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Qualitative Analysis and Study of Pb, Cd, Cr and Zn in Cultivated Shrub and Non-Shrub Cucumber (*Cucumis sativus* L.) of Sari, Iran

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The analysis of the metal ion were performed on the cultivated cucumber in Mazandaran province. The samples were taken from 10 regions and 5 sample from each plant. The samples were washed, dried and then with dry by aching method. The results from this research based on statistical analysis ANOVA evaluation, which showed a meaningful relation between the amount of lead and regions ($p < 0.05$) and also compared between these mean numbers shows that in Eastern station lead has the highest amount with average 5.152 ppm non-shrub and 6.281 ppm in syrup. Regarding other metals, the results are below standard with the respect to the obtained results.

Key Words: Heavy metals, Shrub, Non-shrub cucumber.

INTRODUCTION

One of the side effects of industrialization is the deliberate or accidental consumption of different chemical substances, leading to dangerous and life threatening poisoning[1-3]. Heavy metals such as lead, cadmium, chromium and zinc, are of those substances and their presence in the food or environment is considered to be hazardous by many investigators[4,5]. Recently, several studies have been performed about acute or chronic poisonous effects of food or water pollution by metals[3,6]. These metals result in various complications, such as carcinogenicity, teratogenicity and mutagencity for living creatures and finally for human being as the point of food-cycle pyramid[4,5,7].

The pollution of air, soil and water by industrial substances such as heavy metals spreads to agricultural farm, resulting in great economical damage[1,2,5,6]. Hence, a study to determine the amount of metals in vegetables in Sari is performed.

EXPERIMENTAL

This study investigated the amount of lead, cadmium, chromium and zinc in two kinds of cucumber shrub and non-shrub cucumber (*Cucumis sativus* L.) agriculture in the northern, eastern, western and southern Sari. Two research stations were randomly selected for each of the first 3 parts and 4 stations.

Initially the sample was washed with sufficient distilled water then it was dried out in an oven (Reimicro, Tehran, Iran) at 70 ºC. It was kept to dry overnight till dried. The dried sample was dissolved in nitric acid based on 1:1 ratio. The sample

was heated for 2 h in a distilled equipped with a condenser for total reflux. The distilled sample was filtered then distilled was added to reach 25 mL volume the prepared sample was analyzed in Atomic Absorption Model GBC-GF 3000 Australia the data were analyzed.

From each research station (agriculture farm), 3 sample of both of the mentioned cucumber were collected weighing 200 g each. Totally, 60 samples from the 10 stations were collected. The samples were washed and then 100 g of each sample was analyzed according to dry aching method of the AOAC method.

All materials were procured from the Merck company and were washed in nitric acid for 24 h. Flameless atomic absorption spectrophotometery is sensitive and easy method performed for the measurement of these metals. Data were analyzed using the one-tailed variance test[3,8,9]. All chemical used in this research was produced by Merck, Germany.

RESULTS AND DISCUSSION

The average mean amounts of the 4 months were assessed in both vegetables (Tables 1 and 2).

TABLE-1
AVERAGE MEAN LEAD, CADMIUM, CHROMIUM AND ZINC WERE ASSESSED IN THE SHRUB CUCUMBER (ppm)

Region	Station	Mean Pb	Sem	Mean Cd	Sem	Mean Cr	Sem	Mean Zn	Sem
North	I	4.218	1.898	0.205	0.073	0.000	0.000	1.840	0.922
	II	4.152	0.158	0.182	0.020	0.018	0.002	3.747	0.089
East	I	1.896	0.419	0.161	0.047	0.000	0.000	2.563	1.286
	II	1.202	0.283	0.199	0.021	0.102	0.050	3.704	0.169
West	I	1.312	0.416	0.203	0.029	0.000	0.000	2.712	1.362
	II	0.656	0.032	0.113	0.021	0.000	0.000	2.391	1.195
South	I	1.021	0.429	0.129	0.062	0.149	0.014	1.800	0.180
	II	0.647	0.118	0.127	0.076	0.000	0.000	1.557	0.155
	III	0.937	0.457	0.179	0.054	0.142	0.087	2.547	1.487
	IV	1.648	0.368	0.261	0.039	0.000	0.000	4.165	0.077

The maximum amounts of lead in shrub and non-shrub were found in the first station of the northern (4.21 ppm) and eastern regions (5.15 ppm), respectively. The maximum amount of cadmium was found in the 4th station of the southern part for shrub (0.26 ppm) and non-shrub (0.17 ppm). Chromium had its largest amount in the first station of the southern region for shrub (0.14 ppm) and in the western region for non-shrub (0.032 ppm). The maximum amount of zinc was found in the forth station of the southern part for shrub (4.16 ppm) and in the third station part for non-shrub (2.75 ppm). Variance analysis of different regions showed the following results:

TABLE-2
AVERAGE MEAN LEAD, CADMIUM, CHROMIUM AND ZINC WERE ASSESSED IN THE NON-SHURB CUCUMBER (ppm)

Region	Station	Mean Pb	Sem	Mean Cd	Sem	Mean Cr	Sem	Mean Zn	Sem
North	I	2.708	1.968	0.106	0.033	0.000	0.000	1.271	0.367
	II	4.057	0.909	0.110	0.014	0.000	0.000	1.310	0.047
East	I	5.152	0.847	0.103	0.010	0.000	0.000	1.205	0.168
	II	2.937	1.699	0.142	0.001	0.000	0.000	1.749	0.064
West	I	0.860	0.057	0.084	0.017	0.032	0.032	1.694	0.061
	II	0.587	0.157	0.072	0.029	0.000	0.000	0.852	0.473
South	I	1.100	0.221	0.089	0.009	0.000	0.000	1.553	0.007
	II	0.531	0.234	0.038	0.014	0.000	0.000	0.037	0.037
	III	1.302	0.499	0.107	0.220	0.000	0.000	2.759	0.899
	IV	1.635	0.017	0.172	0.004	0.000	0.000	1.865	0.119

The similarity in the amount of lead between geographic parts was failed (a = 0.05) and significant difference was found between the 4 regional parts (a = 0.05). No significant difference was found between the amounts of cadmium, chromium and zinc between 4 geographic parts (a = 0.05).

The result of this study when compared with the standard measures (2 ppm for lead and cadmium, 0.25 ppm for chromium and 10 ppm for zinc) shows that there is no need to be concerned about the amount of cadmium, chromium and zinc in two kinds of cucumber, but the amount of lead should be considered because its mean amount was greater than the standard one. Therefore, the amount of lead 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[1,2]. When the evaluation the amount of lead, having its maximum amounts in northern and eastern parts, it is found that the gradient of the lead is geographically toward these areas and to the Caspian sea, so that the surface water streams toward the mentioned parts and gives water to the vegetables grown there and this could be one of the reasons for this pollution[8,9].

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