

Estimation of Selected Essential Metals in Ginger (*Zingiber officinale*) and Roselle (*Hibiscus sabdariffa*)

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ABSTRACT

Zingiber officinale and Hibiscus sabdariffa are common medical plants used in traditional medicine. The mineral elements (Se, Zn, Cu, Fe, Ca, K, Mg and Na) have played a major part in the health and battling sicknesses in the human body. The aim of this study is to estimate the mineral composing Zingier officinal, Zingier officinal and Hibiscus sabdariffa which would be an important promotion vantage in human health, despite the fact that the characterization of the components is somewhat difficult. The analysis of mineral composition of these plants is carried out by using inductively Coupled Plasma- Mass spectrometry. The finding of this study shows that the level of the elements in, Zingier officinal are 345.7, 7012.7, 2444.7, 685, 8283, 67722, 12260 and 2520 $\mu\text{g}/\text{kg}$ for Se, Z, Cu, Fe, Ca, K, Mg and Na, respectively. The level of Se, Zn, Cu, Fe, Ca, K, Mg and Nain Hibiscus sabdariffa are 55.7, 3052, 2288, 120, 112071, 88690, 27822 and 2229 $\mu\text{g}/\text{kg}$, respectively. Moreover, the results of this study suggest that Ginger and Roselle could be utilized as enhancement nourishment or diet improvement particularly in the lower protein diets.

Introduction:

Trace elements play an important role in human bodies (1). Hence, trace elements present in very low amount in the human body, less than 0.01% of body's mass, less than 1 micro-gram per gram of the tissues. In that case they are defined as trace elements. Whilst, those present at ng/dL or $\mu\text{g}/\text{kg}$ concentrations are defined as ultra-trace elements. Trace elements have many important roles in biological processes, even if they are found in a very small amount. Among those roles, some are necessary for enzymes reactions, in the proteins structure as well as complex carbohydrates that are involved in biological activities (2).

Ginger, one of the Zingiberaceae family, is used widely in cooking as spices and in the pharmaceutical as well. Looking at the past history of the medicinal plants, India and China were the leading countries that used plants or herbs such as ginger in medicine. Due to the presence of different pungent constituents and active ingredients, ginger was employed for treating headaches, nausea, rheumatism, and colds (3).

Recent studies (4) have indicated that ginger has medical features properties such as, anti-oxidant activity, antimicrobial, and anti-inflammatory (5). Roselle, (*Hibiscus sabdariffa*) is a genus of the Malvaceae family, that is originated in Africa and also called a "Sour Tea" in Iran. Its red succulent contains about 15%-30% plant acids such as citrus, malic, tartaric acids and allo-hydroxy citric acids lactones. The remaining percentage of the plant comprised of many chemical compounds such as alkaloids, L-ascorbic corrosive, anthocyanin, Beta-carotene, Beta-sitosterol, citrus extract, polysaccharide rides Arabians and arabinogalactans, quercetin, gossypetin and little measures of galactose, arabinose, glucose, xylose, mannose and rhamnose (6). Hibiscus Sabdariffa is utilized to treat heart disease also as a diuretic (7). The aim of the current study is to investigate and quantify the amount of some trace elements in both Ginger and Roselle. applied herpes that are widely consumed in world.

Materials and Methods:

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Plant collection: Roselle leaves and ginger roots are dried and grinded thoroughly. The samples are analyzed from three repetitions for (Se, Zn, Cu, Fe, Ca, K, Mg and Na) minerals in chemistry laboratories.

Elements Determination:

Elements are determined in the extract by inductively Coupled Plasma-Mass Spectrometry (Japan, Agilent Technology).

Digestion Method:

A mixture of (8mL) of concentrated HNO₃ and (2mL) of H₂O₂ is added to three replicates of (0.2g). The digestion vessel is closed and heated in microwave oven based on the parameters. The obtained solutions are cooled at room temperature and filtered. Deionized water (with 5% v/v nitric acid) is prepared and used for all dilutions throughout this work.

Standard Analysis Procedure:

Multi element working standards are prepared containing (Se, Zn, Cu, Fe, Ca, K, Mg and Na) by diluting high purity (1000mg. l⁻¹) stock solutions with deionized water 5% v/v nitric acid. ICP-MS responses, the experiments are performed using different concentration levels. The digested samples are analyzed for (Se, Zn, Cu, Fe, Ca, K, Mg, and Na) using Inductively Coupled Plasma-Mass Spectrometry (Agilent Technology, Japan).

Result and Discussion:

In this study, the concentration of K and Ca in ginger are higher while in Roselle, the concentration of Ca, K and Mg are higher Fig (1). Mg, Cu, Se, Zn, Fe, Mn and Mo are important co-factors found in the structure of certain enzymes and are indispensable in numerous biochemical pathways (8). Mg is the most important metal that is required in the body, it is used to correct absorption of K and the efficient functioning of the enzyme (9). Ca, Mg and P are also essential for bone and teeth formation (10). The importance of these elements cannot be overemphasized because they are required by many enzymes as co-factors (11). Also, trace elements play a significant role in maintenance of a healthy state of an organism (12). The organic fertilizers contain N, K, P in small quantities, yet contains good amounts of micronutrient requisite for plant growth. Also, the organic wastes from whatever is left of the plant or animal waste can

completely fill the requirements of macro and micronutrient for ginger. As well as the environmental influences on the absorption of organic nutrients by plants. The addition of organic waste may increase the nutrient content in the soil for plant growth (13). Trace elements have remedy and precaution in battling sicknesses. For instance, Se, Zn, and Cu are fundamental to the metabolism of the human body. The trace elements in ginger and Roselle play an important role in the medical field. The utilization of both plants adds to the admission of essential and non-essential trace elements by the human body (14). The obtained results show that ginger and Roselle contain a good concentration of the elements (Fe, Zn, Cu and Se) as Fig (2). Fe and Zn are major elements that plant could be piling up and pass into the food chain. The high concentrations of Zn and Fe in ginger may cause these ions to be easily transferred from soil to plants and accumulate in plants (15). Cu and Se are important elements for organisms. Particularly, Se, Cu and Fe in variant pathologic conditions have been broadly investigated in numerous illnesses (16). Cu in the human body combines with Fe in the production of hemoglobin " While its major role in plants differs among plant types. Se appears to be a major nutrient in counteracting the growth of virulence and inhibiting HIV" (17).

Conclusion:

The present study has provided some comparative biochemical information on the mineral elements in Ginger and Roselle. Ginger and Roselle are a rich source of chemical elements such as (Fe, Cu, Zn, Se, Ca, K, and Mg). Therefore, their use as promising nutritional supplements (incomplete sentence). In fact, results give indications that Ginger and Roselle are good sources of nutrients and mineral elements.

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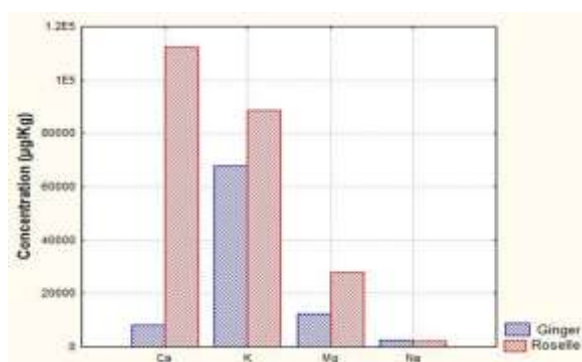


Figure (1) Level of (Ca, K, Mg, and Na) in Ginger and Roselle

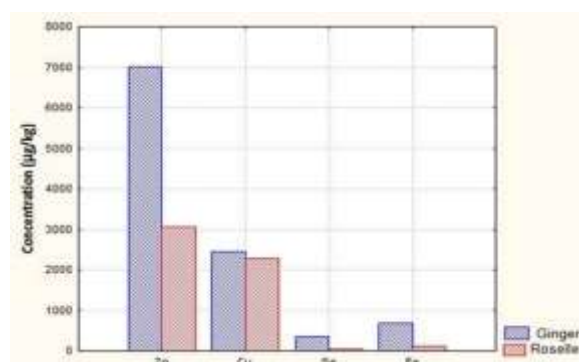


Figure (2) Level of (Zn, Cu, Se, Fe) in Ginger and Roselle

تقدير العناصر الأساسية المختارة في الزنجبيل والكرديه

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المستخلص

الزنجبيل والكوجرات من النباتات الطبية الشائعة الاستعمال في الطب التقليدي. وتعرف هذه النباتات بعدة خواص علمية. تلعب العناصر المعدنية (السيلينيوم، الخارصين، النحاس، الحديد، الكالسيوم، البوتاسيوم، المغنيسيوم والصوديوم) دورًا رئيسيًا في الصحة ومكافحة الأمراض في جسم الإنسان. يهدف هذا العمل الى تقدير التركيب المعدني لنباتات الزنجبيل والكوجرات والتي من شأنها أن تكون ميزة تعزيز هامة في صحة الإنسان على الرغم من حقيقة أن توصيف المكونات صعبة بعض الشيء. اتم اجراء تحليل التركيب المعدني لهذه النباتات باستخدام تقنية بلازما الحث المقترن- طيف الكتلة. أظهرت نتائج التحليل أن تراكيز عناصر السيلينيوم، الخارصين، النحاس، الحديد، الكالسيوم، البوتاسيوم، المغنيسيوم والصوديوم في نبات الزنجبيل كانت (345.7، 7012.7، 2444.7، 685، 8283، 67722، 12260 و 2520 مايكرو غرام/كيلوغرام) على التوالي. في حين كانت تراكيز السيلينيوم، الخارصين، النحاس، الحديد، الكالسيوم، البوتاسيوم، المغنيسيوم والصوديوم في نبات الكوجرات (55.7، 3052، 2288، 120، 112071، 88690، 27822 و 2229 مايكرو غرام/ كيلوغرام) على التوالي. بينت نتائج هذه الدراسة امكانية استخدام نبات الزنجبيل والكوجرات كمكملات غذائية أو للحمية الغذائية في نظام الحمية ذات البروتين المنخفض.