

Comparison of Elemental Concentrations between Foreign and Myanmar Traditional Medicines for Diabetes Mellitus

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Abstract

Myanmar Traditional Medicine for Diabetes Mellitus-Ananda Thu Kha and foreign medicine for Diabetes-Mellitus-Metformin (500 mg) product of Malaysia, were analyzed using the energy-dispersive x-ray fluorescence (EDXRF) detection technique and the Shimadzu EDX-700 analysis software. The concentrations of elements contained in these samples of interest were compared.

Key words: EDXRF, Shimadzu EDX-700 analysis software, Diabetes-Mellitus-Metformin

Introduction

Diabetes Mellitus is characterized by hyperglycaemia (high glucose concentration in blood) and disturbance of carbohydrate fat and protein metabolism due to decrease insulin production or inefficient insulin utilization. Medicinal plants have been in use for untold centuries and have proved reliable and effective in healing, preventing and controlling diseases. The present day drugs including insulin and oral hypoglycaemic agents only control the blood sugar level as long as they are regularly administered. A large number of herbal drugs are being used for the treatment of diabetes mellitus in different regions of the world.

Diabetes means any disorder of metabolism causing excessive thirst and the production of large volumes of urine or continued excessive secretion of urine. Diabetes Mellitus is a result of problems with the pancreatic hormone insulin. Insulin controls the amount of glucose (sugar) in the blood and the rate at which the glucose is absorbed into the cells. The cells need glucose to produce energy in people (Ministry of Health, Department of Medicine, 2003).

The World Health Organization (WHO) criteria specify blood glucose concentration for Diabetes Mellitus. The specification is fasting blood glucose level of more than 140 mg/dl and random blood glucose level of more than 200 mg/dl. The characteristic symptoms of Diabetes Mellitus are excessive loss of weight, excessive thirst, easily fatigue and frequent urination leading to intake of large volumes of water. There are two major types of diabetes.

Type I (or) insulin dependent diabetes mellitus (IDDM) and Type II (or) non-insulin-dependent diabetes mellitus (NIDDM). Type I often occurs during childhood or early adulthood. In this type, the insulin forming cells of pancreas are destroyed already at a very young age. For this type, the pancreas retains some ability to produce insulin, but this is inadequate for the body's need and patients may require treatment with oral hypoglycaemic drugs or insulin. In both types of diabetes, the diet must be carefully controlled, with adequate carbohydrate for the body's needs. NIDDM is usually found in overweight older individuals.

Materials and Methods

Sample preparation

The guiding principles for specimen preparation technique are reproducibility, accuracy, simplicity, low cost and rapidity of preparation. By the nature of EDXRF

experiment, the sample must be in the form of pellet. The specimen is made into fine powder using grinding machine and then pressed into a pellet using hydraulic press machine to be used as a sample. The diameter of the pellet is 2.5 cm (25 mm) and thickness is 2.5 mm.

Experimental setup

The EDXRF system (Tertian & Claisse, 1982) is composed of two parts: the spectrometers and personal computer (PC). The spectrometer contains: the x-ray generating elements; x-ray tube, sample chamber, Si (Li) detector, detector electronics, microprocessor controller, liquid nitrogen (LN₂) 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 the EDX-700 Qualitative and Quantitative Analysis Software. The Fundamental Parameter (FP) method was used for elemental analysis (Dziunikowski, 1989).

Results and Discussion

The experimental work was performed at Universities' Research Centre, University of Yangon. The concentrations of the elements contained in the samples are shown in Table 1. Figure 1 and 2 show the concentrations of elements contained in samples 1 and samples 2.

Figure 3 shows the comparison of elemental concentrations in Myanmar traditional medicine and foreign medicine for diabetes mellitus. According to Figure 3, the samples contain the same elements but different concentration amounts. This Fig. indicates that Myanmar traditional medicine for diabetes mellitus have more trace elements such as potassium (K), calcium (Ca) and iron (Fe) than foreign medicine for diabetes mellitus.

The comparison of the sulphur (S) concentrations for these samples is presented in Figure 4. In sample 1, the amount of sulphur concentration is higher than sample 2.

Results of chlorine (Cl) concentrations are compared in Figure 5. In Figure 5, the amount of chlorine contained in these samples and the amount of chlorine concentration in sample 2 is higher than sample 1.

Table 1 Elemental concentrations contained in Myanmar traditional medicine and foreign medicine

Atomic Number (Z)	Element	Concentration (%W)		Std-Dev	
		Sample 1	Sample 2	Sample 1	Sample 2
16	S	3.343	2.682	0.155	0.130
17	Cl	60.346	97.318	0.655	0.875
19	K	7.575	0	0.224	-
20	Ca	25.093	0	0.306	-
26	Fe	3.643	0	0.045	-

Sample 1 - Ananda Thu Kha

Sample 2- Metformin (500 mg) (Malaysia)

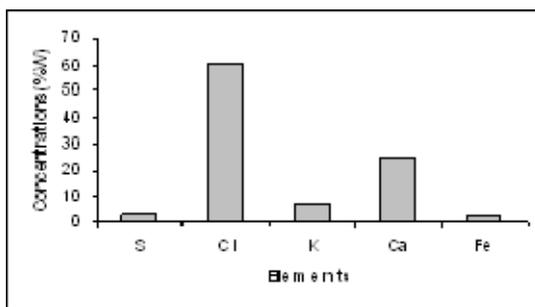


Figure 1 Comparison of elemental concentration in Ananda Thu Kha sample

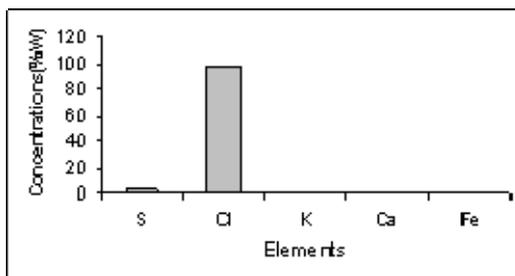


Figure 2 Comparison of elemental concentration in Metformin sample

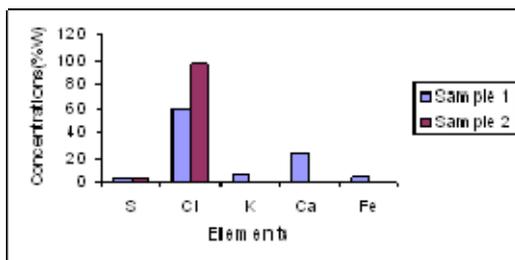


Figure 3 Comparison of elemental concentration in two samples

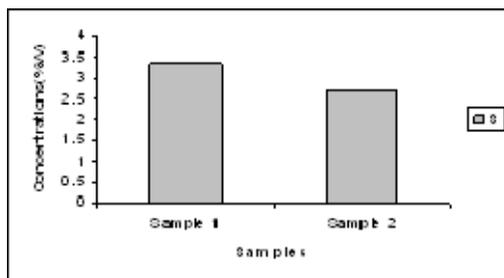


Figure 4 Comparison of Sulphur concentration in two samples

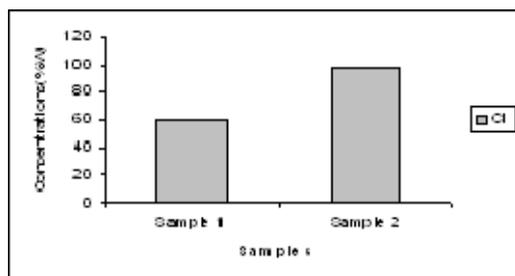


Figure 5 Comparison of Chlorine concentration in two samples

Conclusion

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

The foreign medicine for diabetes mellitus has mainly sulphur (S) and chlorine (Cl) organic compounds. Similarly, the elements sulphur (S) and chlorine (Cl) are found in Myanmar traditional medicine for diabetes mellitus analyzed in this work.

In addition, Myanmar traditional medicine for diabetes mellitus has more trace elements such as potassium (K), calcium (Ca) and iron (Fe) than foreign medicine for diabetes mellitus. It is because Myanmar traditional medicines are made from natural indigenous medicinal plants and foreign medicines are manufactured for pure chemical compounds needed. Potassium, calcium and chlorine are very important in the treatment of Diabetes Mellitus. They promote the secretion of insulin and also regulate the blood sugar metabolism.

Although most medicines are rich in organic compounds, the EDXRF analysis technique cannot determine the compositions and structures of chemical compounds.

According to results study, sulphur is needed for carbohydrate and fat metabolism. It is used to repair tissue including the Retina, the Central Nervous System and the Kidneys. These are all parts of the body that are affected by diabetes. Sulphur (S) is involved with the production of insulin. It is an important factor in digestion, and of the metabolism of proteins, fats and carbohydrates.

Chlorine is an important chemical for some processes of water purification and can also be used for killing bacteria. Chloride is essential for the proper distribution of carbon dioxide and the maintenance of osmotic pressure in the tissues. It is necessary for the manufacture of glandular hormone secretions. It prevents the building of excessive fat and auto-intoxication. Chloride regulates the alkali-acid balance in the blood. It works, with potassium in a compound form.

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References

- Dziunikowski, B. (1989). *Energy dispersive X-ray fluorescence analysis* (Warszawa: PWN).
- Ministry of Health, Department of Traditional Medicine (2003). *Commonly used herbal plants* (Yangon Traditional Medicine).
- Tertian, R. and Claisse, F. (1982). *Principles of quantitative X-ray fluorescence analysis* (London: Heyden).