Original Research Article

Study of Some Heavy Metals on Roasted Grains (Nuts) Present in Local Markets of AL-Diwaniyah City, Iraq

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Abstract: This study was conducted to examine some heavy elements in a number of imported and local roasted grains that are available and most consumed in local markets in AL-Diwaniyah Governorate. The heavy metals were (Pb, Mn, Fe, Zn and Cu). The results showed that the highest values were recorded for Fe, where 232 µg/g dry weight were recorded in sample No. 6., while Zn recorded 80 µg/g in sample No. 8. The concentration of Mn and Cu were 90 and 37.44 µg/g dry weight, respectively. The lowest value for Pb was 0.034 µg/g dry weight. From the current results, it is noted that the local, unpackaged samples recorded the highest concentration of heavy metals for all the samples studied.
Keywords: Iron, Lead, Copper, Zinc, Nuts.

INTRODUCTION

Nuts are considered one of the most delicious foods eaten by children and adults. In addition to their distinctive taste, they contain many health benefits. Nuts of all kinds are considered healthy and beneficial foods, because it contains a number of proteins and amounts of fats that can provide the body with the necessary energy. There are 300 types of nuts in the world, the most famous of which are (almonds, pistachios, hazelnuts, cashews, walnuts, chickpeas, peanuts, and sunflower seeds), among others. Nuts generally contain low levels of saturated fat and high levels of monounsaturated and polyunsaturated fats, as well as flavonoids and dietary fiber. They are considered plant proteins and contain high amounts of arginine and minerals such as Mg, Zn, Fe, Ca, Cu, K, Se, folic acid and vitamins [1].

Nuts (pistachios, walnuts, almonds, hazelnuts, pecans, chestnuts and cashews), and members of this group are characterized by their fatty taste and a distinctive flavor specific to the type and variety, in addition to the high percentage of proteins in them, the part of the fruit (nuts) that has nutritional value and for which they can be consumed and it is the seed, The seed in most types of nuts is surrounded by a hard covering known as the shell, The word (Nut) is defined as a dry fruit with one seed, a hard wall that does not split when ripe, and it arises from a single-chambered superior ovary as a result of the fusion of two or more carpels. Nuts contain many nutritional and medical benefits for human health, as they contain many elements such as Ca, Mg, Zn, Fe, PO_4, in addition to a group of vitamins B1, B2, and B6.

In addition to containing proteins, carbohydrates and a percentage of water, and despite containing fats, they are unsaturated fats that help in

reducing cholesterol levels in the blood, it also contains a good percentage of dietary fiber, which plays a role in reducing the risks of heart disease, as it reduces the rate of infection by more than half for people who consume nuts regularly. Adding walnuts or peanuts to food also reduces the rate of harmful cholesterol [3]. Chemical analyses of nuts show that they contain potassium, which is a very important element for muscle activity, especially the heart muscle, as it protects and strengthens it. They also contain phosphorus, which is beneficial for the brain and bones. For example, hazelnuts are an important nutritional element for stimulating the brain's functional work. Walnuts contain a large amount of phosphorus equivalent to the amounts found in liver, eggs and fish. Almonds help reduce the incidence of high blood pressure because they contain magnesium, which helps in expanding blood vessels and also in reducing muscle spasms [4].

Heavy metals are among the most important contaminants of food, and food safety has received global attention. Heavy metals and toxins have been linked to food consumption, Heavy element pollution comes from several sources, including natural sources such as the erosion of the earth's crust, and environmental pollution from various human activities. These have clear repercussions on biological systems and thus affect the entire food production process [5]. Throwing household and industrial waste into rivers and seas or burying it near water sources is one of the most important reasons for the accumulation of heavy elements in the environment. The accumulation of heavy elements in human food occurs during the stages of the formation of this food and even during harvesting, marketing and transportation to the places of its manufacture and storage [6].

The Aim of the Research:
The aim of this study is to detect some heavy elements in some types of local and imported nuts that are widely consumed and widely available in the markets of Diwaniyah Governorate.

MATERIALS AND METHODS
11 types of nuts most commonly found in local markets in the governorate were collected, where 3 replicates of each type were collected. These types included a variety of sunflower seeds from various local and imported companies, as well as types of pistachios, cashews, field pistachios, and pumpkin seeds. These samples included local ones and imported ones from neighboring countries, such as types produced by Iran, Jordan, Turkey, and China. As follows:

No.	Type of Nuts
1.	Al Bustan (Sunflower Seeds)
2.	Al Qasimi (Sunflower Seeds)
3.	Al Hashemi (Sunflower Seeds)
4.	Iraqi Falcon Nuts
5.	Turkish Sunflower Seeds Semki
6.	Jordanian Castania Cherries
7.	Bulgarian Roasted Peanuts ZiGi
8.	Homemade Sunflower Seeds
9.	Iranian Salted Pistachios Loura
10.	Turkish Pumpkin Seeds SGS
11.	Chinese Peanuts
12.	Chinese peanuts

Three replicates of each type were taken and the samples were digested and prepared according to [7].

The samples were examined and the elements (Lead, Manganese, Iron, Zinc and Copper) were detected using a flame atomic spectrometer at the University of Kufa/College of Pharmacy and expressed in µg/g dry weight.

RESULTS AND DISCUSSION
From Figure (1), it is noted that the highest values of the studied elements, which are (lead, manganese, iron, zinc, and copper), were in sunflower seeds, which are samples (1, 2, 3, 5, and 8) mg/kg, and for the lead element, it was (0.13) mg/kg, while the manganese element recorded (90 and 77) mg/kg. Iron was recorded at 232 mg/kg, zinc (79, 78 and 70) mg/kg and copper (37.33 and 36.31) mg/kg. High values are observed for most local sunflower seed samples, indicating an increase in the concentration of the studied elements in this plant. The reason is that the sunflower plant *Helianthus annuus* is one of the plants that has the great ability to absorb many elements from the soil, such as lead, cadmium, and others, and store them in its seeds [8]. It is one of the oily plants that deplete the soil of some elements, especially small elements, including pollutants found in the soil resulting from fertilizers and pesticides in large quantities added to the plant, as well as from the water used to irrigate the plant. The reason may be due to the nature of the plant itself, as it is one of the plants that contains a high percentage of fats in its seeds and has taproots 1-2 m long that spread horizontally and laterally and can grow in calcareous soils with high salinity [9, 10]. The reason may be due to the tools used to roast these seeds, which are usually made of aluminum, copper, and iron, and the way they are displayed in the markets may be exposed. Lead is a toxic element that enters the human body through either the respiratory system by inhaling polluted air, or through the digestive system when swallowing contaminated food or drinks, or by absorption through the skin. The main source of lead pollution is

from manufacturing plants, so it is likely that the main way it enters the human body is through inhaling dust containing lead compounds, and secondarily through absorption through the skin. Lead causes many health problems for humans. It is easily transferred to the blood and thus distributed quickly to all parts of the body. It also has an effect on red blood cells and competes with calcium, so it has an effect on the bones and causes osteoporosis. Among the organs in which this element can accumulate are the liver, the nervous system, and the bones, in addition to its accumulation in the kidneys [11].
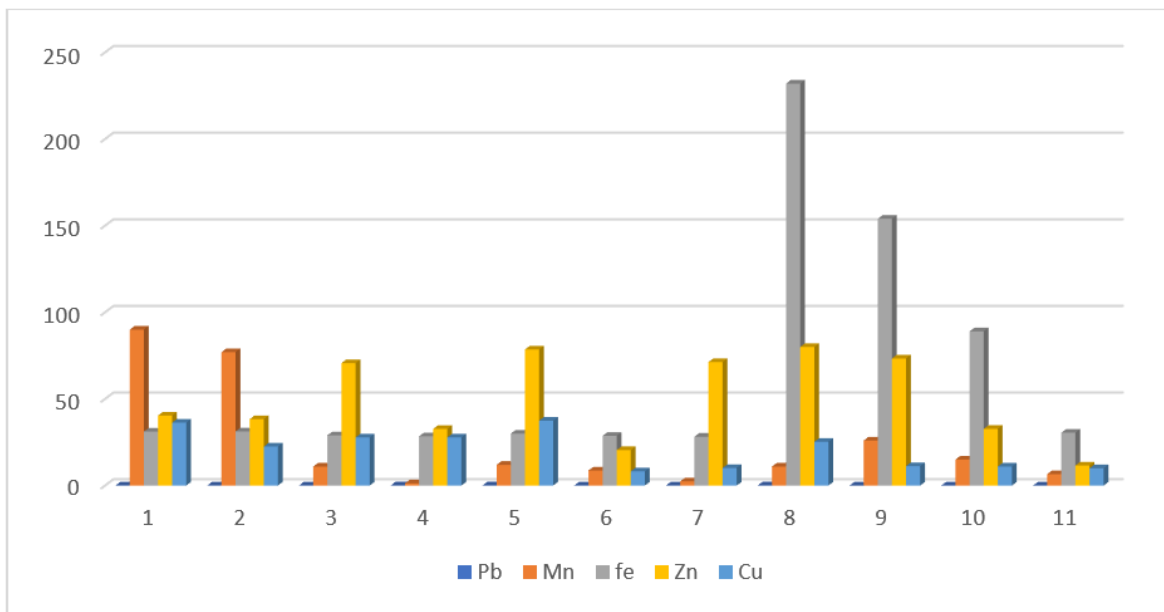

Figure 1: Shows the heavy elements that were studied in the studied research samples

As for Mn, it is noted from the figure above that the highest value was in sample No. 1 and 2, recording 90 and 77 µg/g dry weight, while the lowest concentration was in sample No. 4, recording 1.3 µg/g dry weight. The sample No. 4 of nuts produced by Al-Saqr Al-Iraqi. It is packaged by a company that uses modern machines and clean, closed spaces, which indicates that the type of grains used is low in pollution and the factory follows the correct methods for producing these grains.

Mn is an important element in the human body. It is concentrated in the kidneys, liver, bones and some glands in the body, where it is linked to some essential enzymes that carry out a number of metabolic reactions in the body when present in small quantities. It works to activate enzymes to metabolize proteins and carbohydrates. It helps in the formation of urea and works to break down proteins in the intestines and works to protect the mitochondria in the body in addition to other functions [12]. As for the Fe element, it is noted from the previous figure that the highest value recorded was in samples 8 and 9, where it reached 232 and 154 µg/g, respectively, and the lowest value was in samples No. 6 and 7, where it recorded 28.68 and 28.16 µg/g dry weight, respectively. It is one of the most important trace elements in the human body because of the important functions it performs for the body, despite its limited amount, which reaches 4 grams of the body weight of an adult human. It is involved in the composition of the basic hemoglobin of red blood cells, as well as in the formation of oxidative enzymes found in the muscles necessary to produce energy from glucose and fatty acids. It is involved in the manufacture of collagen and also helps to eliminate the effect of some toxic drugs in the liver [13]. As for the Cu element, its highest value was recorded in sample No. 5, amounting to 37.44 micrograms/g dry weight, and the lowest value was in sample No. 6, amounting to 8.22 µg/g dry weight. The human body contains 100-150 mg of copper, which is an important element that enters into many important enzymes in the body as a cofactor for carrying out important vital processes such as oxidation and reduction. It helps move iron from its stores in the liver to manufacture hemoglobin, and it also manufactures the myelin sheath surrounding the nerve fibers [14]. As for Zn element, it recorded its highest concentration in samples (8, 5, 9), which recorded (80, 78.55, 73.33) µg/g, respectively. The reason for the presence of Zn in a high concentration in the samples is that although it is one of the basic elements that enter into the construction and metabolism of plants, the increase is due to the use of fertilizers and fertilizers containing this element in large quantities [15, 16].

From the figure above, it is noted that the least polluted samples that recorded the lowest concentrations of the studied elements are samples (4, 6, 11). They recorded (0.13, 0.09, 0.048) µg/g for lead, respectively, and the concentrations of Mn were (1.3, 8.7, 6.6) µg/g. As for Fe, it recorded (28.44, 28.6, 30.5) µg/g, while Zn recorded concentrations of (32.7, 20.5, 11.56) µg/g, and copper recorded in these samples (27.8, 8.22, 10) µg/g, and all these values are within the internationally permissible limits [17].

CONCLUSIONS

Nuts contain many heavy elements to varying degrees depending on the origin, manufacturing methods, storage and many other factors. The highest results were recorded in sunflower samples due to the nature of the plant and its storage and manufacturing methods. Most of them are locally manufactured and exposed when displayed. The elements were arranged from highest to lowest concentrations: Fe > Zn > Mn > Cu > Pb.

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