

## Determination of Zinc & Iron Concentrations in Different Types of Dates & Vegetables in Baghdad

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### Abstract:

The **aim** of the present study is to determine the concentration of zinc & iron in dates & vegetables and compare the results with other foods. The present study conclude that the concentration of Fe & Zinc of some selected samples of Iraqi dates and vegetables were higher than all previous works done on Iraqi vegetables, & within the safe limits for Iron (Fe) and Zinc (Zn), respectively set by the WHO/FAO. The present study recommends that pregnant & lactating women should encourage to take dates for at least twice a day. Also, Trace & major elements in vegetables & fruit in Baghdad city should be measured.

**Key word**:zinc| iron| X-Ray fluorescence (XRF), dates, vegetables.|

## تعين تراكيز الزنك و الحديد في التمور و الخضراوات في بغداد

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### الخلاصة:

**الهدف** من هذه الدراسة هو تحديد تركيز الزنك والحديد في التمور و الخضار العراقية ومقارنة النتائج مع غيرها من الأطعمة توصلت هذه الدراسة أن تركيز الحديد والزنك من بعض عينات مختارة من التمور و الخضار العراقية كانت أعلى من جميع الأعمال السابقة التي تمت على الخضراوات العراقية، وضمن الحدود الآمنة. ألتوصيات: توصي هذه الدراسة أن بتشجيع النساء الحوامل والمرضعات على تناول التمور يوميا و على الأقل مرتين في اليوم. و كذلك يجب أن تدرس و تقاس العناصر الرئيسية في الخضار والفاكهة في مدينة بغداد و المدن العراقية الأخرى.

الكلمات المفتاحية: |الحديد| الزنك| الاشعة السينية المتفلورة| التمور و الخضار

**Introduction:**

Clinical deficiency of zinc in humans was first described in 1961, when the consumption of diets with low zinc bioavailability due to high phytic acid content associated with "adolescent nutritional dwarfism" in the Middle East <sup>(1)</sup>. Since then, zinc insufficiency has been recognized by a number of experts as an important public health issue, especially in developing countries <sup>(2)</sup>.

Zn is the least toxic and an essential element in human diet as it is required to maintain the functioning of the immune system. Zn deficiency in the diet may be highly detrimental to human health than too much Zn in the diet <sup>(3, 4, 5)</sup>. Although it called a "trace mineral" because the body need only a small amounts of it, nevertheless it presents in all body cells and essential for healthy skin and maintenance of mucosal membranes. Adequate level of zinc is necessary for proper wound healing <sup>(1)</sup>.

It plays an important role in growth and development, the immune response, neurological function, and reproduction. Its function on the cellular level can be divided into three categories: catalytic, structural, and

regulatory <sup>(3)</sup>. Even mild to moderate zinc deficiency can depress the immune system through impaired macrophage and neutrophil functions <sup>(4)</sup>.

It also helps the cells in humans body communicate by functioning as a neurotransmitter. A deficiency in zinc can lead to stunted growth, diarrhea, impotence, hair loss, eye and skin lesions, impaired appetite, and depressed immunity. Zinc is also essential for creation and activation of T-lymphocytes <sup>(3,4,5)</sup>. Furthermore, low levels of zinc have been associated with increased susceptibility to pneumonia and other infections in children and the elderly <sup>(6-7)</sup>.

Iron deficiency is the most prevalent micronutrient deficiency in the world and 3 billion people worldwide are affected [5]. Iron deficiency exists in all countries, but the prevalence is highest in South East Asia (57%) and Africa (46%) <sup>(8)</sup>.

This study aims to determine the concentration of zinc and iron and compared with results of other foods, with a special focus for zinc concentration and its effect on human cells.

**Materials & method:****Collection of samples:**

A total of 103 samples of various types of Iraqi dates (Six types of dates, 10 samples for each type), and seven types of vegetables (six samples for each type of vegetables) were obtained from a many parts in Baghdad Governorate - Iraq.

**Preparation of samples:**

Date samples were cleaned by double distilled water. These samples were dried by freeze dried and ground to powder by using well cleaned agate mortar.

**Sample preparation:**

About 250 mg of prepared samples were pressed as a pellet of 22 mm diameter to be excited by radioisotope sources. Data were expressed as mean  $\pm$  standard deviation.

**Data analysis:**

The analysis of major and trace elements in geological materials by x-ray fluorescence is made possible by the behavior of atoms when they interact with radiation. When materials are excited with high-energy, short wavelength radiation (e.g., X-rays), they can become ionized. If the energy of the radiation is sufficient to dislodge a tightly-held inner electron, the atom becomes unstable and an outer

electron replaces the missing inner electron. When this happens, energy is released due to the decreased binding energy of the inner electron orbital compared with an outer one. The emitted radiation is of lower energy than the primary incident X-rays and is termed fluorescent radiation. Because the energy of the emitted photon is characteristic of a transition between specific electron orbitals in a particular element, the resulting fluorescent X-rays can be used to detect the abundances of elements that are present in the sample <sup>(9)</sup>.

X-Ray fluorescence is particularly well-suited for investigations that involve: -bulk chemical analyses of major elements (Si, Ti, Al, Fe, Mn, Mg, Ca, Na, K, P) in rock and sediment. -bulk chemical analyses of trace elements (>1 ppm); (Ba, Ce, Co, Cr, Cu, Ga, La, Nb, Ni, Rb, Sc, Sr, Rh, U, V, Y, Zr, Zn) in rock and sediment.

Data obtained were analyzed using Microsoft Excel and results were expressed as mean  $\pm$  standard deviation. These samples were analyzed for trace metals Fe & Zn, by using XRF technique.

All data of each type of dates and vegetables were presented as a mean and standard deviation. Statistical analysis: Data were statistically analysed by using

unpaired student T- test with critical probability of  $p \leq 0.05$ .

### Results and Discussion:

The need for food composition in Iraqi foods like other works done elsewhere <sup>(10)</sup>.

The mean and standard deviation of Zinc & Iron concentrations in dates were the presented in table 1 separately for each mineral. Table 1 show the mean concentrations of zinc & Iron measured in dates (Braum, khidrawi, Tebarzel, Khistawi, Zehdi&Usta-umran). The elements levels determined were based on dry weight of the dates fruit.

The mean concentrations of zinc & Iron measured in dates (Braum, khidrawi, Tebarzel, Khistawi, Zehdi&Usta-umran). The elements levels determined were based on dry weight of the dates fruit. The lowest zinc content (Zn) ( $2.76 \pm 0.21$  ppm) was found in Zehdi and the highest concentration ( $15.6 \pm 1.7$ ) was found in Khidrawi. While Braum sample had the second high levels of zinc after khidrawi ( $9.7 \pm 0.6$  ppm). The highest concentrations of Iron was found in Tebarzel ( $89.12 \pm 5.2$  ppm), followed by Khidrawi ( $86.08 \pm 4.8$  ppm). However, the lowest iron

concentration was found in Usta-umran ( $30.4 \pm 0.8$  ppm).

The measured concentrations of Fe & Zn in the dates were compared with the recommended limit as established by the FAO/WHO in 2001 to assess the levels of food contamination.

The amount of Iron (Fe), found in the dates samples were presented in table 1. The highest concentrations of Iron was found in Tebarzel ( $89.12 \pm 5.2$  ppm), followed by Khidrawi ( $86.08 \pm 4.8$  ppm). However, the lowest iron concentration was found in Usta-umran ( $30.4 \pm 0.8$  ppm).

In the present study, Table 2 show the concentration of zinc & Iron in measured vegetables arranged from thr highest concentration to the lowest content. The highest concentration of zinc was found in Celery ( $36.4 \pm 4.7$  ppm), and the lowest concentration was found in turnip, ( $16.8 \pm 8.5$ ). Moreover, the highest concentration of Iron was found in Celery ( $534.5 \pm 39.6$  ppm), and the lowest concentration Fe was found in cabbage, ( $121.9 \pm 24.5$  ppm).

Isam M. Jawad's study (2010) measured the Level of certain metals in selected vegetables Crops collected from Baghdad city. Zinc Level were quite low in all the sample of vegetables examined <sup>(11)</sup>, even more lower than the results reported in the study of Parveen *et al.*, 2003<sup>(12)</sup>.

Jawad's study found that the concentration of zinc & Iron in different vegetables in Baghdad were low in all samples of vegetables.

In the present study, after the celery, Okra contains a high concentration of zinc ( $31.3 \pm 1.64$ ), & iron ( $159.18 \pm 67.9$ ). A wide variation between the types of vegetables and the level of iron were observed. Green pepper contained the higher level of iron compared with okra and cucumber which contained the lowest levels <sup>(11)</sup> and other <sup>(12)</sup>.

No previous study done on Iraqi dates to compare with. The present study found that the content of iron & zinc in dates were higher than all vegetables measured by Isam M. Jawad, <sup>(11)</sup>.

Zana Mohammed Abdulazeeza, and Jeza M. Abdul Aziz, 2014, made another study of heavy metals in some Green Leafy Vegetables in Sulaimania, Kurdistan-Iraq, <sup>(13)</sup>. Zinc & Iron were measured in green leafy vegetables sampled from the Village of in Sulaimania city. The results showed, the highest concentration of Fe was found in leek, curly cress and celery, while the lowest concentration was detected in mint and celery. The levels of Fe & zinc in vegetables of Sulaimani city show a low concentration of Zinc & iron as compare with the concentration of Iraqi dates found

in the present study. Their results were below the rate of heavy metals which are recorded in WHO/FAO and there is no potential hazard on the consumer's health, <sup>(14-15)</sup>.

The higher concentration of Zn in Curly cress  $2.608\text{mg/kg}$  from and lowest concentration was detected in celery ( $0.69\text{mg/kg}$  from. Generally, Fe and Zn content of these leafy vegetable are lower than the FAO/WHO (2001), safe limit of 67 and  $99.40\text{ mg/kg}$  <sup>(15)</sup>.

As a whole, the content of zinc & iron in the dates was found higher than other vegetables, however it is lower than that of sea food <sup>(8, 9, 16)</sup>. In the clinical practice, Supplemental of elemental iron (38-65 mg/day) but not dietary levels of iron may decrease zinc absorption.

Iron, and zinc contents of 15 commonly consumed Bangladeshi vegetables were analysed. It was found less than the recommended values. The present results of zinc and Iron contents were higher than the result of vegetables content in Bangladeshi vegetables, <sup>(17)</sup>.

Previous study stated that the iron intake in all measured vegetables was adequate according to recommended values <sup>(15)</sup>, but due to iron contamination and reduced bioavailability, Iron supply may not be met in a vegetable based diet. More

studies are needed to investigate possible sources of contamination of Iron, <sup>(18, 19)</sup>.

The most vulnerable groups are pregnant women, children and adolescents due to the increased iron needs during pregnancy and also during rapid growth in children and adolescents <sup>(20)</sup>.

The iron content in the selected foods was high and variable, and higher than in similar ingredients from Kenya and Mali, while the zinc concentrations were generally in accordance with reported values, <sup>(21)</sup>.

In a Tanzanian study of iron availability, it was also observed that the iron content of cereals and vegetables was higher than values in the African Food Composition,

<sup>(22)</sup>. More studies are needed to investigate possible sources of iron content, but the bioavailability of Iron for human intestinal absorption is still of debate.

### **Conclusion:**

This study cleared that the highest concentration of zinc was found in Khidrawi, the second level was for Braim date sample, while the lowest content was found in Zehdi.

The results obtained in the present work of the concentration of Fe & Zn of some Iraqi dates & vegetables were higher than results found in other vegetables, and within the safe limits of 425, and 99.40 mg/kg for Iron (Fe) and Zinc (Zn), respectively set by the WHO/FAO <sup>(15)</sup>.

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**Table 1:** The mean & standard deviation of Zinc & Iron in different types of Iraqi dates in (ppm)

Type of dates	Zinc (ppm)	Iron (ppm)
Khidrawi	15.6 ± 1.7	86.08 ± 4.8
Braim	9.7 ± 0.6	43.03 ± 1.4
Usta-umran	7.45 ± 0.8	30.4 ± 0.8
Khistawi	5.12 ± 0.5	50.66 ± 2.3
Tebarzel	2.95 ± 0.21	89.12 ± 5.2
Zehdi	2.76 ± 0.21	34.95 ± 0.91

**Table 2** The mean & standard deviation of Zinc & Iron concentration in Iraqi vegetables, (ppm).

Vegetables	Zinc (ppm)	Iron (ppm)
Celery	36.4 ± 4.7	534.5 ± 39.6
Okra	31.4 ± 1.6	159.18 ± 67.9
Beet	22.9 ± 12.1	221.4 ± 31.1
Carrot	18.3 ± 1.9	163.8 ± 45.9
Turnip	16.9 ± 8.4	148.1 ± 5.7
Onion	16.8 ± 16.2	129.2 ± 13.9
Cabbage	16.7 ± 7.3	121.9 ± 24.5