Determination of mineral composition of Iraqi Nigella Sativa L. seed by Atomic absorption spectrophotometer

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Abstract

The elements are widely distributed in nature with variable proportions, which lead to variation in foods intake of these elements according to their sources in plants or foodstuffs.

These elements play a vital role in growth, health and maintenance of human body.

In this study the macronutrients elements (Ca, P, S, Mg, K, Na) and trace elements (Zn, Fe, Cu, Mn, Se) were measured in the seed oil of Nigella sativa by using atomic absorption spectrophotometers. The results observed the presence of significant quantities of the above elements which to be considered as a good source of trace elements supplimination to human body by used the oil of nigella sativa in certain amounts.

الخلاصة

تتوافر العناصر الأساسية في بذور النباتات بصورة متباينة . يؤدي هذا التباين الى اختلاف في كمية العناصر المستخدمة كغذاء حسب نوع ومصدر النبات المستخلص منه . في هذه الدراسة تم تعيين العناصر ذات التركيز العالي مثل الكالسيوم والكبريت والفسفور والمغنيسيوم والصوديوم والبوتاسيوم في مستخلص زيت الحبة السوداء وكذلك العناصر الأساسية الضئيلة ذات الأهمية الطبية مثل الخارصين والحديد والنحاس والمنغنيز والسيلينيوم , والكروم .

أوضحت النتيجة احتواء زيت الحبة السوداء على كميات مهمة من العناصر الأساسية في زيت الحبة السوداء والتي يمكن اعتبارها احد المصادر الأساسية الطبيعية للعنصر الأساسية التي يحتاجها الجسم وذات الأهمية الواسعة في العمليات الحيوية للجسم .

Introduction

The recent studies suggest at least 17 elements which considered to be essential for human life[1-4]. Trace elements have great importance for therapeutic efficacy, their lack may result in characteristic pathological sign and symptom, the mineral nigella extract have highly influence on lipds profile in Albino-rats therefore, enough daily intake should not lead to any disease disturbance[5] on other hand, may be toxic in higher concentrations[6]. Some elements required in substantial amount known as major elements (Ca, P, Mg, Na, K, Cl, S) while (Fe, Zn, Co, Cu, Mn, Mo, Ni, I, Se and Cr) are required in small quantities and usually referred as trace elements. These elements are especially prominent in assisting enzyme functions, and few of them act as biological catalysts and coenzyme. the clinical interests in trace elements determination for diagnosis of different diseases related to deficiency or toxicity of these elements[7] for example, zinc is important metalloenzymes, therefore, Zn supplements has been found to protect against cadmium accumulation in various organ[8], plasma Zn level reported to be low in-patients with leukemia Hodgkin's disease and bronchial cancer[9]. About 200 enzymes in the human body have been shown to be containing zinc, Zn is essential main cause of acrodermitits entropathica, inflamation of eye, photophobia, malabsorption syndrome and corneal opacity[10].

Valle and Kellin[11-12] reported that zinc is essential in variety of metabolic processes including carbohydrate, Lipid, Protein and nucleic acid synthesis and degradation.

Iron is playing a vital role in the erythropoiesis as well as in much intracellular reaction in all tissue and also in oxygen transfer, iron form active component of heme-containing enzyme[13].

Copper form an important constituent of many metallo-proteins, metallo-enzymes of various organs and tissues. Cu is responsible for metabolism of tyrosine and for production of melamine, the pigments of skin freckles[13].

Recently, zinc was used for treatment of Wilson's disease by oral administration of zinc sulphate 600 mg/day[14].

Chromium, is enzyme activator[15] and maintenance of the structure of nucleic acid[16] and potentiation of action of insulin and some biological function that controlled by this element[17]. Several epidemiological studies linking Cr efficiency with the risk factors of cardiovascular diseases[18-20].

Offenbacher[21] reported that a significant decline in plasma cholesterol as well as total lipids has been observed in human subjects after supplementation with Cr rich brewer's yeast.

Selenium Se was an integral component of glutothione peroxidase (cell membrane stabilizer) and know as to protect the body from the effect of mercury and cadmium. Selenium deficiency play a significant role in the various type of carcinogen's[22-24] and immune system functions.

Manganese is essential[25] for human nutrition and it is absence from diet lead to retarded growth, rare faction of bones slipped tendons and other collagen problem as well as disorder of central nerve system.

Experimental

1 gm of nigella sativa seed powder mixed with 10 ml of acid mixture (nitric acid, perchoric acid, sulfuric acid 5:2:1) v/v). The mixture heated up to 70^{o}C, the volume allowed to evaporated till the volume reach about 0,5 ml. 0.5 ml of the residue were

diluted with 25 ml deionized water in volumetric flask.

The final solution subjected to atomic absorption spectrometer analysis. The heavy metals of arsenic, lead and cadmium analysed by inductively coupled plasma.

Result and Discussion

The concentration in □g/gram mineral elements in the Nigella Sativa seed, were determined by using atomic absorption spectrophotometer and inductively coupled plasma for As, Pd, Cd as shown in table 1.

Table 1. The concentration of minerals in nigella sativa seeds

	Element	Concentration □g/gram
1.	Calcium Ca	1500 ± 12
2.	Phosphorous P	4500 ± 20
3.	Sulfur S	3400 ± 25
4.	Magnesium Mg	1250 ± 30
5.	Potassium K	7800 ± 49
6.	Sodium Na	180 ± 10
7.	Zinc Zn	18 ± 1.5
8.	Copper Cu	12 ± 1.6
9.	Iron Fe	17.2 ± 1.5
10.	Manganese Mn	10 ± 2
11.	Chromium Cr	3 ± 0.3
12.	Selenium Se	0.2 ± 0.01
13.	Arsenic As	-
14.	Cadmium Cd	-
15.	Lead Pb	-

The importance of macronutrients Ca, P, S, Mg, K and Na in electrolyte body fluid is well known[5]. In this study we concentrated on essential trace elements which have a vital tole in diagnostic and preventive effect in various disease. The nigella S. oil have a significant amounts of the following trace elements (Zn, Cu, Fe, Cr, Mn, Se) which considered to be a good supplement for the deficiency of these element in blood serum, the deficiency might be due to the action of chealting agents such as phytate, oxalate and phosphate which are found in quite large amount in food is mainly based on cereals protein and dryed food, such food form in soluble complexes with zinc and iron to decrease their absorption[26-27] e.g. zinc deficiency are a general feature of infections illness including leprosy[28-29], breast cancer[30], digestive tract cancer[31]. It is reported that immunological days functions are resist in patients with head and neck cancer[43] the cell mediated immune function interleukin production by mononuclear cells, natural cell killer are zinc dependant. It was reported[32] that the serum zinc level in mentally retarded children is 0.3 □g/ml compared with healthy control children (0,92 + 0.09 □g/ml), however, they are get improvement by oral zinc sulphate therapy. In contrast, ashma is found to be associated with significant rise of serum zinc, however, the cure of the disease was associated with reduce in concentration of zinc to normal value.

Copper is important element in many metalloenzyme, which have

multiple biochemical functions, in liver, red cells and other tissues, therefore, the Cu serum status is important factor in human health[33]. Attention has been drown on controlling trace elements like Cu, Zn, Fe, in schemic heart disease[34-35], the elevated in serum Cu level and reduce serum level of Zn and Fe associated with variation in enzyme activity following Acute Mycordial Infaraction (A.M.I) has been recently reported[36], on other hand it has been suggested that Cu, Zn determination might be useful for early diagnosis of AMI and digestive cancer[37].

Chromium is one of the newer essential trace element[38] which is very essential for normal glucose tolerance and carbohydrate metabolism it act as cofactor for intitation of periphery insulin action or receptor cell membrane[39]. Chromium deficiency has been associated with vascular of diabetes militias and atherosclerosis disease[39-40]. It was reported[40] that the risk factor of cholesterol, fatty acids, impaired glucose tolerance, and aortic plaques increased by chromium deficiency for that reason chromium supplementation in necessary to get positive balance by using chromium complexes for both oral and parental administration[40].

Selenium Se is very important trace element (cell membrane stabilizer), their deficiency in blood serum has been associated with cancer risk in several organ[41], this association was investigate in resplasia of colorectum, It has been demonstrated that selenium deficiency play an important role in the etiology of Keshan disease cardiovascular diseases and cancer[42-43]. It was reported[44] that selenium is a structural component of glutothione peroxide (GSH-px), oxidoreductase, these enzyme act as reducing H_2O_2 and wide variety of organic peroxide.

The important of nigella oil due to a wide variety of active ingredients, which is essential and prominent in assisting enzyme functions and some of them act as biological catalysts and coenzymes.

The present study project the concept of trace element supplementation and preventive role in various disease, due to small change in essential trace elements affects various physiological functions lead to various disease processes thus alarming us against imbalance of these important elements.

Beside these important role of essential trace elements present in nigella seed oil, the main inspiration to us comes from (Hadith) of or Holy Prophet Muhammad Mustafa (Peace be upon him) “Nigella sativa seed is remedy for all diseases except death”. The authors suggested that one teaspoon daily of nigella oil is important supplementation of essential trace elements beside other important active ingredients useful for different purposes.

Conclusion

In general , minerals are essential to life , they are needed by every organism from bacteria and sample plant to man . Element is essential to activated enzymes, hormones and other organic molecules that participate in the growth , function and maintenance of life processes . with out the proper minerals in appropriate amounts, the organic molecules cannot assist the body in carrying out its primary functions . some minerals once regarded as solely “toxic” have now been identified as important in supporting longevity and quality of life. Selenium has been considered a toxic element for decades , but studies in china and united state

have now demonstrated that sufficient dietary selenium markedly reduces the incidences cancer and heart diseases . we now know that selenium plays an important role in activity the protective enzyme glutathione peroxides. However, there are some regions of the world , notably Finland and china , that are low in soil selenium , in Finland , the entire country receives supplemental selenium through mandatory fertilization of all crops with selenate[45] chromium are considered a toxic , but trivalent chromium , is important dietary supplement that is associated with fat metabolism and has been linked to the regulation of blood glucose level and reduce cholesterol and triglyceride which is important in cardiovascular diseases. Manganese is important antioxidant , which play an important role in chemical reactions involving energy production , never –cell metabolism ,muscle contraction and bore growth , while molybdenum is antioxidant which help the body remain healthy by detoxifying sulfides and sulfur compounds.

Some authorities conclude that as many as 60 elements are necessary for optimum longevity and quality of humans . In fact the number of different minerals necessary for complete nutrition is still unknown to science . Until recently only few minerals whose deficiencies caused overt ,gross symptoms were regarded as necessary for good health . Such symptoms include, iron deficiency causing anemia and iodine deficiency causing goiter . Now it has become widely recognized that a large number of minerals are required by the body , and dietary deficiencies in these minerals may not produce overt symptoms bur can still result in poor health or shortened life expectancy .

The main source of essential trace element come from the agriculture crops . As plant grow in the soil year after year , accumulation of the trace minerals from the soil becomes exhausted so the current crops contain little or no trace elements.

In future , agriculture authority have to supplement the soil with a sufficient number and amount of all necessary elements so the food groups become a better source of nutritional minerals .

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