



Assessment of Some Heavy Metal Contaminants in Roadside Sold Fruits from the Market Sites of Aurangabad India

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Abstract

Emissions of heavy metals from the industries and vehicles may be deposited on the fruits & vegetable surfaces during their production, transport and marketing. Young children and senior citizens with poor immunity are mostly affected by this contamination. The present work was done to assess some heavy metal contaminants in roadside sold fruits from the market sites of Aurangabad India by atomic absorption spectroscopy (AAS) method. Fruits were selected which are mostly available in the local market of Aurangabad such as tomato, guava, papaya, custard apple and figs. Heavy metals which were determined were cadmium, copper, lead and, zinc. Results showed that the level of Copper and Cadmium were under permissible limit in this fruits. While that of zinc and lead was also under permissible limit these were compared with standards. The concentrations for each heavy metal in the market samples were compared with the standard set by world health organization/food and agricultural organization (WHO/FAO). The heavy metal levels were found to be within safe limit which indicates that the fruits sale in local market of Aurangabad city are safe for consumption without any risk of environmental toxicants.. Hence, the purpose of doing this study is to make society aware of heavy metals contamination and to know their hazardous effects on health.

Keywords: Contamination, heavy metals, kidney disorder, carcinogenic, health effects

Introduction:

Although fruits and vegetables are of great health benefit, the accumulation of their contaminants in the bodies of consumer over a long period of time is of major concern as it can result to serious health conditions [1]. One of the issues is the presence of heavy metals. Heavy metals toxicity has shown to be one of the major threats to health with several health risks associated with it [2]. Rapidly increasing urbanization and emission of heavy metal contaminated fumes from the industries and vehicles have contributed to agricultural soils and consequently in food chain by deposited on the vegetable surfaces during their production, transport and marketing. Application of wastewater to irrigate agricultural lands is one of familiar practices in suburban and industrial areas in many parts of the world [3]. The main sources of heavy metals to plants are the air or soil from which metals are taken up by the root or foliage. Some heavy metals are essential in plant nutrition, but

plants growing in a polluted environment can accumulate these elements at high concentrations, causing a serious risk to human health [4] Heavy metals are a universal problem because these metals are indestructible and most of them have toxic effect on living organisms, when permissible concentration levels are exceeded. Young children and senior citizens with poor immunity are mostly affected by this contamination. The heavy metals infected vegetables may pose serious hazard to human health. Plants can receive these metals from soil by their roots, transport them upwards to their shoots, and finally collect them inside their tissues, although there are large variations among different plant species in terms of metal gathering capacity [5]. It has been reported that almost half of the means of intake of lead, copper and chromium through food is due to plant origin (fruit, vegetables and cereals) and it sometimes in more than permissible limits within urban areas[6] Heavy or toxic metals are stable elements (they cannot be metabolized by the body) and bio-accumulative (passed up the food chain to humans). These include: mercury, nickel, lead, arsenic, cadmium, aluminium, platinum, copper, chromium and Zinc. If heavy metals enter and accumulate in body tissues faster than the body's detoxification process can handle, a gradual building up of these toxins will occur. Exposure to high concentrations will not therefore be necessary to produce a state of toxicity in the body, as heavy metals accumulate in body's tissues over time can reach toxic concentration [7] International and national regulations on food quality have lowered the maximum permissible levels of toxic metals in food items due to an increased awareness of the risk these metals pose to food chain contamination [8]

Heavy Metal and its hazardous effects on health :The polluted soil and air that transfer the heavy metals into the plants indirectly involve the heavy metals in the food chains that later will harm the consumer [9] Heavy metals are a universal problem and most of them have toxic effect on living organisms, when permissible concentration levels are exceeded. Trace metal pollution and the resulting health effects present some of the biggest challenges currently affecting the world[10].The prolonged consumption of unsafe concentrations of heavy metals through foodstuffs may lead to the chronic accumulation of heavy metals in the kidney and liver of humans causing disruption of numerous biochemical processes, leading to cardiovascular, nervous, kidney and bone diseases [11] Heavy metals such as Cd and Pb have been shown to have carcinogenic effects. High concentrations of heavy metals (Cu, Cd and Pb) in fruits and vegetables were related to high prevalence of upper gastrointestinal cancer [12]Lead has been found to be toxic to the red blood cell, kidney, nervous and reproductive systems. Excess of cadmium has been reported to cause renal tubular dysfunction accompanied by osteomalacia (bone softening) and other complications, which can lead to death [13] Lead and cadmium poisoning has also been reported in Japan in which many lives were lost and many more developed bodily abnormalities[14].Excess zinc can cause copper deficiency, autism, nausea, vomiting, stomach pain and diarrhea [15].Excess copper intake can cause liver, kidney and heart parenchymatous injury[16] .The exposure of heavy metals inside the body will lead to many types of disease such as brain damage, kidney failure and infertility. Heavy metals are carcinogenic and able to cause severe disease. The binding of lead to the erythrocyte can remain about 1 month and accumulate in the skeleton for about 20 to 30 years [17]. Lead is a serious cumulative body poison which enters into the body system through air, water and food and cannot be removed by washing fruits and vegetables [18].Excess zinc can cause copper deficiency, autism, nausea, vomiting, stomach pain and diarrhea [19]. Excess copper intake can cause liver, kidney and heart parenchymatous injury [20]. Cadmium last for a long time in the body and can

cause renal damages, abnormal urinary excretion of protein and decrease in bone calcium. Mercury can be harmful at a very low concentration because its high toxicity and ability to bio accumulate. It is one of the most toxic elements among the studied trace metals and exposure to high level could permanently damage the brain, kidney, liver, immune system, pituitary gland, developing foetus [21, 22].

Materials and Method: The chemicals used for analysis were of A.R grade. All quantitative tests for determination of Heavy metals were done by using standard procedure. In this study five different fruits samples were selected which are mostly available in the local market of aurangabad.(India).Fruits such as tomato, guava, papaya, custard apple ,and figs, respectively. Heavy metals which were determined was cadmium, lead, copper and, zinc by atomic absorption spectroscopy (AAS) method. Standard procedures were used to perform the experiments.

Samples Collection & Preparation: Five different fruits samples such as tomato, guava, papaya, custard apple and figs were purchased from (shahjunj) local market of Aurangabad (M.S) India. It was washed with double distilled water. The dry-ashing process was carried out in a muffle furnace by stepwise increase of the temperature up to 550°C and the samples left to ash at this temperature for 6 hrs. The ash was kept in desiccators and then rinsed with 3M hydrochloric acid. The ash suspension was filtered into a 50 ml volumetric flask through Whatmann No. 1 filter paper, and the volume was made up to the mark with 3N hydrochloric acid..The resulting samples were then followed by Atomic absorption spectrometry (AAS) for the determination of heavy metals such as, Cd, ,Cu, Zn, Pd. The concentration of the fruit samples were studied compared with the WHO maximum permissible limit.

Results and Discussion:

Table no 1 concentration of heavy metals in fruits mg/kg

Sr. No	Name of fruits	Botanical Name	Cd	Pb	Cu	Zn
1	Tomato	<i>Solanum</i>	0.28	0.06	18	30
		<i>lycopersicum</i>	0.11	0.02	20	32
2	Guava	<i>Psidium</i>	0.30	0.04	16	28
		<i>guajava</i>	0.25	0.03	25	25
3	Papaya	<i>Carica</i>	0.12	0.02	11	18
		<i>papaya</i>	0.18	0.05	24	15
4	Custard apple	<i>Annona</i>	0.16	0.03	20	18
		<i>cherimola</i>	0.11	0.04	18	21
5	Fig	<i>Ficus carica</i>	0.10	0.06	22	24
			0.16	0.04	20	21

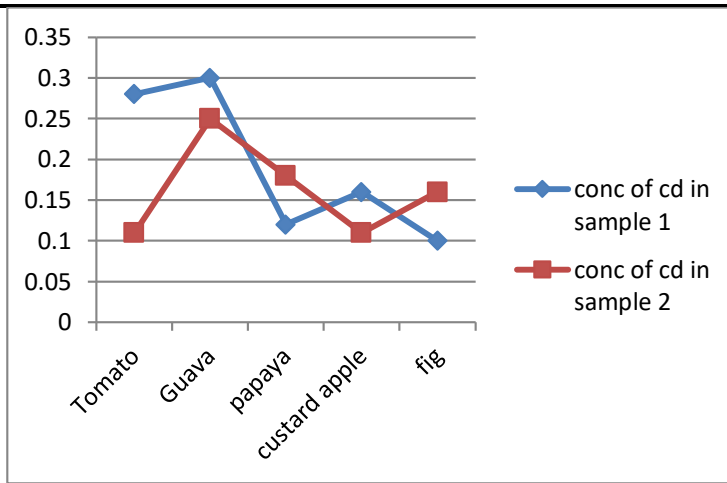


Fig no.1 Concentration of cadmium in fruits samples in mg/kg

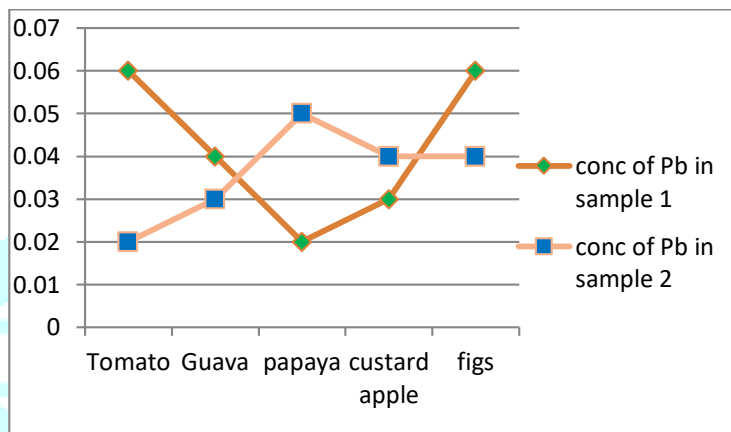


Fig no.2 Concentration of Lead in fruits samples in mg/kg

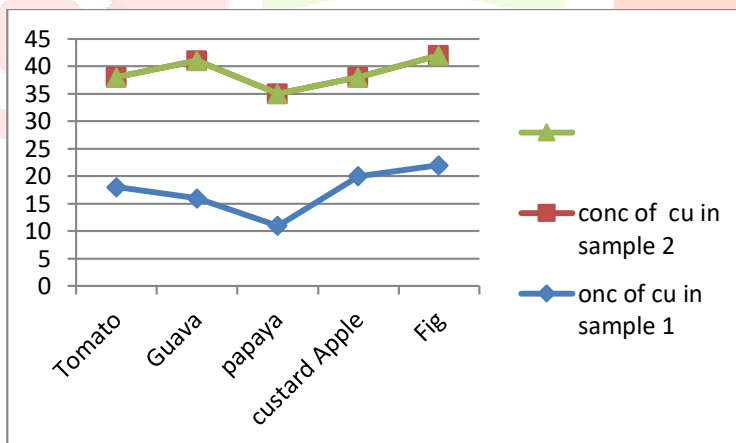


Fig no. 3 Concentration of copper in fruits samples in mg/kg

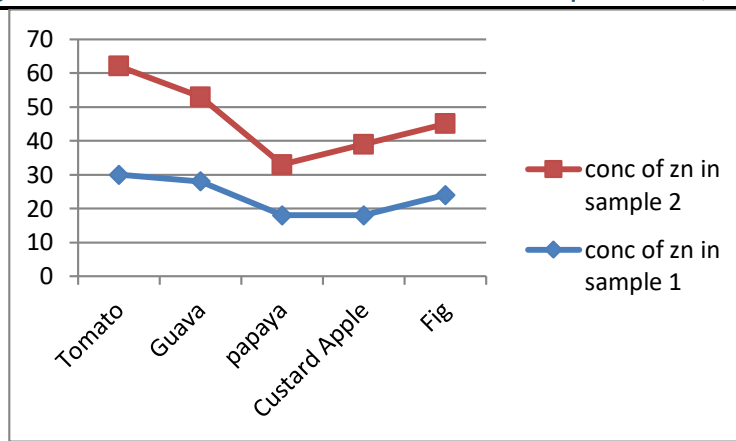


Fig no. 4 Concentration of zinc in fruits samples in mg/kg

Table No. 2 Concentration of heavy metals according to the International organization WHO (mg/kg)

Sr. No	Heavy Metals	UPL
1	Cadmium (Cd)	0.3
2	Lead(Pb)	0.3
3	Copper (Cu)	30
4	Zinc (Zn)	40

UPL: Under permitted limit

Atomic Adsorption spectroscopic technique were used to determine the cadmium, copper, lead and, zinc were determined as heavy metals in five selected fruits sample in locally available market of Aurangabad city India . According to the international organisation WHO the standard Maximum permissible limit of cadmium, Lead, copper & Zinc is 0.3, 0.3,30,40 mg/kg respectively as shown in table no 2.

As shown in Table no 1 in tomato fruit samples it was observe the conc. of Cadmium 0.28,0.11, conc. of Lead 0.06,0.02,conc of Copper 18,20 & conc. of Zinc 30,32 respectively.

In Guava fruits it was found that the conc. of Cd 0.30, 0.25, conc. of Pb 0.04, 0.03, conc of cu 16, 25, conc. of Zn 28, 25 respectively.

In Papaya fruit samples was found that the conc. of Cd 0.12, 0.18, conc. of Pb 0.02,0.05 ,conc. of cu 11,24,conc of Zinc 18.15

In Custard Apple fruit samples it was found that the conc. of Cd 0.16,0.11,conc of Pb 0.03,0.04,conc of Cu 20,18,conc of Zinc 18,21 respectively

In Fig fruit samples it was found that the conc. of Cd 0.10, 0.16, conc. of Cd 0.06,0.04,conc of cu 22,20,conc. of Zn 24,21 respectively.

Conclusion:

The results further indicated that the fruits collected from the chosen markets have heavy metal concentration within the safe limits prescribed by WHO/FAO.

It was concluded that the fruits which was selected for analysis were found under permissible limit when it was compared with standard maximum limit recommended its sample by International organization WHO.

The heavy metals such as cadmium, lead, copper & Zinc was found within safe limit which is an indicator

that selected fruits from local market of aurangabad city are safe for consumption to the public without any risk of environmental toxicants. Hence, this study is to make society aware of heavy metals contamination and to know there hazardous effects on health

Reference:

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