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RESEARCH ARTICLE

HEALTH RISK ASSESSMENT OF HEAVY METALS (Pb, As.) FOR HUMANS VIA CONSUMPTION OF GREEN VEGETABLES

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ABSTRACT

Ingestion of vegetables containing heavy metals is one of the main ways in which these elements enter the human body. Once entered, heavy metals are deposited in bone and fat tissues, overlapping noble minerals. Slowly released into the body, heavy metals can cause an array of diseases. A value of intake of heavy metals in human diets was also calculated to estimate the risk to human health. Vegetable samples were collected at the Lucknow city in Alambagh local area, and the heavy metal content was determined by SEM (Scan Electron Microscope). The heavy metals pollution is one of the problems that arise due to the increased uses of fertilizers and other chemicals to meet the higher demands of food production for human consumption. Health risk assessment for heavy metals is a very good technique because such assessment would be useful to give information about any threat regarding heavy metals contamination in vegetables. For health risk assessment different methods are used by different researchers.

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INTRODUCTION

Heavy metals contamination is a major problem of our environment and they are also one of the major contaminating agents of our food supply (Abdollatif Gholizadeh, 2009). Most of the heavy metals are the natural constituents of earth's crust and from there they are taken by plants and thus transferred to food chain. These metal concentrations vary from soil to soil. Metals concentration of vegetables mainly depends on the texture of soil or media on which they grow but this also depends on the type and nature of plant (Kabata-Pendias and Pendias, 1984). Heavy metals can impair important biochemical systems, constituting an important threat for the health of plants and animals. The adverse health effects of several chemical elements have been documented throughout history: Greeks and Roman physicians were able to recognize symptoms of acute lead and arsenic poisoning long before toxicology became a science. Currently, the advances of toxicology has improved our knowledge about human exposure to toxic elements and their health effects, such as developmental retardation, several types of cancer, kidney damage, endocrine disruption, immunological disorders (autoimmunity) and even death. Significant contamination of seeds, plants and plant products with toxic chemical elements due to contaminated soil and water has been observed as result of release of these toxicants into the sea, rivers, lakes and even into irrigation channels. Afterwards, the consumption of contaminated vegetables constitute an important route of animal and human exposure. The tradition of growing vegetables within and at the edges of cities is very old. (Smit, 1996) Green leafy vegetables are predominantly known for their high nutritional content and are mostly consumed for health and nutritional benefits. Generally an industrial, mining and agricultural waste contains heavy metals and metalloids, viz. Cu, Zn, Pub, Fe, Cd and Mn Heavy metals are non-biodegradable and thermo stable and thus readily accumulate to toxic levels (Singh *et al*., 2006, 2010). Vegetables constitute an important part of the human diet since they contain proteins, vitamins, as well as carbohydrates, minerals, and trace elements. Green leafy vegetables are predominantly known for their high nutritional content and are mostly consumed for health and nutritional benefits. It is known that serious systemic health problems can develop as a result of excessive accumulation of dietary heavy metals such as Cd, Cr, and Pb in the human body. Consumption of heavy metals-contaminated food can seriously deplete some essential nutrients in the body causing a decrease in immunological defenses, intrauterine growth retardation, impaired psycho-

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social behavior, disabilities associated with malnutrition and a high prevalence of upper gastrointestinal cancer (Arora *et al*., 2008) Potentially harmful metal contents in soils may come not only from the bedrock itself, but also from anthropogenic sources like solid or liquid waste deposits, agricultural inputs, and fallout of industrial and urban emissions (Wilson and Pyatt, 2007) Excessive accumulation in agricultural soils may result not only in soil contamination, but has also consequences for food quality and safety. So, it is essential to monitor food quality, given that plant uptake is one of the main pathways through which heavy metals (HMs) enter the food chain (Antonious and Kochhar, 2009). Air pollution of the natural environment by heavy metals is a universal problem because these metals are indestructible and most of them have toxic effect on living organisms, when permissible concentration levels are exceeded. Heavy metals frequently reported in literature with regards to potential hazards and occurrences in contaminated soil are cadmium, copper, zinc and lead (Akoto *et al*., 2008; Alloway, 1995) Vegetable plants growing on heavy metal contaminated medium can accumulate high concentrations of trace elements to cause serious health risk of consumers. Regular monitoring of these heavy metals from effluents, sewage, in vegetables and in other food materials is essential for preventing excessive buildup of the metals in the food chain. Heavy metals depositions are associated with a wide range of sources such as small scale industries (including battery production, metal products, metal smelting and cable coating industries); the term vegetable applies to edible part of the plant that stores food in roots, stems, or leaves. Vegetables are green and leafy-like in appearance bearing edible stems or leaves and roots of plants (Sharma, 2004). Vegetables constitute essential diet components by contributing carbohydrates, proteins, vitamins, iron, calcium and other nutrients that are in short supply. Vegetables also contain both essential and toxic elements over a wide range of concentrations. Metals in vegetables pose a direct threat to human health. Plants and vegetables take up elements by absorbing them from contaminated soils and waste water used for irrigating them as well as from deposits on different parts of the plants exposed to the air from polluted environment (Funtua *et al*., 2008). Main sources of heavy metals to vegetable crops are their growth media (soil, air, nutrient solutions) from which these are taken up by roots or foliage. Soil gets polluted due to waste water irrigation and absorbed minerals settle in edible tissues of the vegetables (Lokeshwari and Chandrappa, 2006). Food safety issues and potential health risks make this as one of the serious environmental concerns (Cui *et al*., 2005) Though, metals are indispensable part of our environment and play positive role in various biological processes such as signaling, homeostasis and enzyme catalysis, higher concentration of metals tend to toxic effects since they are prone to bioaccumulation and bio-magnification along the food chain. Industrialization and urbanization as well as anthropogenic activities are main source for heavy metal contamination (Begum and Harikrishna 2010).

MATERIALS AND METHODS

The experiment was conducted in the research laboratory of the Department of Food Science and Technology, USIC lab BBAU, Lucknow & in the analysis laboratory of RFARC (Regional Food Analysis & Research Centre) situated in Lucknow. The different tools & techniques used during experimental process were broadly describedin this research. The samples taken at the Lucknow area. The Lucknow city stands at an elevation of approximately 123 meters (404fit) above sea level and covers an area of 2528 square kilometers (976 sq mi). The coordinates for the study area are 26.80 N, 80.90 E. Collect the vegetables samples from market area. We taken two samples spinach and coriander .then its proper washing dyed then use the dehydrate for dry the sample. In this process we are use to Dehydrator. Dry the sample by dehydrator at 70-80^0 c for 4 hours. In the case of dehydration both sample coriander and spinach put in dehydrator different treys, no any mix-up any sample each together .After dry the both the samples that collect the different treys. Then both the samples make powder from by grinder. Both the samples make powder froms. Then we packed in small poly bag and then sealed.

RESULTS AND DISCUSSION

The result are described properly. In this testing method use SEM.

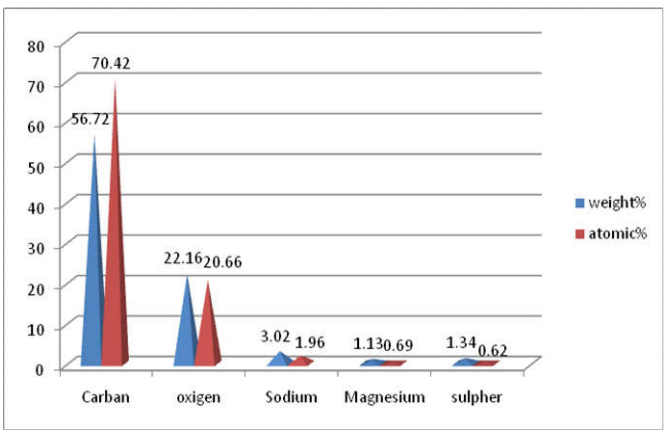
Sample 1 coriander

The first sample coriander that have no any heavy metals (pb and As) are founding but some elements are found in this samples that are properly describe.

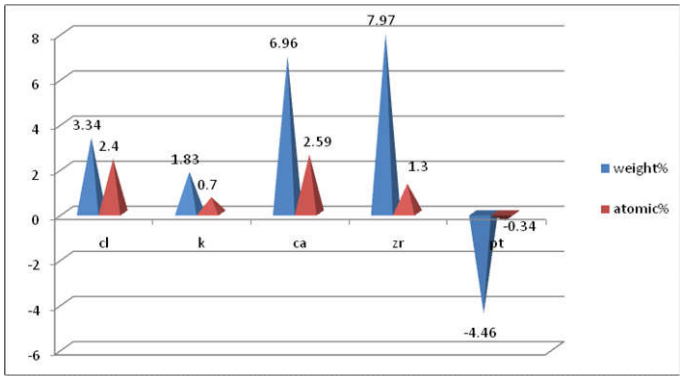
Heavy metals and Elements in coriander

Element	Weight%	Atomic%
C K	56.72	70.42
O K	22.16	20.66
Na K	3.02	1.96
Mg K	1.13	0.69
S K	1.34	0.62
Cl K	3.34	1.40
K K	1.83	0.70
Ca K	6.96	2.59
Zr L	7.97	1.30
Pt M	-4.46	-0.34
Totals	100.00	

Present heavy metals and elements percentage graphical representation



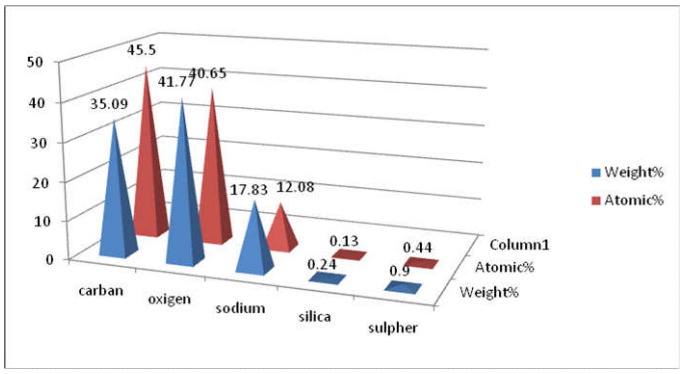
Present elements percentage graphical representation



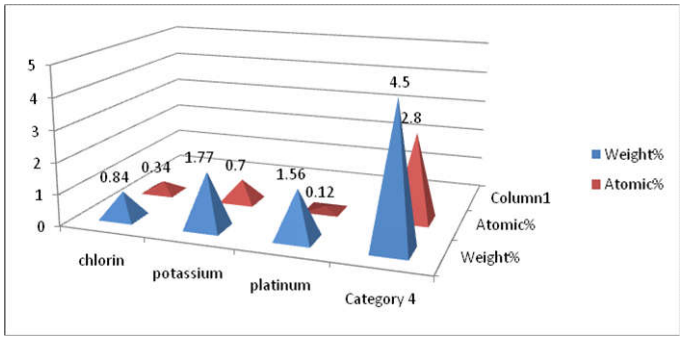
Sample 2 Spinach- The second sample spinach after detection by SEM technique ,no anyone heavy metals detect in the sample but some elements are detect.In this sample some silica particle are found but they are not toxic and harmful.

Element	Weight%	Atomic%
C K	46.15	56.24
O K	39.94	36.54
Na K	6.07	3.86
Mg K	0.72	0.43
Si K	0.44	0.23
P K	0.91	0.43
S K	0.94	0.43
Cl K	0.76	0.31
K K	4.08	1.53
Totals	100.00	

Graphical representation of elements and heavy metals in spinach



Graphical representation of elements and heavy metals in spinach



Present study describe that present time sample of vegetable safe. In this Bothe sample no anyone heavy metal (Pb and As) and toxic substance are not founding that samples. So the vegetable is safe, in this testing some elements are founding eg. C,O,Na,Mg,S,K,Ca,Zr,Pt, these samples are present in sample one coriander. Present these sample pt. are show but they are not natural, they are part of SEM. Pt are use in testing. The present second result spinach shows that no anyone heavy metals are fund, and no any toxic substance, after testing some result show elements eg. C,O,Na, Si, S,Cl,K, in this sample found the silica are naturally they are found all green leafs. Si main work to maintain the moisture in leafs.

Summary and Conclusion

Air pollution of the natural environment by heavy metals is a universal problem because these metals are indestructible and most of them have toxic effect on living organisms, when permissible concentration levels are exceeded. Heavy metals frequently reported in literature with regards to potential hazards and occurrences in contaminated soil are cadmium, copper, zinc and lead. The vehicular exhausts, as well as several industrial activities emit these heavy metals so that soils, plants and even residents along roads with heavy traffic loads are subjected to increasing levels of contamination with heavy metals. However, heavy metals are natural components of the earth's crust and cannot be degraded nor destroyed. The metal concentration in the green leafy vegetables from the market that is safe and no any toxic effect on health. The testing of both sample spinach and coriander was tested then, no anyone heavy metal (Pb, as) was found. In this sample some nontoxic elements are found eg. C, O,Na,Mg,S,K,Ca,Zr,Pt, these was founding in coriander sample. And second sample elements was found eg. C,O,Na, Si, S,Cl,K. The sample of spinach in present traces amount Silica (Si) was found that level weight 0.24% and atomic 0.13%, that level was not toxic. They have no any effect on health's are founding in green leafs naturally. The main work of silica to maintain the moisture of leafs. But high amount of silica causes cancer.

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