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Accumulation some essential heavy metals in Allium and Scallion plants cultivated in Markazi province/Iran

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Abstract

Allium ampeloprasum and Allium wakegi is a members of the onion genus Allium that commonly used in human diet. Absorbing heavy metal from soil by root bulb can accumulate these metal in green leafy vegetables. Cr, Fe and Zn are essential components for biological activities that can enter to human body by using vegetables in diet.

The aim of this research was determining essential heavy metal (Zn,Fe,Cr) in two genus of Allium family that most commonly used in Iranian dishes and comparing between them.

Material & Method

Green leafy vegetables gathered from agricultural sites of Markazi province. After washing leaves, they keep in container and transfer to laboratory.samples dried in oven 60º and digested by acids, then by using Coupled Plasma Optical Emission Spectrometry the amount of heavy metals were measured. Results analyzed by SPSS22.

Results and discussion

The maximum amount of Iron and Zink were seen in Allium ampeloprasum in order 8451.74±24287.2 and 1087.63±619.27. There was significance differences in term of the accumulation Iron in these plant but has no significant differences in Zn and Cr, although in Zink accumulation was minor difference in Allium species. The concentration of this three metals in Allium family are lower than permission limit WHO/FAO.

In conclusion Allium ampeloprasum can accumulate high concentration of essential heavy metal that make an important vegetable in diet

Key word: Allium species, heavy metal, vegetables, human diet

Introduction

Allium species are grown word wide and they have over 600 members which differ in maturing, color and taste; however, they are similar in biochemical content(1)**.** They are used as condiment, salad, raw vegetables with and in food and also have medicinal values. Scallion, spring onion or Allium Wakegi and wild leek , Allium or Allium ampeloprasum are generally open pollinated crops and have been cultivated for long time, number of landraces and natural hybrids(2).

Many member of this genus are popular with gardeners as an herbaceous perennial or annual plant, the smell of this family are off-putting that many animals don't eat them.

The smell is due to the presence of sulfur containing compounds, which is characteristic of this genus (3-5).

Scallion has been a popular remedy in Asian folk medicine for thousands of years, having been first described about 2,000 years ago in the Chinese herbal classic *Shen Nong Ben Cao Jing*. The plant, which flourishes in warm climates, is native to Asia but has been found growing in many parts of the world (6, 7).

Allium families are monocotyledon plants. It has a characteristic taste and morphological features, making it to be considered as one of the popular herbal medicine because of pharmacological activities of the plant such as antidiabetic, hypolipidaemic, and antimicrobial, free radical scavenging and anti-inflammatory role (3, 8).

By having bulb in root system they can absorb many heavy metals from soil and transfer to green leafy vegetables that it makes them as an important nutritional value for consumer (9,10).

In this research we measured three essential heavy metal: Iron, Zink and Chromium as an essential heavy metal for plant and human being in Allium species.

Material& Method

Markazi province in Iran has a lot of agriculture sites that cultured green leafy vegetables. A kind of more important vegetables in Iranian dishes is Allium species. Allium plant gathered by using plastic gloves and were placed in container to carry to laboratory. In laboratory vegetables washed carefully then dried in oven (60 ˚) for 24-48 hrs. Dried vegetables powdered and with acid digested. The samples injected to coupled plasma spectrometry, Cr, Zn and Fe concentration measured (ppb). Data analyzed by SPSS version 22, tables and charts drawing by using Excel.

Results and Discussion

Table 1 indicates the mean concentration of Cr, Zn and Fe in two leafy vegetables from six agricultural sites. According to table 1 the high average concentration of Fe and Zn was seen in Allium ampeloprasum, 8451.74±24287.2 and 1087.63±619.27 and 671.902, 662.925 for Fe and Zn in Allium Wakegi.

vegetable/ metals	Cr	Fe	Zn
Allium Wakegi	2.498	671.9	662.92
Allium ampeloprasum	2.499	8451.745	1087.63
WHO**	2.3	20-150	<5

**Who permission limit is based on mg/kg

Table 1: metal concentration in Allium family (ppb)

The results show significant differences ($p<0.05$) in Fe concentration in this two types of Allium family that seen in chart 1.

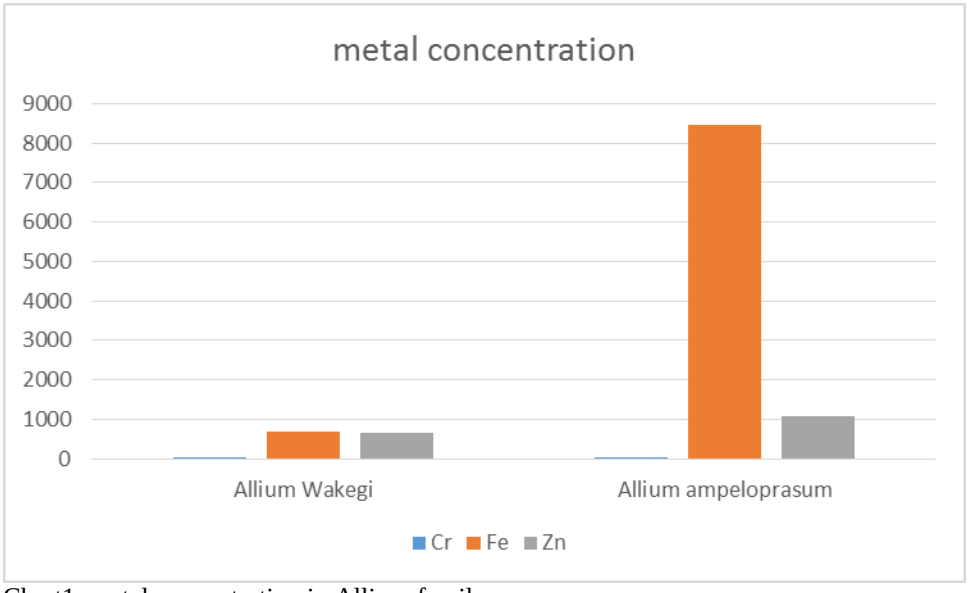

Chart1: metal concentration in Allium family

Although Cr, Fe and Zn is an essential element for various biological activities within the human body such as stabilize the blood glucose level, make homeostasis in lipid, participate in structure of blood hemoglobin and immunological system but at high level can make adverse effect there for it must measure metal concentration in food and nutrition diet.

The level of Cr in Allium species was low, and didn't have meaningful differences in these two vegetables and this is lower than permission limit of who/FAO (2.3 mg/kg) (11,16).

The guideline value in vegetables for Zn is <5, for Fe is 20 to 150.0 mg/kg that Zn and Fe concentration in Allium is lower than permission limit and was seen no significant differences in Zn concentration in Allium family(11,12).

The results of this investigation is in agreement with the results of Hassan.Mostapha (2014) about Fe in spinach (3.96 mg/kg) planted in Nigeria (12). My results is lower than the results of Guerra on Sao Paulo (2012) that report the range of 0.225±0.048 (13).Abdulazeeza (2014) has reported that the concentration (mg/kg) of heavy metal in some green leafy vegetables obtained from Sulamani/Iraq was in the range of 6.118 to 339.646 for Fe, 0.041 to 0.247 for Cr and 0.690 to 2.016 for Zn (14), that these values about Fe and Zn is near to this study values.

Shuaibu (2013) shows that the level of Zn (0.268) and Fe (0.260) in green leafy vegetables purchased from Katsina was below the WHO/FAO limits (15), The mean values obtained in that present experiment is lower than the values obtained in Allium ampeloprasum and is near to the concentration of Zn and Fe in Allium wakegi.

According to this finding Fe and Zn as an essential heavy metal can accumulated in Allium family especially in Allium ampeloprasum that it is an important vegetables in nutrition diet and do not cause health hazard for consumer.

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