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DETERMINATION OF LEAD POISON IN VEGETABLES PROCURED IN DIFFERENT LOCATIONS IN BENGALURU, KARNATAKA, INDIA

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ABSTRACT

This study reports the concentration of lead present in different vegetables, in particular, namely Daucuscarotasubps. Sativus (Carrot), Beta vulgaris (beetroot), Raphanussativus (radish), Solanum tuberosum (potato) collected in Bangalore rural market areas. The concentrations of lead was analysed in four selected vegetables each 8 of 32 samples by XRF technique. The analysis also consists of the determination of pH, conductivity and acidity which influences the concentration of metals. The objective of the analysis was to provide updated information on the concentration of LEAD in vegetables available in the local markets at different areas of Bangalore. The selected vegetables are analysed for the concentration of lead among them one, i.e., Radish which exceeds the standard level (24ppm). The analysis suggests that the consumption of these vegetables is not completely free from health risks.

Key words: ***Lead contamination, XRF-technique, vegetables, local markets.***

INTRODUCTION

Awareness about the toxic effects of non-essential metals is still lacking in developing countries. Lead is on among them, which ranks second in the Agency for Toxic Substances and Disease Registry's top 20 lists of toxic metals (1).Lead is a natural metal found in soil and rocks. Lead is one of the non-ferrous metal (2). Traces of lead are almost ubiquitous in nature, and small amounts are found in normal foods and vegetables. It is harmful even at relatively low concentrations, and its toxic effects are well documented (3). Man, animals and plants have no nutritional requirement for this element.

Lead imitates the function of essential elements like calcium, iron, etc., in the human body. There by lead content increases resulting in lead poisoning. Children are more vulnerable to lead poisoning than adults because their nervous systems are still developing, and it absorbs more lead than the adults (4). Childhood poisoning from lead-

based paints was first noted in 1897 in Australia, where children ate paint chips from porch railings (5). Lead poison is affected to mankind by damaging kidney and nervous system. High level of exposure to lead can also damage their reproductive organs.

The analysis gave the sufficient information about the content of lead in various vegetables like Dacuscarotasubpssativa (˜carrot) Beta vulgaris (beetroot) Raphanussativas (radish) salanumtuberosum (potato) in some places of Bengaluru (K.R.Market, Yeshwanthpura, Soluru , Nelamangala, Leggere, Doddaballapura, Yelahanka, Tavarekere). The analysis mainly concentrates on vegetable contamination due to lead. Because these are the main part of the human diet since they contain carbohydrates, proteins, vitamins, minerals as well as trace elements (6).

Vegetables are contaminated by many ways, namely by soil, water, pesticides and automobiles, etc. Lead present in soil enters into the plant body and accumulates in different organs. Lead contamination in plants decreases the productivity (7). Lead can be entered into plant body by external aspect. The lead-contaminated vegetable causes the lead poisoning in organisms. Others sources of lead contamination in the environment are mentioned in below figure.

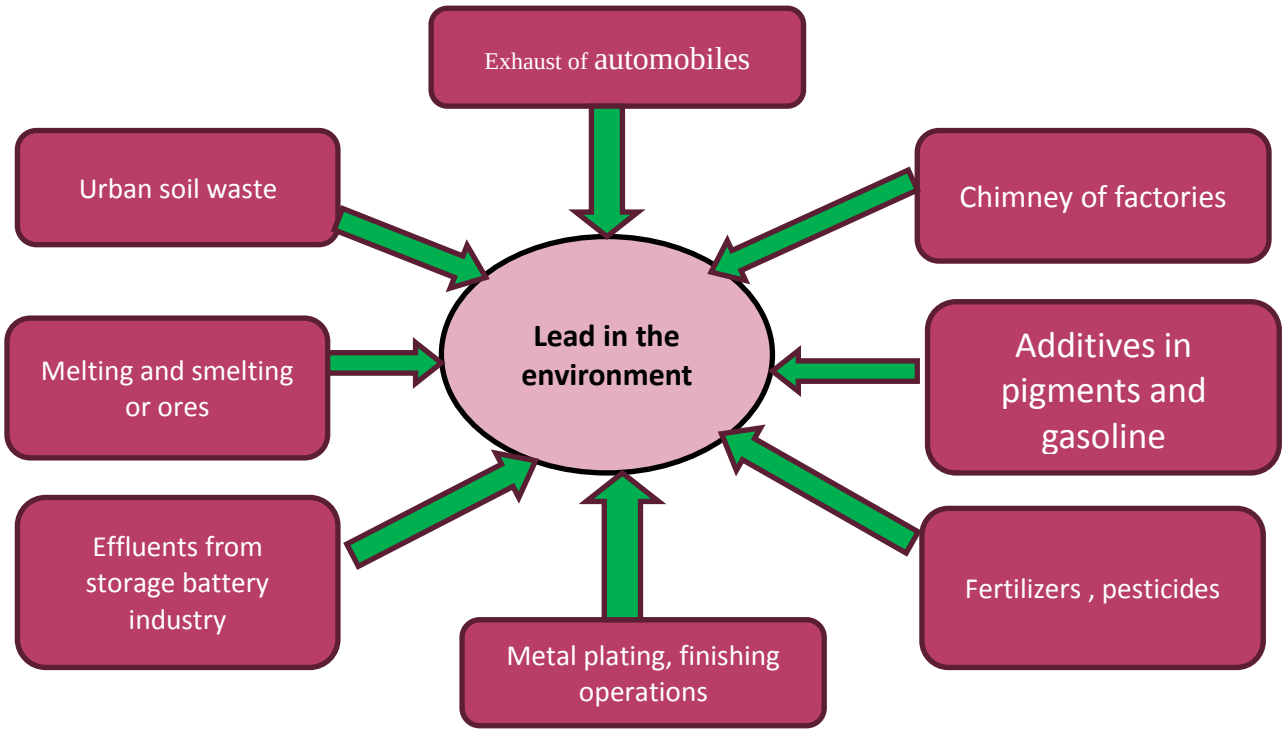


Figure [1]: sources of lead pollution in the environment

MATERIAL & METHODS

1. STUDY AREA: The analysis was done particularly in four different vegetables like Dacuscarotasubpssativa (˜carrot) Beta Vulgaris (beetroot) Raphanussativas (radish) salanumtuberosum (potato) in 2015 from the different places of Banglore like K R Market, Yeshwanthpur, Soluru , Nelamangala, Leggere, Doddaballapura, Yelahanka, Tavarekere.

The areas like K R Market, Yeshwanthpur, Yelahanka, Tavarekere, were considered as high traffic, industrial area and highway roads (2500-5000 vehicles are moved per one day) which cause high pollution. Remaining areas are less polluted compare to other because these are contains small scale industries, less traffic areas etc.


2. SAMPLING AND PRETREATMENTS:

The analysis was done particularly in four different vegetables like Dacuscarotasubpssativa (carrot) Beta vulgaris(beetroot) Raphanussativas (radish) salanumtuberosum (potato) in 2015 from the different places of Bengaluru like K.R.Market, Yeshwanthpura, Soluru, Nelamangala, Leggere, Doddaballapura, Yelahanka, Tavarekere. For each category eight vegetable samples are collected. The collected samples are washed thoroughly with distilled water.



Then the samples are finely chopped into small pieces by a clean knife and are dried in sunlight by placing them on a thin plastic sheet for 2days and also in air dried oven at 75^0-85^0 for 48 hours until constant weight obtained. Dried materials are ground into powder using pestle and mortar and motor grinder. Samples are stored in plastic polythene covers. We used de-ionised water throughout this analysis. Then the samples are analysed for pH, conductivity using instrument Deluxe water and soil analysis kit Model 191 E (Eleco), Acidity and alkalinity using Phe naphthalene and methyl orange indicator by Titration method and Heavy metals are detected using X-ray fluorescence spectrophotometer (XRF a-400).




3. XRF- Technique:

XRF is an analytical method to determine the chemical composition of all kinds of materials. The materials can be in solid, liquid, powder, filtered or another form.

TABLE 1

Sl No	samples	pH S/mol	Acidity in mg/liter	Conductivity mosh/cm3	Pb ppm
1	C1	5.44	320	0.34	<LOD
2	C2	5.76	500	0.38	<LOD
3	C3	6.21	480	0.44	<LOD
4	C4	5.33	260	0.3	<LOD
5	C5	4.83	380	0.26	<LOD
6	C6	4.22	500	0.26	<LOD
7	C7	5.28	380	0.33	<LOD
8	C8	5.75	720	0.37	<LOD
9	B1	6.4	280	0.38	<LOD
10	B2	5.15	240	0.62	<LOD
11	B3	5.89	400	0.38	<LOD
12	B4	6.16	420	0.4	<LOD
13	B5	5.29	300	0.45	<LOD
14	B6	5.11	460	0.3	<LOD
15	B7	5.44	580	0.33	<LOD
16	B8	5.85	460	0.45	<LOD
17	R1	4.07	480	0.32	<LOD

18	R2	3.5	700	0.44	24
19	R3	4.93	540	1.04	<LOD
20	R4	4.37	480	0.47	<LOD
21	R5	3.77	520	0.37	<LOD
22	R6	3.57	440	0.56	<LOD
23	R7	3.52	520	0.34	<LOD
24	R8	3.34	280	0.34	<LOD
25	P1	6.31	420	0.24	<LOD
26	P2	6.75	340	0.29	<LOD
27	P3	6.2	640	0.18	<LOD
28	P4	5.66	720	0.13	<LOD
29	P5	5.88	840	0.21	<LOD
30	P6	7.05	660	0.39	<LOD
31	P7	5.77	780	0.23	<LOD
32	P8	5.44	760	0.2	<LOD

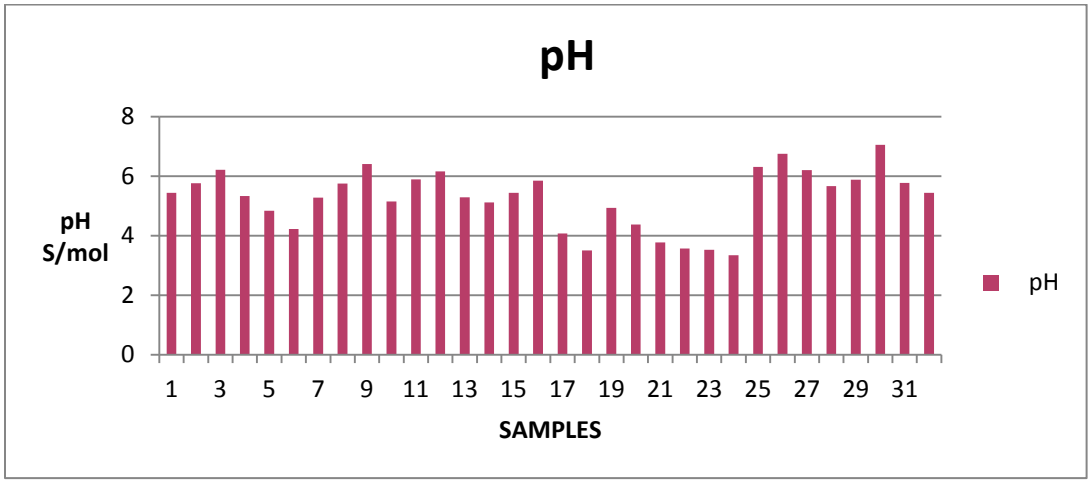
Note:-Where sl no: C1-C8 Carrot, B1- B8 Beetroot, R1- R8 Radish, P1- P8 Potato.

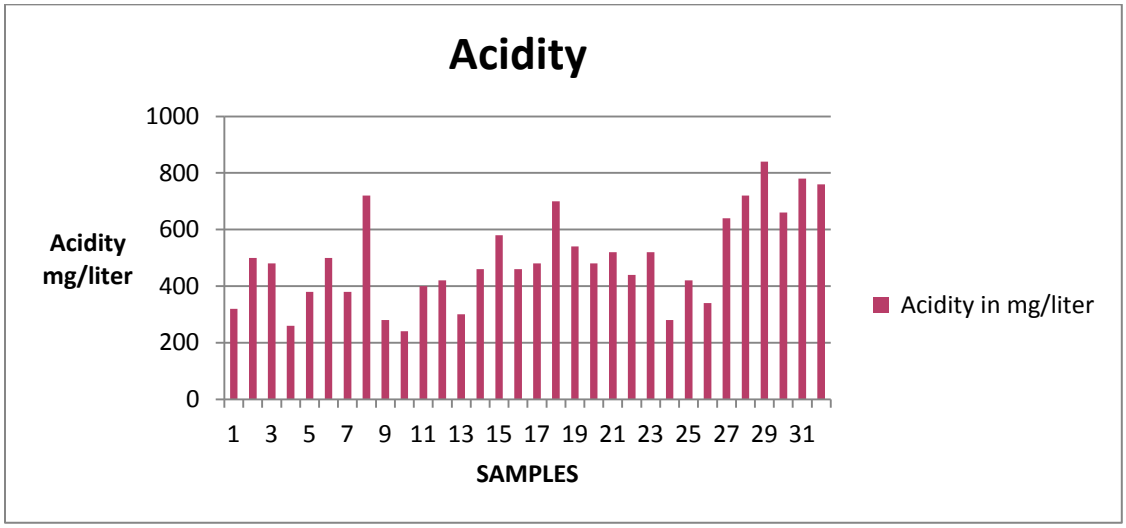
Each samples are collected in different parts of Bengaluru as mentioned above respectively

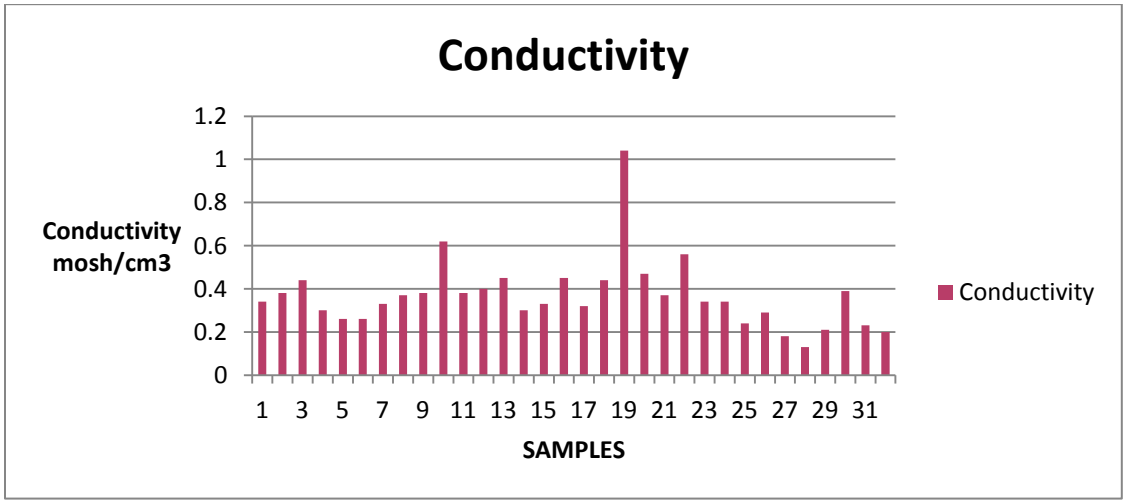
TABLE 2

Sl No	samples	pH S/mol	Acidity in mg/liter	Conductivity mosh/cm3	Pb ppm
	Max	7.05	840	1.04	
	Min	3.34	240	0.13	
	BIS std	6.5-7.5	-	-	6

GRAPH:


pH
pH S/mol
8
6
4
2
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
SAMPLES
pH


Acidity
Acidity mg/liter
1000
800
600
400
200
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
SAMPLES
Acidity in mg/liter


Conductivity
Conductivity mosh/cm3
1.2
1
0.8
0.6
0.4
0.2
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
SAMPLES
Conductivity

DISCUSSION AND CONCLUSION

The mean concentrations of Lead in vegetables studied are given in above Table. The concentrations of heavy metals in these samples are quite variable such as Lead (24mg kg^{-1}). Only one vegetable namely Radish, in particular, one place contained the highest level of Lead. This contamination can cause during transportation, or by growing vegetables in contaminated soil and water.

The results from this study suggested that significant differences existed in the elemental concentrations among the vegetables analysed that might be in due part to the geological status of the area under investigation and the ability of plants and their specific parts to accumulate metals as well. The present study revealed that Lead is above the toxicity level collected in suburban areas of Bengaluru. From the results of present investigations, it could be concluded that in the suburban of Bengaluru, the uptake of heavy metals (Pb) by the vegetables may increase and thus a risk factor for consumption of such vegetables.

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