

Ensuring the Safety and Quality of Novel Foods Through Development of Insect Protein Certified Reference Material

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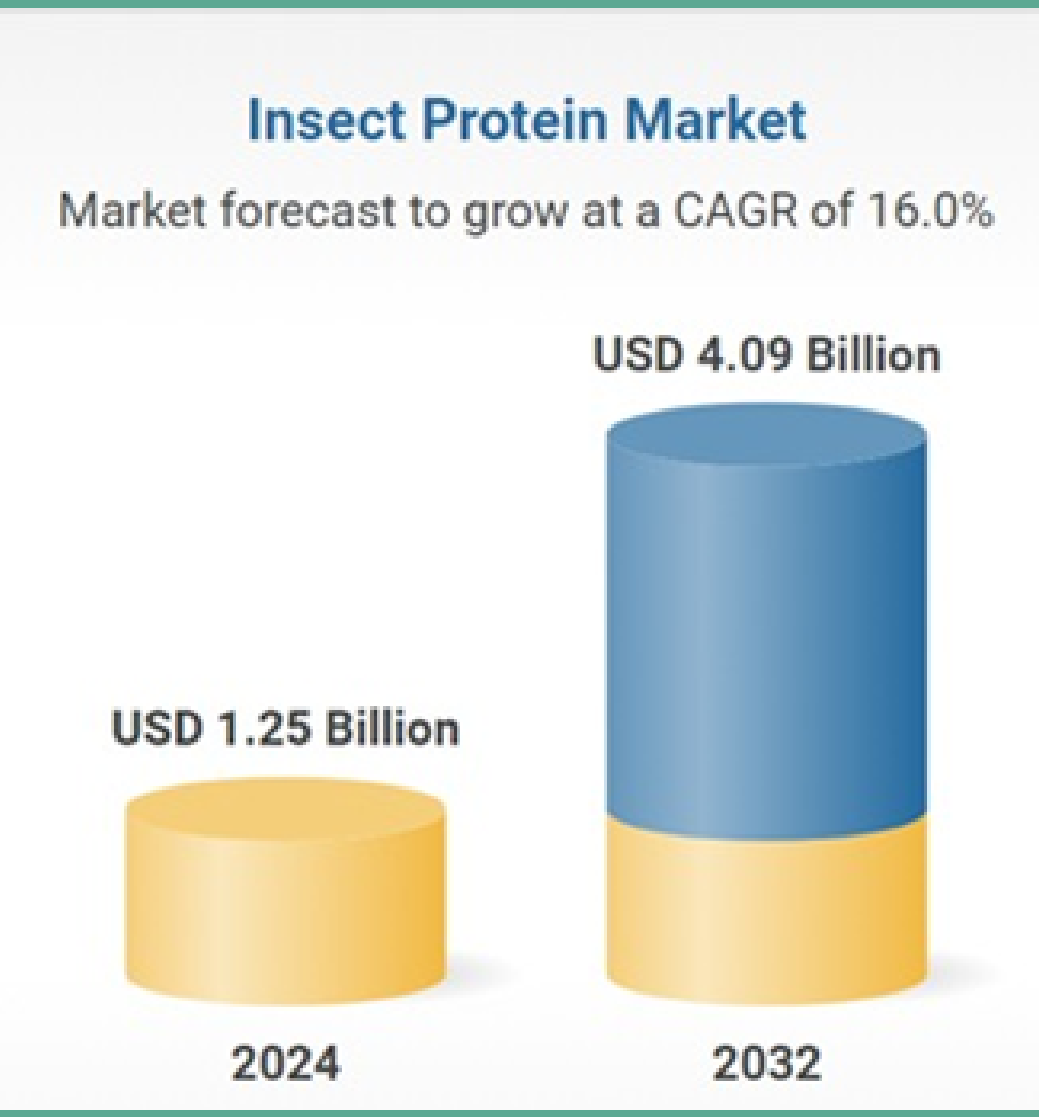
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Introduction

As the global regulatory landscape for novel foods evolves, many countries are developing frameworks to assess the safety and quality of alternative proteins, including cell-based and insect-based products. Singapore has taken a leading role, approving the sale of cultured meat in 2020 and the consumption of 16 insect species in 2024, demonstrating its commitment to food innovation, sustainability, and safety.

Interest in insect protein is growing due to its sustainability and low environmental impact. This poster explores methods for producing insect-based certified reference materials (CRM) for inorganic contaminants. While insects provide a viable alternative to traditional proteins, ensuring their safety requires reliable analytical methods and reference materials, which remain limited, especially for contaminants.



<https://www.researchandmarkets.com/reports/6036860>

Objective

To produce naturally incurred cricket powder material that contain elevated levels of inorganic contaminants (arsenic, cadmium, chromium, mercury, lead, arsenic species) and selenium as well as to develop the material into a CRM for insect protein matrix in accordance with the requirements of ISO 17034 and Guide 35.

Methodology

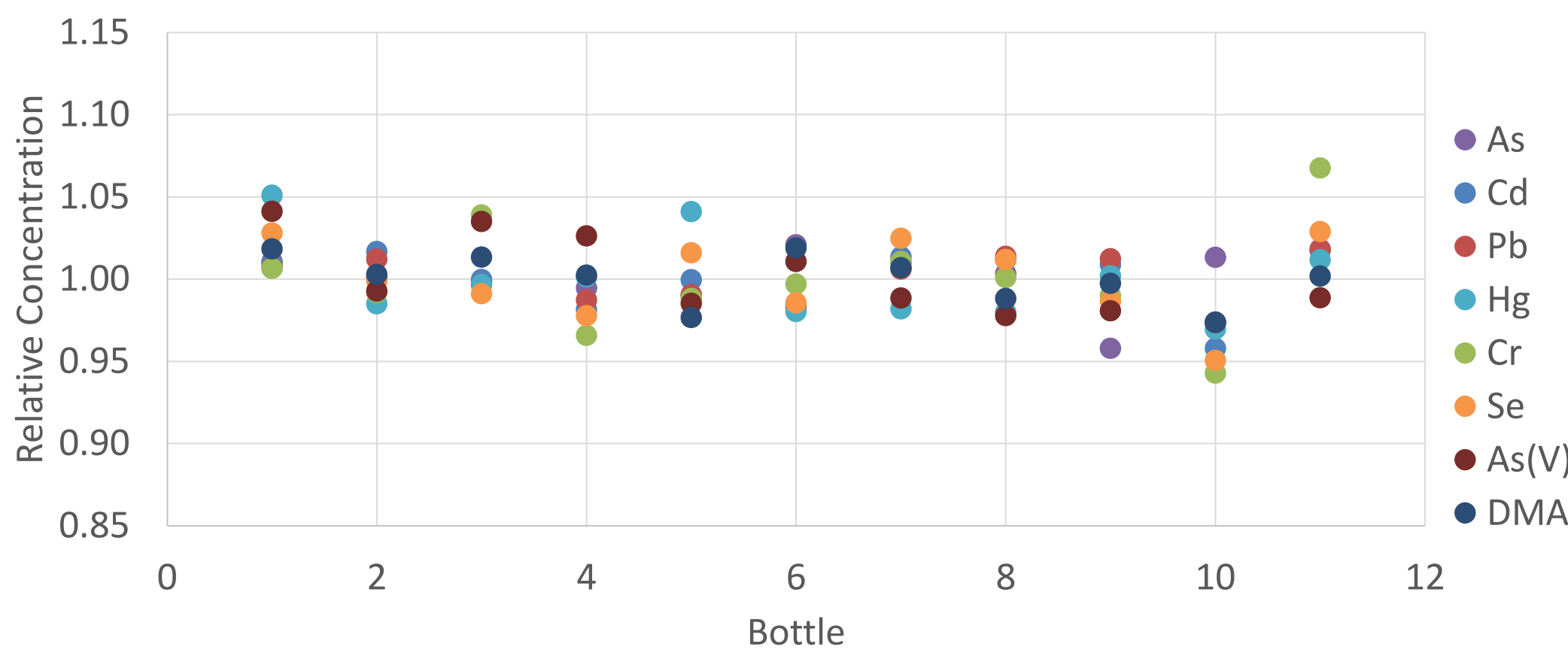


References

1. International Standards Organization. ISO 17034, General requirements for the competence of reference material producers. ISO, Switzerland. 2016. <https://www.iso.org/standard/29357.html>
2. International Standards Organization. ISO Guide 35, Reference materials — Guidance for characterization and assessment of homogeneity and stability. ISO, Switzerland. 2017. <https://www.iso.org/standard/60281.html>

Results

Homogeneity Study



All analytes were deemed to be sufficiently homogeneous. There was no observed bottling trend for all analytes.

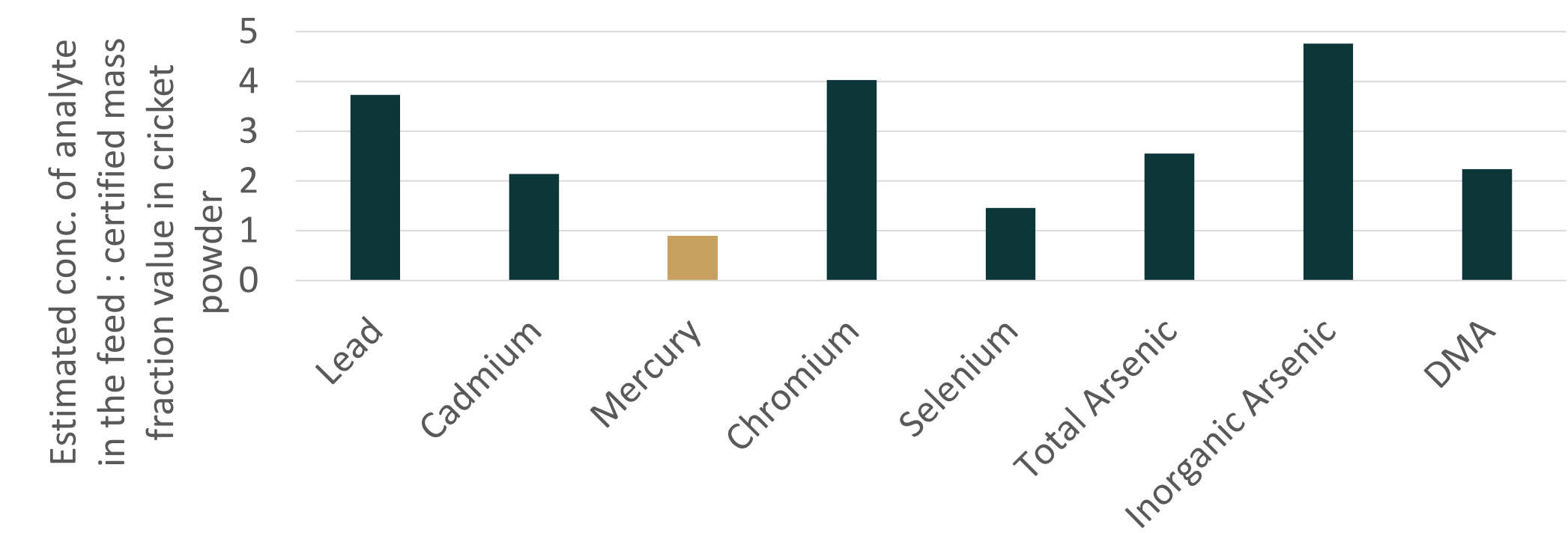
Value Assignment

The mass fractions of elements and arsenic species were determined by using exact-matching isotope dilution mass spectrometry (IDMS) (cadmium, mercury, lead, chromium and selenium) and standard addition (total arsenic, arsenic species) method.

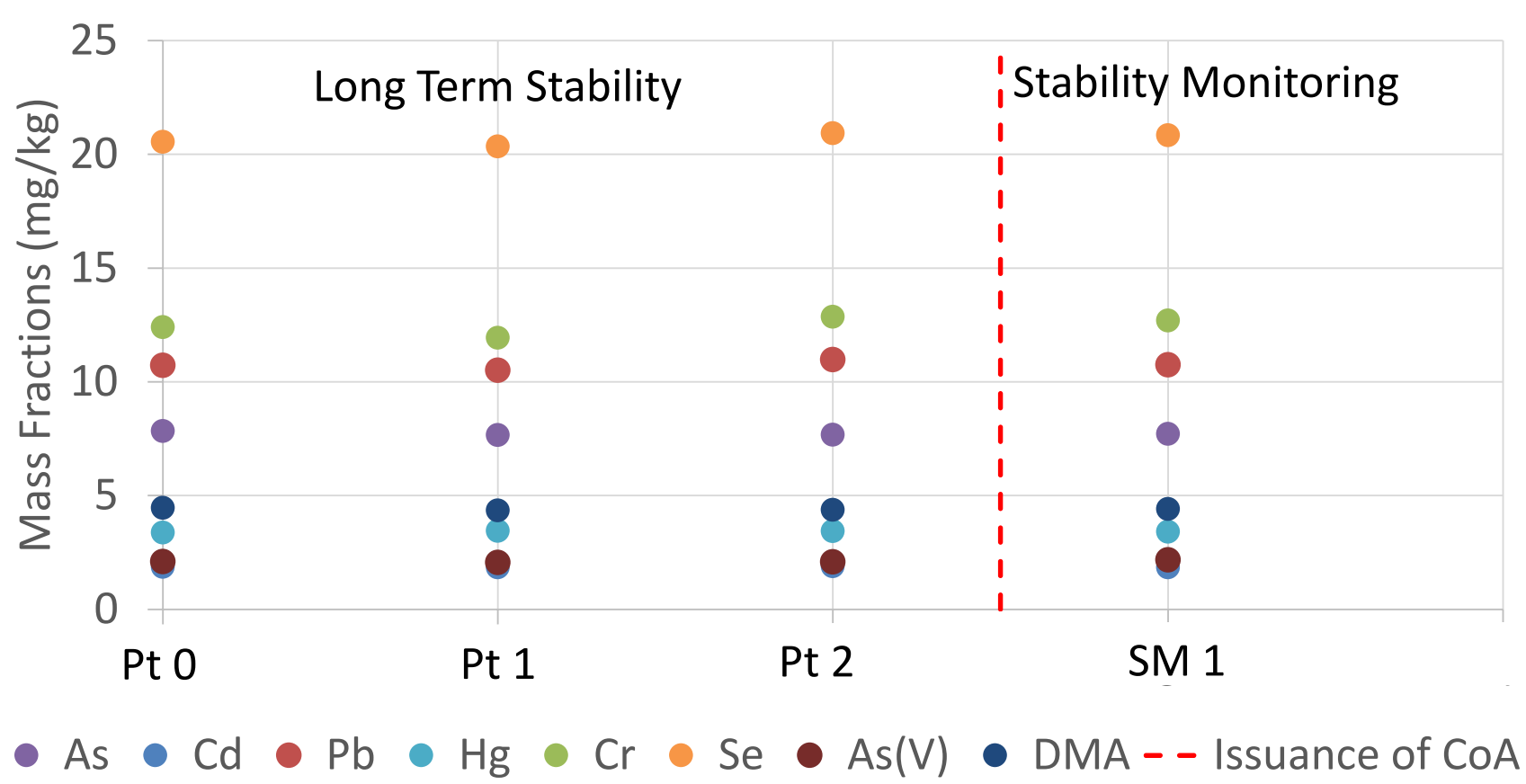
Analyte	Certified mass fraction (mg/kg)
Lead	10.69 ± 0.71
Cadmium	1.87 ± 0.09
Mercury	3.38 ± 0.24
Chromium	12.40 ± 1.94
Selenium	20.55 ± 1.27
Total Arsenic	7.84 ± 0.74
Inorganic Arsenic [As(V)]	2.10 ± 0.17
Dimethylarsinic acid (DMA)	4.46 ± 0.43

The relative uncertainties due to between-bottle inhomogeneity (u_{bb}), long-term stability (u_{ts}) and characterisation (u_{char}) were considered in the combined uncertainty of each analyte

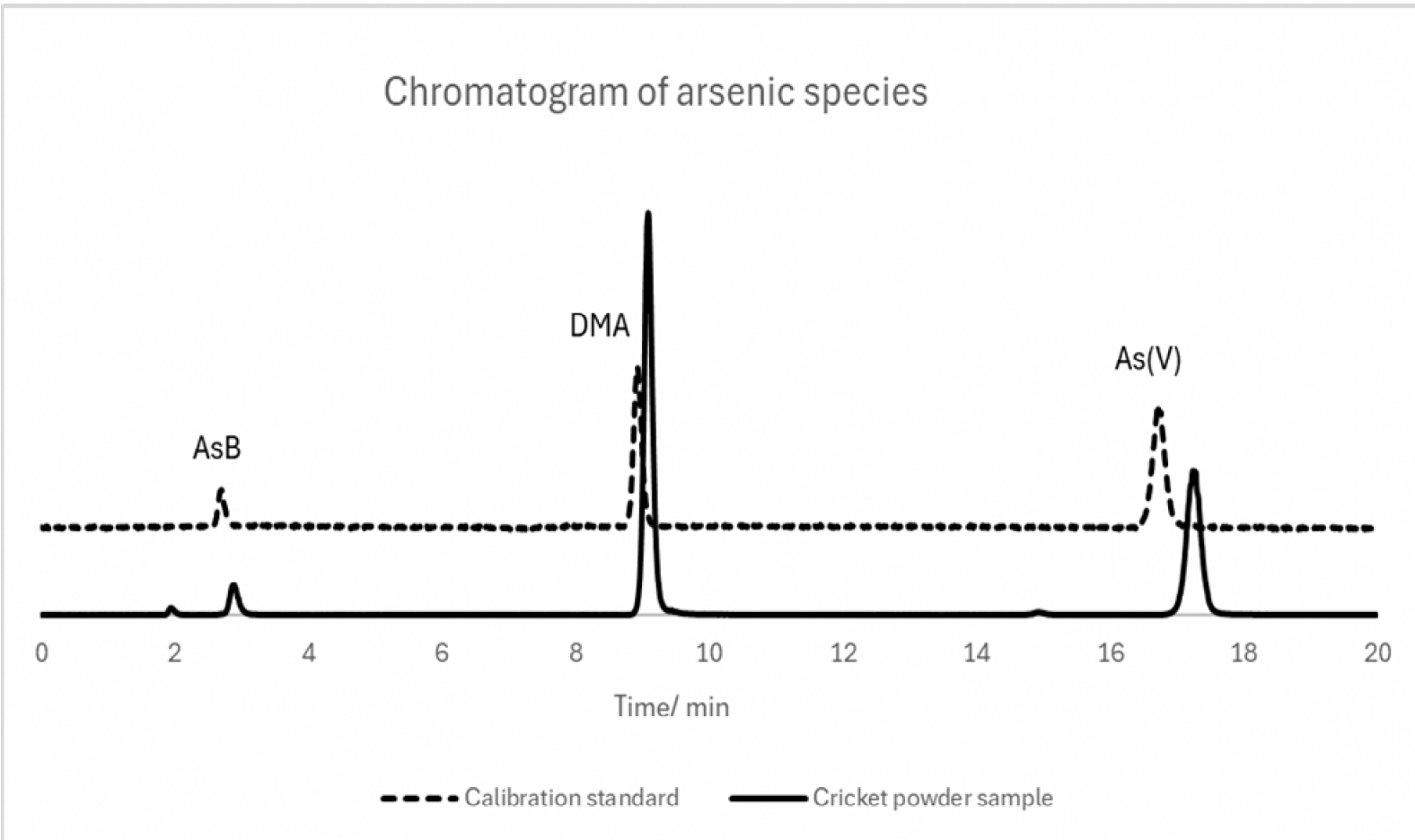
Accumulation of Contaminants



Stability Study



All analytes demonstrated no statistically significant instability. Stability continues to be monitored following the issuance of the Certificate of Analysis (CoA).



There was an effective separation of As(V) and DMA in the sample.

- Mercury had a ratio lower than 1.
- The ratios for other toxic elements, such as lead, cadmium, arsenic, and the more toxic form of arsenic species – inorganic arsenic – were higher than 2.
- These suggest that the cricket species may have the ability to process and excrete these toxic analytes rather than accumulate them in their bodies.

Conclusions

- This CRM helps to address the gap caused by the limited availability of matrix-matched CRMs with elevated inorganic contaminants, serving as a crucial quality control tool for laboratories.
- Further innovation is needed to develop CRMs for organic contaminants, allergens, and other markers, given the diversity of edible insects with distinct analytical challenges, to support laboratories and regulatory bodies.
- Progress in developing insect-based CRMs will enhance food safety, quality, and consumer trust, contributing to a sustainable and resilient food future.