

Review Article

An Overview of the Level of Heavy Metals Concentration in Fruits and Vegetables

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Abstract: Fruit juices are extracted from one or more fruits for their liquid content. They supply vitamins, minerals; such as iron, copper, potassium, folate minerals, and vitamins A, B, and C and easily absorbed fruit sugar to our bodies. Fruit consumption on a regular basis is critical for providing the body with the nutrients it requires to stay healthy since we get important mineral elements such as copper (Cu), iron (Fe), and manganese (Mn), are important for human life since they are required for growth and respiration. However, these drinks may contain toxic metals that are extremely harmful to human health. Accumulation of toxic heavy metals in food can be dangerous to all individuals due to they may include heavy metals such as lead (Pb), nickel (Ni), arsenic (As), chromium (Cr), and palladium (Pd) which are toxic to humans even at low levels. Toxic heavy metals have the potential to transfer from soil or water to vegetables and fruits. As a result, the purpose of this paper was to review heavy metal concentrations and health risk issues. Most fruits are consumed raw, without being processed or cooked. In most situations, untreated waste water discharges result in significant concentrations of toxic heavy metals. Untreated wastewater discharges usually result in high concentrations of toxic heavy metals. It bears no attention to regulatory bodies. We recommend that regulatory bodies focus on controlling the release of heavy metals from various sources, such as untreated waste water discharges from manufacturing industries like leather and textile that flow to irrigation areas, monitoring automobile services that cause pollution by lead (Pb), and establishing good household waste disposal systems as soon as possible. Waste water discharges contribute to heavy metal contamination in fruits and vegetables when they are exposed to farms and irrigation regions. Furthermore, it is preferable to analyze the quantity of hazardous heavy metals in fruits and vegetables.

Keywords: Fruits, Heavy Metals, Soil, Vegetables, Water

1. Introduction

Fruits are horticultural crops usually they are eaten without processing (cooking), however in some cases they may be processed industrially or in household levels. Both industrial or in household the processed fruits are known as Juices [13]. Fruit juices are made from one or more fruits that may be pressed or extracted for their liquid content. They provide our bodies with vitamins, minerals, and easily absorbed fruit sugar [16]. They are thought to be abundant in a variety of essential elements, including iron, copper, potassium, folate minerals, and vitamins A, B, and C [6]. Fruit consumption is essential for giving the body the nutrients it needs to be healthy. However, these foods may contain hazardous metals, which

are very bad for people's health [2]. Heavy metal accumulation in soils results in harmful metal levels in food crops, fruits, and vegetables exceeding acceptable limits. If sufficient precautions are not taken, exposure to heavy metals from food can pose a major concern to all humans [5].

2. Some Common Heavy Metals and Their Impact on Health

Since these metals are coenzymes and organic necessities for growth and respiration, some heavy minerals like copper (Cu), iron (Fe), and manganese (Mn) are crucial for human life [1]. But fruit juice may include heavy metals like lead (Pb) and nickel (Ni), which are harmful to humans even at low doses.

Heavy metals are non-biodegradable, unlike other contaminants, and they tend to bio accumulate and bio-amplify from one tropic level to another [8]. Essential heavy metals are beneficial to human health and other living things. However, when the concentration surpasses the acceptable level for the organisms, vital heavy metals can be hazardous to living beings. Even in low amounts, non-essential heavy metals may be hazardous to human cells. The concentration of heavy metals varied greatly from region to region, depending on the abundance of possible metal sources in the area prior to industrialization and population density. It is clear to understand urban areas are highly exposed to contaminate with heavy metals like Arsenic (As), Chromium (Cr), Palladium (Pd) and Lead (Pb) [5].

Cement manufacturing industries cause the most common heavy metals pollutants. These hazardous heavy metals pollute the land, groundwater reservoirs, fruits, and vegetables. Soil and groundwater resources were heavily contaminated by copper in the neighborhood of the cement factory and its surrounding area, whilst fruits and vegetables were enriched with zinc (Zn), nickel (Ni), cobalt (Co), copper (Cu), and chromium (Cr). Toxic heavy metals such as cobalt (Co), copper (Cu), and chromium (Cr) have the greatest potential for transfer from soil to plants and bioaccumulation [9].

The overwhelming majority of heavy metals, including cadmium (Cd), nickel (Ni), and chromium (Cr), are carcinogenic and present a number of health risks to people, including the possibility that cadmium (Cd) intake will result in disease, mercury buildup may result in disease, and as intake through contaminated drinking water may result in poisoning [17]. They could be harmful to the ecosystems and affect the metabolism at greater doses [10]. At concentrations over the maximum allowed limits, many metals, including arsenic (As), cadmium (Cd), chromium (Cr), and nickel (Ni), may be mutagenic. Cancer is caused by these mutations [11].

Some metals, including arsenic (As), cadmium (Cd), and lead (Pb), may volatilize when processed at high temperatures. These metals will become oxides and condense as little particles of oxides [15].

Common sources comprise lead-acid batteries, fertilizers, paints, industrial waste from mining and industry, automobile emissions, and treated wood. The most common heavy metal contaminant is lead (Pb). It was widely utilized as a tetra-ethyl lead component in petrol [14].

In most cities the accumulation of heavy metals in soil, ground water, fruits and vegetables exceeds the WHO/FAO maximum tolerable limits [5, 7, 9, 12]. According to the author [3] the concentrations of major studied metals (Fe, Mn, Cu, Zn, Pb, Cd and Hg), were exceeding than the recommended maximum acceptable levels proposed by the Joint FAO/WHO and EC Committees. As well as [13] found beyond WHO/FAO permissible limits.

Toxic heavy metals, such as cobalt (Co), copper (Cu), and chromium (Cr), have the greatest potential for transfer from soil to plants and bioaccumulation [12]. Therefore the aim of this paper was to review the concentration level of

heavy metals and the health risk concerns.

Table 1. Dietary intake of trace elements in the human body.

Essential trace elements	Diet mg/day
Chromium (Cr)	0.05 - 0.1
Iron (Fe)	15.0
Zinc (Zn)	8.0 - 15.0
Nickel (Ni)	0.4
Manganese (Mn)	2.2 - 8.8
Cobalt (Co)	0.3
Copper (Cu)	3.2

Source: [4].

Table 1 shows amount required for daily human intake of essential trace metals from our foods. We also understand heavy metals are important in trace levels. However above beyond permissible causes health risk.

Table 2. Concentrations of heavy metal levels in the fruits juices (mg/kg).

Heavy Metals	WHO/FAO tolerable limit (g/kg)
Cadmium (Cd)	0.10
Lead (Pb)	0.20
Copper (Cu)	0.05 – 0.5
Nickel (Ni)	0.14
Cobalt (Co)	2.00
Manganese (Mn)	0.30
Iron (Fe)	0.80

Source: [10].

Table 2 shows heavy metals concentration of WHO/FAO tolerable limits in gram per kilo gram in the fruits and vegetables. It indicates, beyond this tolerble concentration causes serious health problems.

3. Conclusion

Fresh fruits and vegetables are important components of a healthy diet, as they are a significant source of vitamins and minerals. A regular intake of fresh fruits is extremely healthy for the body. Fruits contain all the necessary vitamins and minerals which also fit the body's need. But we will ask ourselves how safe and healthy are these fruits? We think that eating well gives our body the essential nutrients that it requires when we consume fresh fruits and vegetables. This might come as a surprise to some of the people, but most of the foods may contain beyond the permissible limit of heavy metals. The nature of most fruits is directly ingested without processing or cooking. In most cases, untreated waste water discharges cause high concentration of toxic heavy metals. However, it is does not get attention of regulatory concerned bodies. It needs serious attention of regular follow up, assessment of the presence of concentration of heavy metals in fruits and vegetables. From the findings we recommend that it is better to take attention for regulatory bodies to control the release of heavy metals from different sources; untreated waste water discharges from manufacturing industries like leather and textile which flow to irrigation areas, follow up of automobile services that cause pollution with lead (Pb),

establish good house hold waste disposal system and soon. When they exposed to farms and irrigation areas, the waste water discharges contribute for contamination heavy metals in fruits and vegetables. In addition, it is better to assess the level of toxic heavy metal in fruits and vegetables.

Data Availability

Data sharing is not applicable to this article as no datasets were generated, since this is a review paper.

Conflicts of Interest

There is no conflict of interest that the author can find in the publication of this review study.

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