

Detection of Some Heavy Metals in Two Most Consumed Vegetables (*Spinacia oleracea* L. and *Raphanus sativus* L.) from Different Sari Market Places

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Abstract: Analysis of three heavy metals performed (Lead, Cadmium, and Chromium) in two vegetables, Spinach (*Spinacia oleracea* L.) and Radish (*Raphanus sativus* L.), taken from four market stations in Sari city. 100 gr samples from each plant selected, washed, dried, and then prepared with dry ashing method for atomic absorption spectrometry in order to measurement of lead, Cadmium, and Chromium. The results based on ANOVA test showed a meaningful relation between the amounts of lead in stations ($P < 0.05$). With Comparison between means shows that in Goharbaran Region station, lead had the highest amount with average 4.31 ppm in Spinacia and 2.43 ppm in Raphanus ($p < 0.05$). The results about another metals showed the concentration under standard. Although the results for Cadmium and chromium showed very small amounts but there is a great potential for hazardous substance in the region. There is a need for a serious analysis about this subject in the region.

Key words: Heavy metals • Lead • Cadmium • Chromium • vegetables • Spinach • Radish • Iran

INTRODUCTION

The main effect of industrialization is the most consumption of different chemical and toxic substances especially in agricultural sectors that leading to dangerous and life threatening poisoning [1-2]. It is proved that Heavy metals such as lead, cadmium, and chromium can inter to food chain or environment and have hazardous consequences. In recent years, many discussions have been performed about acute or chronic poisonous effects of food or water pollution by metals. These metals will result in various complications, such as carcinogenicity, and mutagenicity for living creatures and finally for human being as the point of food-cycle pyramid [1-9].

As the pollution of air, soil and water by industrial substances such as heavy metals can spread to agricultural farm and eventually to food chain and then lead to great economical Damage, Hence, in this study we designed an Analysis of three heavy metals performed (Lead, Cadmium, and Chromium) in two vegetables, Spinach (*Spinacia oleracea*) and Radish (*Raphanus sativus*) from main market stations in Sari city of Mazandaran Province of Iran.

MATERIALS AND METHODS

The vegetable samples Spinach (*Spinacia oleracea* L.) and Radish (*Raphanus sativus* L.) taken from four main market (Goharbaran Region, Kiyasar Region, Khazar Abad region, and Jouybar road) of vegetables during 20 August to 20 September 2010. The samples selected in all stations randomly for each vegetable. each weighting 200 grams. Totally, 60 samples from the 10 stations were gathered. At First, 100 gr of each samples were chosen, washed analyzed according to Dry ashing method of the AOAC book [3]. All materials were provided from the Merck Company and were washed in Nitric acid for 24 h. Flameless atomic absorption spectrophotometry is a very ideal, sensitive and easy method performed the measurement of the mentioned metal.

RESULTS

The averages mean numbers of both vegetables shown in Tables 1 & 2. The highest amounts of lead in Spinacia and Raphanus were found in Goharbaran Region, 4.31 ppm in Spinacia and 2.43 ppm in Raphanus, respectively. The maximum amount of

Table 1: The average mean lead, cadmium, and chromium in Spinacia samples (ppm)

Regions	Mean of Lead		Mean of Cadmium		Mean of Chromium	
	(ppm)	SEM	(ppm)	SEM	(ppm)	SEM
Goharbaran Region	4.31*	1.45	0.22	0.00	0.77	0.00
Kiyasar Region	1.22	0.33	0.17	0.00	0.56	0.00
Khazar Abad region	1.44	0.40	0.16	0.00	0.62	0.00
Jouybar road	0.83	0.12	0.37	0.00	0.14	0.00

* Significant at $p < 0.05$.

Table 2: The average mean lead, cadmium, and chromium in Raphanus samples (ppm)

Regions	Mean of Lead		Mean of Cadmium		Mean of Chromium	
	(ppm)	SEM	(ppm)	SEM	(ppm)	SEM
Goharbaran Region	2.43*	0.77	0.23	0.11	0.79	0.00
Kiyasar Region	1.12	0.56	0.43	0.31	0.56	0.00
Khazar Abad region	0.65	0.62	0.27	0.22	0.62	0.00
Jouybar road	0.98	0.98	0.41	0.20	0.55	0.00

*Significant at $p < 0.05$.

cadmium was found in the Jouybar road (0.37 ppm) and Kiyasar Region (0.43 ppm). Chromium had its largest amount in the Goharbaran region for both vegetables, Spinacia (0.77 ppm) and Raphanus (0.79 ppm). Variance analysis of different regions showed that there was significance difference between four stations about lead concentrations for both vegetables ($p < 0.05$). At The similarity in the amount of lead between about Cadmium and Chromium there was No significant difference was found stations.

DISCUSSION

With comparison of results of this study with standard measures (2 ppm for lead & cadmium, and 0.25 ppm for chromium), we found that there is no need to be concerned about the amount of cadmium, and chromium in both vegetables, but about the lead concentration there is still concern (Higher than standard). Based on our results the monitoring of lead amount in the soil is important due to its direct transmission of lead, and also due to forming water-soluble forms of lead by streams of water or rain. Furthermore, the effect of lead in the water or air is directly transmitted [4-6]. If, the polluted areas (Goharbaran parts), have maximum soil lead, it is proposed the gradient of the lead is geographically toward these area and to the Caspian sea, Means that the surface water streams toward the polluted parts and gives water to the vegetables fields and this could be one of the reasons for this pollution [5-9]. Another reason is the consumption of surface water, which is a main source of lead pollution and flows toward the rivers and then being consumed to give water to the farms.

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