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Determination of Heavy Metals in Henna using Inductively Coupled Plasma Optical Emission Spectroscopy

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Structured Abstract

Background: This research addresses concerns about heavy metal contamination in henna products, widely used for tattoos and hair colouring. A study in Zliten, Libya, highlighted variable heavy metal content, emphasizing the need for manufacturing oversight. Heavy metals like lead and mercury pose health risks, especially in black henna, prompting the investigation into potential dangers and intentional additions. The study recommends using inductively coupled plasma optical emission spectrometry (ICP-OES) for accurate heavy metal analysis, ensuring consumer safety and compliance with regulatory limits.

Methods: Each henna sample (approximately 2g) will undergo digestion with 10ml of nitric acid at room temperature for 15 minutes, followed by microwave-assisted digestion. After cooling, the digested solution will be transferred into a volumetric flask using 1% HNO3. The final volume will be adjusted to 100 mL with deionized water, filtered through a 0.45 µm Millipore membrane syringe filter, and stored in polyethylene bottles at room temperature. Heavy metal analysis, including Fe, Zn, Cd, Hg, and Mg, will be conducted using ICP-OES within a week of storage after injection into the system. This methodology ensures efficient digestion, accurate quantification, and timely analysis of heavy metal concentrations in henna samples.

Results: This study demonstrates that three henna brands, namely Super Lebat, Desyham, and Jamu Jelita, exhibit heavy metal concentrations below the maximum limits stipulated by regulatory standards. The highest concentration, recorded at 10.219 ppm, is attributed to magnesium in the Super Lebat brand, while the lowest concentration is associated with cadmium in the Jamu Jelita brand, recorded as 0 ppm. This disparity is attributable to the exceptionally low intensity observed, particularly when compared to the established standard range of 0 to 1 ppm.

Conclusion: In conclusion, this research focuses on ensuring the safety of henna use and minimizing its environmental impact by examining the concentrations of metals, such as cadmium and mercury, in henna products. The study found that all heavy metals in these products are within acceptable limits according to regulatory thresholds, affirming their safety for consumer use and compliance with environmental regulations.

Keywords: Heavy metals, henna, ICP-OES, regulations.

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