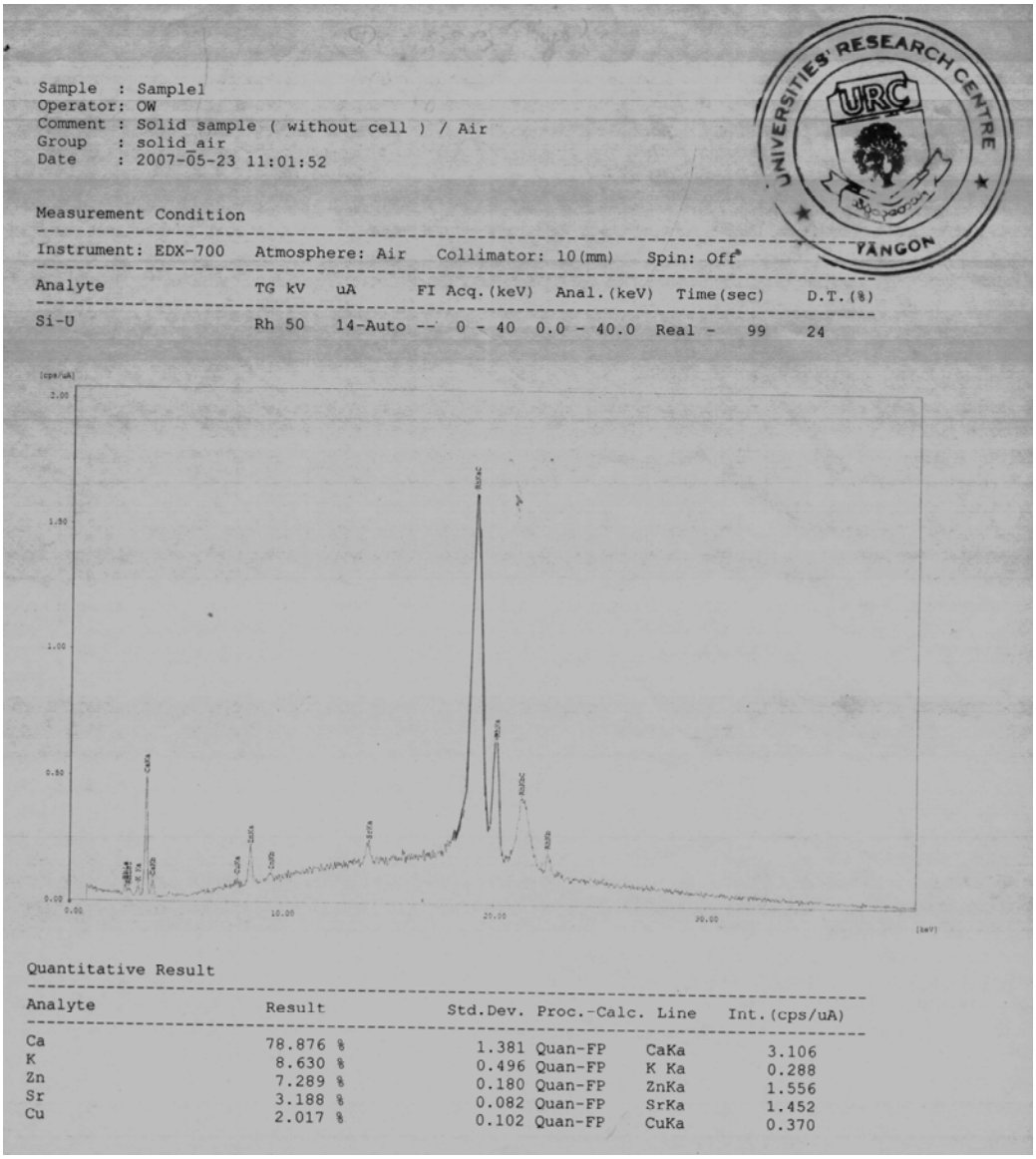

Figure 6. Spectrum for Pakokku Thanakha bark sample

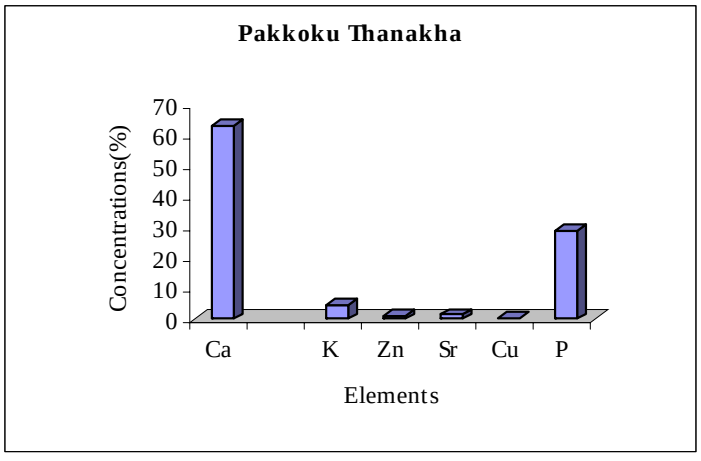

Figure 7. Comparison of elemental concentrations in Pakokku Thanakha.

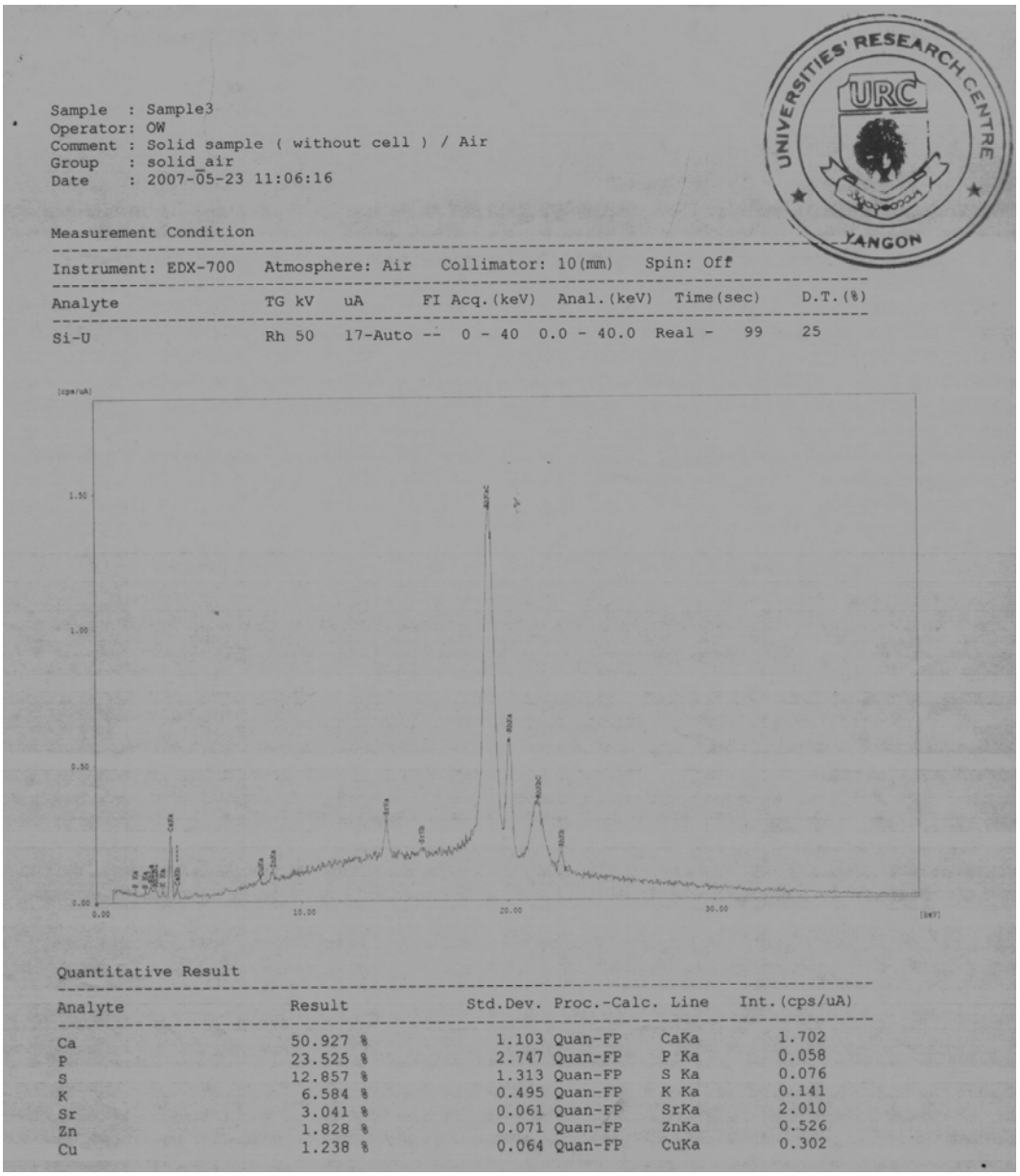

Figure 8. Spectrum for Myinmu Thanakha bark sample

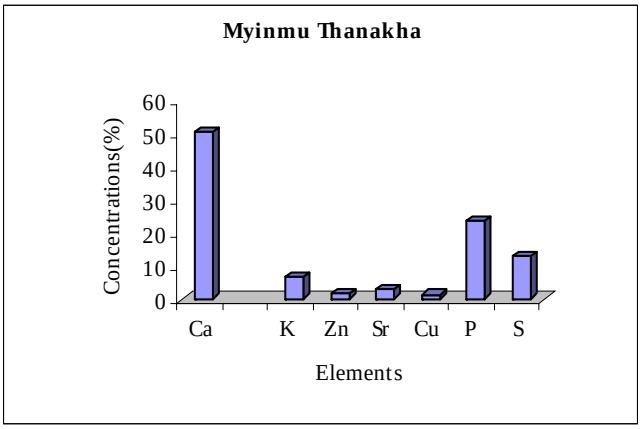

Figure 9. Comparison of elemental concentrations in Myinmu Thanakha.

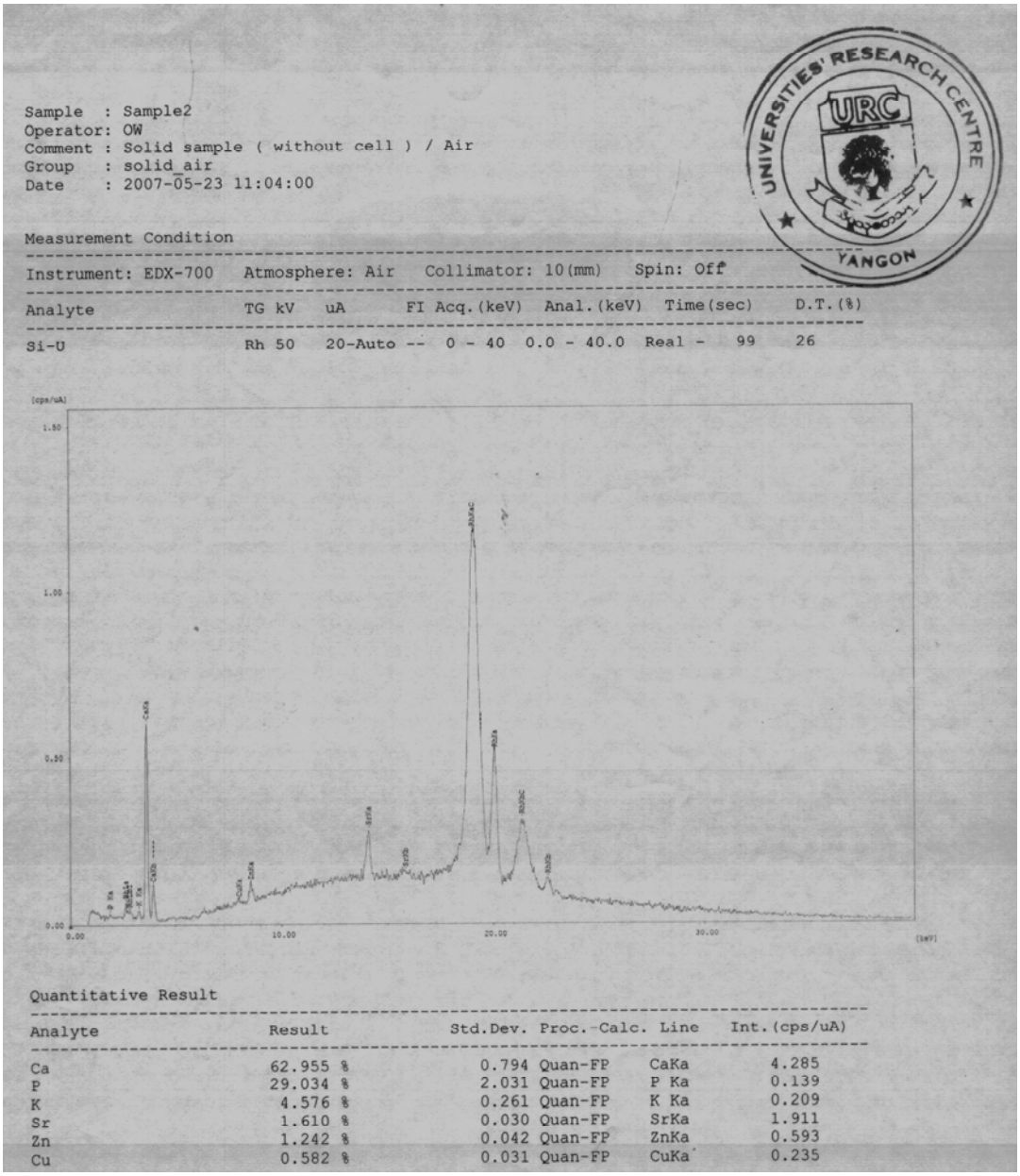

Figure 10. Spectrum for Shwebo Thanakha bark sample

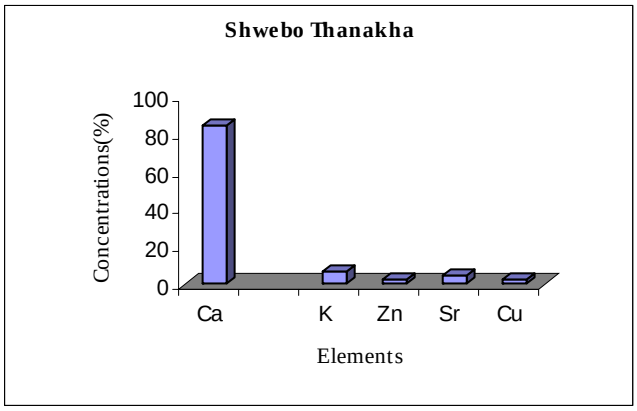

Figure 11. Comparison of elemental concentrations in Shwebo Thanakha.

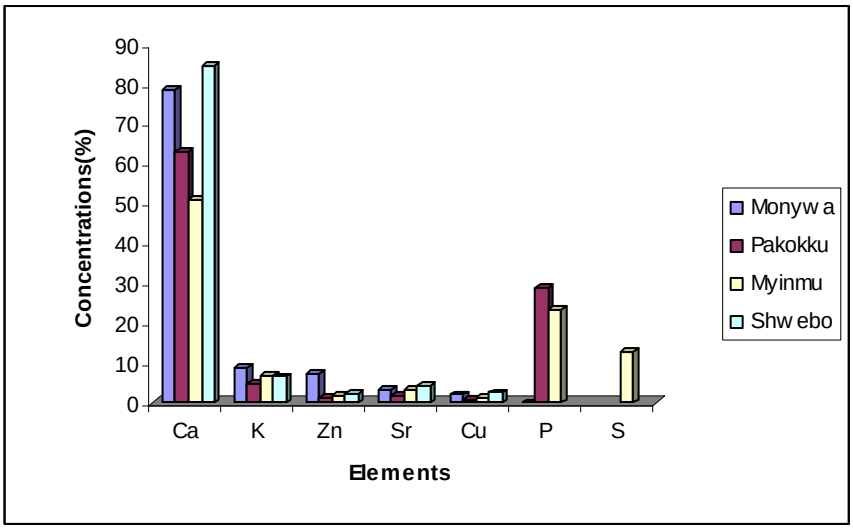

Figure 12. Comparison of elemental concentrations in four Thanakha bark samples.

Figure 12 shows the comparison of elemental concentrations in various samples of Thanakha barks. According to the comparative studies, calcium (Ca) and potassium (K) were mainly observed in all Thanakha samples.

Calcium is one of the most active metals and it can support the metabolism of the body. Ca is essential constituent of bone, shell and teeth of the body. It helps stave off osteoporosis, especially useful for postmenopausal women. Potassium can also support the tonic effect for the human body. It does not give toxic effect. Moreover, it can supply the pharmaceutical necessary.

The concentration of phosphorous (P) is higher in Pakokku Thanakha and Myinmu Thanakha samples but it was not found in Monywa Thanakha and Shwebo Thanakha bark sample. In addition, sulphur (S) content was found in Myinmu Thanakha bark sample only.

Conclusion

In this study, the quantitative data calculated by EDX-700 software based on 100 percent of weightiness of just inorganic elements contained in the samples of interest and not considered on the organic compounds and dark matrix elements. It means that the data shows the relative concentrations of elements contained in the sample of analysis.

In addition, an improved energy resolution of the detector allows the implementation of more sophisticated data treatment methods to convert the measured intensities into mass concentrations of the analysis. EDXRF is a multi-elemental analysis technique, which finds applications in various fields as geology, archeology, biology, medicines and material sciences.

Briefly, the qualitative and quantitative data calculated by the Shimadzu EDX–700 software shows that the toxic elements such as cadmium (Cd), nickel (Ni), mercury (Hg), lead (Pb), arsenic (As) and so on, were not found in the samples analyzed in this work. Therefore, Myanmar Thanakha can be used safely for public health because of its nutrition and they can support for the good health.

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