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Evaluation of Heavy Metal Content in Capsicum Annuum In Obiliq, Kosovo

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ABSTRACT:*The population of Obliq in Kosovo produces and consumes horticultural products as part of their daily diet. As such, the objective of our study was to evaluate the heavy metal content of As, Cr, Ni, Pb and Zn in fruit consumption (Capsicum annuum), because the plants are serve as the absorption system of these metals. Small amounts of these metals accumulated in plants through roots or leaves from the environment (land, air, water) can be perceived as very dangerous. Heavy metal content was analyzed in Agrovet Laboratory, Kosovo and in the Center of Technology Transfer in Fushë- Krujë with atomic absorption. Results obtained are compared with the maximum permissible limits as issued by CE, 2006. The findings through this study have established the values of the elements of As, Cr, Ni within the EC norms for fresh vegetable consumption in all cases analyzed in both areas and cultivars. The opposite has resulted in the elements of Pb and Zn which have resulted in values a few dozen times higher than the CE permissible norms in both the cultivation areas and the cultivars: Kërtoska and Sambroska. The highest value of Pb was found in Plementine (Obiliq) with values ranging from 0.31-0.66 mg / kg of body weight. The same trend was established for the values of Zn, which were much higher in the area of Plementina (Obiliq), an area typical of industrial activity with a maximum value of 88.28 mg / kg of wet weight. The results have established high values of Zn even in Mogila with a maximum value of 57.47 mg / kg of wet weight which is unquestionably much higher than the CE norms. In the paper there follows an exhaustive analysis of anthropogenic, agro-ecological and physiological factors on the behavior of heavy elements in this culture.*

Keywords: *Heavy metals, capture systems, Capsicum Annum, bioaccumulation,Obiliq.*

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I. INTRODUCTION

Heavy metals have been on the rise over the past 100 years in a number of ways for multiple uses. Metals are found naturally in the soil, but in recent years an increase has been observed as a result of anthropogenic activity by industrial, agricultural activities as well as the uncontrolled discharge of different types of waste [2].Heavy metals in plants as well as in all living organisms are essential because they act as structural components or as catalysts for the biochemical processes of organisms, but their increase has been brought about by human activities on earth and in water which produces excessive amounts due to the accumulation ofCd, Hg, Ni and Pb, thus affecting plant relations with other organisms, which in terms carries along toxicity over to the ecosystems [8].Most of these metals are not biodegradable and can therefore get accumulates in the human body's vital organs, producing progressive toxic effects, [4].The bulk of these heavy metals enter the food chain mainly through cultures which absorb the irrigation water which is polluted [10], [4].Plants have developed specific mechanisms for absorption, translocation and accumulation of such substances [6]; but some non-essential metals and metalloids for the plants are absorbed, translocated and accumulated in plants as a result of a similarity in the electrochemical behaviour to the necessary nutrient element. The phytotoxicity of heavy metals is particularly manifested in acid soils which affects the development and formation of lateral and secondary roots [9].The most exposed plants are those that possess a large surface leaf and short length, as is the case with vegetables, which do not even grow a meter in length, a fact that makes them more sensitive to absorption of elements that come from the earth. Many of the vegetables produced are intended for human consumption, in fresh or canned ways, and if we do not gauge the real levels of these pollutants, especially heavy metals, their use and consumption will pose a great danger to their health. The objective of our study was to determine the concentrations of heavy metals As, Cu, Cr, Ni, Pb and Zn in Specie (*Capsicum Annum*) fruits which are irrigated through wells in and around the area.

II. MATERIALS AND METHODS

The vegetative material that has served the purposes of the study was collected in the experiment which was set up in the Municipality of Obiliq, in two separate areas of Plementine and Mogila and in two cultivars of Kërtoska and Sambroska respectively (Fig. 1), in an area of 125 m2 for each cultivar, (total of 250 m2) divided into four sub-parcels.In both areas, Plemetine (1 plot in four subplots, Fig. 1) and Mogille 1 plot (4 subplots, Fig. 1) there followed an analysis of heavy metals where each subplot contributed an amount of 10 kg, which were selected as representative samples for analysis with a total of 35-40 fruits for the two cultivars of Kerkoska and Sambroska. After the fruit is harvested it is subsequently ground and the calculation of weight of 0.5 gr for each sample is worked out. It has been poured into utensils with 6ml of 65% nitric acid and 1ml of hydrogen peroxide 30%. After this process the samples were placed in a microwave at temperatures of 145 ° C, 170 ° C, 190 ° C, 100 ° C, and a pressure of 30 ° C; 30; 30; 0; 0 barr as well as in different lengths of time starting at of 5, 10, 15, 10, 10 minutes, respectively. After being subjected to cooling at room temperature the filtration was carried out at normal temperature and the container was filled up to its upper-limit volume. Reading is done via ICP, based on the EPA 6010 C / 2007 method. The metal content is determined through the Atomic Absorber Esctophotometry. The statistical method used for the statistical data analysis was the SPSS version 23.0 method. The experiment was conducted during 2013.

Figure 1: View of the experiment in Obiliq, Kosovo

III. RESULTS

The heavy metal content in tissue and in fruit is closely tied up with the physiological timelines of collecting samples, because the plants have different metabolic pathways [7].In this study, as well as in other similar studies, there were no observations of food deficiencies or visible (seen through the eye) toxicities. The results of the study are presented in Tables 1 and 2. The standard permissible limits are set down by the law 1881 of CE (2006). The results established in the study have indicated a content of the elements As, Cr and Ni in pepper fruit which is in line with the limits set by CE standards. Both in the area of Plementine (Obiliq) which is potentially considered as being contaminated due to industrial activity and in the unpolluted area of Mogila (Viti municipality), little differences have been observed in the fruit content of Capsicum annum. The opposite has happened to two other elements being studied Pb and Zn.

The Pb element has yielded content higher than the limit of 88.5% of the analyzed samples, except for the third sample of the Sambroska cultivar where it has resulted in a minimum value of 0.27 mg / kg body weight.

The highest content of Pb was found in the Kertoska cultivar in repetition tests 1, 3 and 4 with a maximum value of KM_1 of 0.56 mg / kg weight in the Plementina area. The trend of Pb content not falling within the permissible limits has also resulted with another Sambroska cultivar in 75% of the results, save that the values found are a lot lower than the other cultivar and in one case SM_2 has resulted the same as the CE limits of 0.3 mg / kg of wet weight.

Table 1. The content of heavy metals in samples of pepper fruits (mg/kg weight) in Plementina, Obiliq. Normal values of Ni for plants in general, moving between 15 y 25 mg/kg, while studies conducted in England and Wales and presented by Macnicol y Beckett (1985) have found the value of plants cultivated in ranks of 10 mg/kg.

Parameters	**Method**	**K- M 1**	**K-M 2**	**K- M 3**	**K-M4**	**S-M 1**	**S-M 2**	**S- M 3**	**S-M4**	**LIMITS**
As	**BS EN 13804**	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	0.1 ppm
Cr	**BS EN 13805**	1.17	0.81	1.03	1.58	4.27	2.61	3.76	2.09	5-15ppm
Ni	**BS EN 13806**	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	10
Pb	**BS EN 13807**	0.56	0.31	0.66	0.46	0.35	0.31	0.31	0.58	0.30
Zn	**EPA 6010C**	84.45	64.49	74.67	88.17	88.28	61.79	64.9	82.04	10

Table 2. Content of Heavy metals in fruits of *Capsicum Annum* (mg/kg weight njomw), in Mogilla, (Viti), for *Kertoska and Samborka cultivars.* Normal values of Ni for plants in general, moving between 15 y 25 mg/kg, while studies conducted in England and Wales and presented by Macnicol y Beckett (1985) have found the value of plants cultivated in ranks of 10 mg/kg.

Parameters	**Method**	**K- M 1**	**K-M 2**	**K- M 3**	**K- M 4**	**S- M 1**	**S- M 2**	**S-M 3**	**S- M 4**	**Limits**
As	**BS EN 13804**	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	< 2 ppb	0.1ppm
Cr	**BS EN 13805**	0.56	0.58	0.56	0.47	0.89	0.86	1.02	1.12	5-15
Ni	**BS EN 13806**	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	0.5 ppb	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	< 0.5 ppb	10 -25
Pb	**BS EN 13807**	0.31	0.49	0.37	0.42	0.41	0.34	0.27	0.33	**0.30**
Zn	**EPA 6010C**	57.47	55.07	62.35	47.77	62.14	54.63	55.35	56.65	**10**

The same phenomenon has also occurred in the case of the element Zn, which in all cases as being analyzed in Mogilla of Vitise, has resulted to be outside the permissible values. The highest value of Zn is found in the Kertoka cultivar (62.35 mg / kg of wet weight) in the third sample and in the first Sambroska sample at a value of 62.14 mg / kg body weight. On average, the Zn element has resulted to have a value five times higher than the permissible CE norms thus posing a risk to consumption, that is if we refer only to this element.

The highest values of Zn and Pb found in the Plemetina area are considered to be a result of heavy industrial activity in the Obiliq area (industrial zone).

IV. CONCLUSION

The content of heavy metal including As, Cr and Ni has resulted in all cases to be well below the permissible CE limits for fresh vegetable consumption in both study areas. The results demonstrated values which stood much higher for Zn in all analyzed cases and likewise much higher values than allowed norms for Pb, with the exception of just one case in the Mogila area. Soils close to urbanization and soils of industrial areas, as is the case with the Obiliq area, should be continuously under constant and careful monitoring because the risk of heavy metals permeating the food chain is present. The administration of a complex study involving heavy metals analysis in water and air in the agricultural production area and a study over metal contamination and their dynamic development over time would enable the production of more accurate results in the future.

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REFERENCES

[1] Aij. 1996. Code of Practice for evaluation of Fruit and Vegetable Juices. Association of the Industry of Juices and Nectars from fruits and vegetables of the Europian Union, Brussels, Belgium.
[2] Garcia, I. y C. Dorronsoro, 2005. Contaminaciónpor metals pesados. En: Tecnología de Suelos. Departamento de Edafologia y QuímicaAgrícola, Universidad de Granada, Granada España.
[3] Kabata-Pendias, A. 2000. Trace elements in soils and plants. 3a. Ed.CRC Press, Boca Raton, FL.
[4] Queirolo, F.; S. Stegen; M. Restovic; M. Paz; P. Ostapczuk; M.J. Schwuger y L. Muñoz. 2000. Total arsenic, lead, and cadmium levels in vegetables cultivated at the Andean villages of northern Chile. Sci.Total Environ. 255, 75-84.
[5] Union Europea 2006. Contenidomaximo de deperminantescontaminantesenlosproductosalimenticios. Reglamento CE 1881/2006 de la Comision. Diarioofcial de la Union Europea 20.12.2006, L 364/5-L364/24
[6] Lasat, M.M. 2000. The use of plants for the removal of toxic metals from contaminated soil. American Association for the Advancement of Science, Environmental Protection Agency (EPA), Washington DC.
[7] Miranda L., D., C. Carranza y G. Fischer 2008. Calidad del agua de riegoen la Sabana de Bogotá. Facultad de Agronomía, Universidad Nacional de Colombia, Bogotá.
[8] Montenegro, R.O. 2002. Contaminaciónquímica de suelos y cultivos. Etrategias para la productividad de lossuelosagrícolas. SociedadColombiana de la Ciencia del Suelo, Capitulo Tolima, Bogotá.
[9] Tadeo, F.R. y A. Gómez-Cadenas. 2008. Fisiología de las plantas y el estrés. pp. 577-597. En: Azcón-Bieto, J. y M. Talón. Fundamentos de fisiología vegetal. 2a ed. McGraw-Hill Interamericana, Madrid.
[10] Abazi, U and Balliu, A. 2008. Environmental Impact of Heavy Metals Presence in the Fan and Shkumbin Rivers.43 rd Croatian and 3rd International Symposium on Agriculture, Opatija, Croatia, Proceedings, pp. 111-114.

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