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HEAVY METALS IN SLIPPERY ELM DIETARY SUPPLEMENTS

TEŠKI METALI U DODACIMA PREHRANI CRVENOG BRIJESTA

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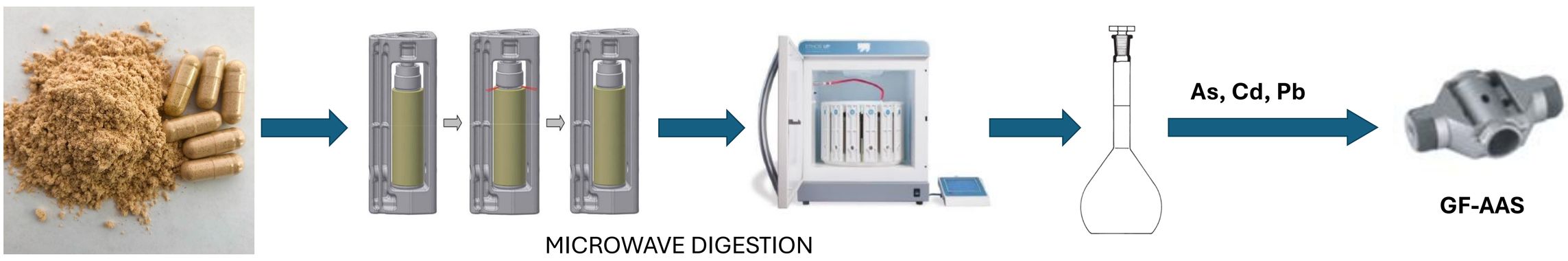
INTRODUCTION

The scientific and healthcare communities have been consistently warning about the quality issues associated with dietary supplements, particularly the presence of harmful agents like metal impurities. Even at trace levels, heavy metals can be extremely harmful to human health, making their analytical determination a critical and essential topic. This has attracted considerable attention from regulatory agencies. The implementation of the ICH Q3D guideline, with its quality risk assessment approach, is a significant milestone in harmonizing the control of metal impurities in dietary supplements worldwide, and a crucial step in ensuring the need for quality control measures.
In traditional medicine, dietary supplements containing slippery elm (*Ulmus rubra*), also known as red elm, are used orally to treat gastrointestinal and urinary tract disorders and topically for skin diseases. For this reason, this study aimed to evaluate the content of heavy metal impurities (As, Cd, Pb, and Hg) in slippery elm-containing formulated dietary supplement products.

SAMPLE

The metal impurity content was evaluated in seven samples containing slippery elm. The samples were collected from local pharmacies, health food stores, or online stores. The collected dietary supplement samples were in different dosage forms, such as hard capsules (5 samples) and tablets (2 samples).

METHODS



SLIPPERY ELM DIETARY SUPPLEMENTS

MICROWAVE DIGESTION

MERCURY CONTENT
Total mercury content in the investigated samples was measured using AMA-254 with HS cuvette (Altec, Praha, Czech Republic) without sample pre-treatment. Briefly, each sample (100±1 mg) was weighed into a vessel, then placed in a furnace and thermally decomposed under the following conditions: drying time 60 s, decomposition time 150 s, and cuvette clear time 45 s. A silicon UV diode detector is used for mercury quantification, and the peak area was measured at a wavelength of 253.6 nm.

RESULTS AND DISCUSSION

According to the ICH Q3D guideline, class 1 contains four heavy metals: arsenic, mercury, lead, and cadmium. The results of the heavy metals content of the investigated dietary supplements are presented in Figure 1. As can be seen, a high incidence was found for Pb (100%) and Cd (85.7%). Pb content was observed in a wide range from 34.9 to 438.1 µg/kg, while Cd content was detected in a narrow interval, up to a maximum value of 58.7 µg/kg. The determination of heavy metals from oral dosage forms needs a very sensitive and selective analytical technique that can quantify the trace level of metals present as contaminants in the complex matrices. Using a sensitive method (LOD = 18 ng/kg; LOQ = 54 ng/kg), Hg content was detected in one hard capsule (1.4 µg/kg). It should be noted that the As content was below the LOQ (41.5 µg/kg) in all samples.

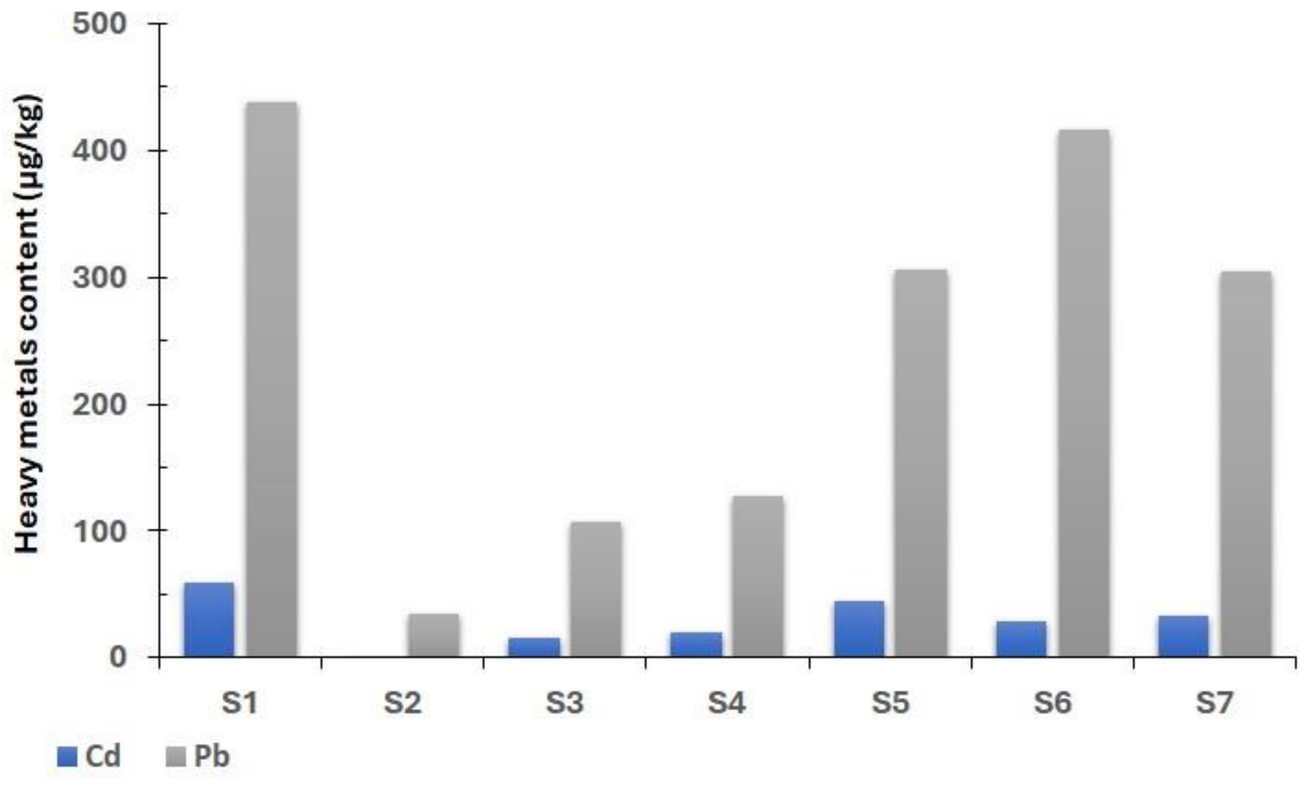


Figure 1. Heavy metals content in slippery elm dietary supplements.

CONCLUSION

These findings underscore the importance of our research in understanding and mitigating the risks associated with heavy metal contamination in dietary supplements. The results indicate the necessity of continuously monitoring heavy metal impurities in these samples.