

# Lychee Heavy Metal Occurrence and Health Risk Assessment

Siddhi Mashique\*

Department of Environmental Science, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia

## Abstract

Lychee is a tropical and subtropical fruit that has gained popularity worldwide due to its unique flavor and nutritional value. Rich in vitamins, minerals, and antioxidants, lychee is a favorite among fruit enthusiasts. However, like many agricultural products, lychee can be susceptible to heavy metal contamination, which poses potential health risks to consumers. This article explores the occurrence of heavy metals in lychee, their sources, and the methods for assessing health risks associated with their consumption. Heavy metals are naturally occurring elements with high atomic weights and can be toxic to humans when present in excessive amounts. They include lead (Pb), Cadmium (Cd), mercury (Hg), Arsenic (As), and Chromium (Cr), among others. These metals can enter the lychee fruit through various pathways, including soil, water, and air.

**Keywords:** Lychee • Vitamins • Antioxidant • Metal

## Introduction

Lychee trees absorb nutrients and water from the soil, making the soil quality a critical factor in heavy metal contamination. Heavy metals may accumulate in the soil due to various human activities such as industrial pollution, agricultural practices, and improper disposal of waste. These metals can then be taken up by lychee trees, leading to their presence in the fruit. Water quality is another important factor influencing heavy metal contamination in lychee. Water sources used for irrigation can contain heavy metals from industrial discharges, mining activities, or natural geological processes. As lychee trees rely on water for growth, the presence of heavy metals in irrigation water can result in their accumulation in the fruit [1].

Air pollution can also contribute to heavy metal contamination in lychee. Atmospheric deposition of heavy metals can occur through industrial emissions, vehicular exhaust, and other anthropogenic sources. These metals can settle on the surface of lychee fruit and be absorbed through the fruit's skin. The presence of heavy metals in lychee raises concerns about potential health risks for consumers. Lead exposure can cause cognitive impairment, developmental delays in children, and damage to the nervous system. Even low levels of lead exposure can be harmful, making it a significant concern in lychee. Cadmium is a known carcinogen and can lead to kidney damage and bone disorders when consumed in excess. Mercury can accumulate in the human body and cause neurological and developmental problems, especially in pregnant women and young children. Chromium can be carcinogenic in its hexavalent form, potentially increasing the risk of cancer when consumed regularly [2,3].

Some heavy metals may naturally occur in the environment due to geological processes. For example, arsenic can be present in soils and groundwater due to natural deposits. Industries that release heavy metals into the environment through waste discharge or emissions can contaminate nearby lychee orchards. These activities may include mining, smelting, and manufacturing. The use of contaminated fertilizers or pesticides can introduce

heavy metals into the soil, leading to their uptake by lychee trees. Heavy metals from urban areas or industrial zones can be transported by wind and deposited on lychee surfaces, where they may be absorbed into the fruit.

## Literature Review

To evaluate the health risks associated with heavy metal contamination in lychee, a comprehensive risk assessment is essential. Analyzing lychee samples to quantify the concentrations of heavy metals present. This step provides essential data for risk assessment. Estimating the amount of lychee consumed by an average person and calculating their daily intake of heavy metals. This assessment considers factors such as age, sex, and eating habits. Utilizing toxicological studies to establish Acceptable Daily Intake (ADI) values for each heavy metal. ADI values represent the amount of a substance that can be consumed daily without adverse health effects. Combining the data from dietary exposure assessment and toxicological data to calculate the health risk associated with lychee consumption. This step typically involves comparing the estimated intake of heavy metals to their respective ADI values. Developing strategies to reduce heavy metal contamination in lychee, such as improving soil and water quality, implementing sustainable farming practices, and monitoring heavy metal levels regularly. Different countries have established regulatory guidelines and maximum permissible limits for heavy metals in food products, including fruits like lychee. These guidelines are designed to protect public health and ensure the safety of food consumption [4].

EFSA sets maximum levels for contaminants in food products within the European Union. Many countries also have their own national regulations governing heavy metal levels in food products. To illustrate the real-world implications of heavy metal contamination in lychee, let's look at a few case studies from different regions. In 2019, reports emerged of lychee orchards in Bihar, India, being contaminated with high levels of lead and cadmium. This raised concerns about the safety of lychee consumption in the region. Local authorities took measures to address soil contamination and educate farmers about safe agricultural practices. China is one of the largest lychee producers globally. Heavy metal contamination, particularly cadmium, has been reported in lychee-producing regions. The Chinese government has implemented stricter regulations and monitoring to ensure lychee safety. In Taiwan, where lychee is a popular fruit, researchers have conducted extensive studies on heavy metal contamination. Their findings have led to improved agricultural practices and public awareness campaigns to reduce heavy metal exposure.

## Discussion

Lychee is a delicious and nutritious fruit enjoyed by millions worldwide. However, like any agricultural product, it can be susceptible to heavy metal

\*Address for Correspondence: Siddhi Mashique, Department of Environmental Science, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia; E-mail: siddhimashique@gmail.com

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**Received:** 02 August, 2023, Manuscript No: jreac-23-116426; **Editor Assigned:** 04 August, 2023, PreQC No: P-116426; **Reviewed:** 16 August, 2023, QC No: Q-116426; **Revised:** 21 August, 2023, Manuscript No: R-116426; **Published:** 28 August, 2023, DOI: 10.37421/2380-2391.2023.10.434

contamination, which poses health risks to consumers. Understanding the sources of heavy metals in lychee and conducting rigorous health risk assessments are crucial steps in ensuring the safety of lychee consumption. Efforts to mitigate heavy metal contamination should encompass soil and water quality improvement, sustainable farming practices, and adherence to regulatory guidelines. Public awareness and education are also essential components of reducing the risks associated with heavy metal exposure through lychee consumption. Consumers, farmers, and regulatory authorities all play pivotal roles in safeguarding the quality and safety of lychee, ensuring that this delightful fruit remains a healthy and enjoyable addition to our diets.

Consuming lychee with elevated heavy metal concentrations can pose health risks to humans, as these metals can accumulate in the body over time and cause adverse health effects. The health risk assessment associated with lychee consumption involves evaluating the potential exposure to heavy metals and assessing the risks based on established guidelines and safety thresholds. Heavy metals like lead, cadmium, and arsenic are known to be toxic to humans. Chronic exposure to these metals through contaminated food can lead to various health problems; including Lead exposure can impair cognitive function, especially in children. Cadmium is known to accumulate in the kidneys and can lead to kidney dysfunction. Arsenic is classified as a carcinogen, and long-term exposure can increase the risk of various cancers, including skin, lung, and bladder cancer [5].

Regulatory agencies around the world have established safety thresholds and guidelines for heavy metal concentrations in food products, including fruits like lychee. These thresholds are designed to protect public health by limiting exposure to potentially harmful levels of heavy metals. For example, the World Health Organization (WHO) has set maximum permissible levels for lead, cadmium, and arsenic in various food items, including fruits. Compliance with these guidelines is essential to ensure the safety of lychee consumption [6].

## Conclusion

Health risk assessment involves estimating the potential health risks associated with the consumption of lychee with elevated heavy metal concentrations. This assessment takes into account factors such as the level of contamination, the amount of lychee consumed, and the body weight of the consumer. Researchers use mathematical models to calculate the health risk and determine whether the consumption of contaminated lychee poses an unacceptable risk to human health. If the calculated risk exceeds established safety thresholds, it may necessitate regulatory action, such as the removal of contaminated lychee from the market or the implementation of soil and water remediation measures in lychee orchards.

To reduce the health risks associated with heavy metal contamination in

lychee, several mitigation strategies. Improving soil quality by removing or treating contaminated soil can reduce heavy metal uptake by lychee trees. Using clean and uncontaminated irrigation water is crucial to prevent heavy metal accumulation in lychee. Regular testing of lychee fruit for heavy metal contamination can help identify and address issues promptly.

## Acknowledgement

None.

## Conflict of Interest

There is no conflict of interest by author.

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**How to cite this article:** Mashique, Siddhi. "Lychee Heavy Metal Occurrence and Health Risk Assessment." *J Environ Anal Chem* 10 (2023): 434.