

## Thermal desorption GC/MS on human dental calculus detected minute millet consumption in medieval Ukraine

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### Abstract:

This study presents a novel biomolecular approach for detecting broomcorn millet (*Panicum miliaceum*) consumption by analysing the plant biomarker miliacin (olean-18-en-3 $\beta$ -ol methyl ether) in human dental calculus. Conventional methods, such as stable isotope analysis of bone collagen, often fail to identify low-level C4 plant consumption due to the need for substantial dietary intake. To address this limitation, thermal desorption–gas chromatography–mass spectrometry (TD-GC/MS) was applied to dental calculus samples from individuals buried at the medieval Ostriv site in Ukraine. Miliacin, a pentacyclic triterpene methyl ether uniquely abundant in broomcorn millet, was identified in eight of the analysed samples. These findings provide the first molecular evidence for millet consumption at trace levels in human remains and demonstrate the viability of using dental calculus to recover dietary plant biomarkers. Stable isotope analysis of dentin collagen revealed depleted  $\delta^{13}\text{C}$  values in several individuals with detected miliacin, confirming that millet consumption would have been overlooked by conventional isotopic approach. This methodological advance significantly improves the resolution of dietary reconstructions and opens new possibilities for studying underrepresented plant foods in archaeological contexts.

\* Excerpted from online journal website (Click the title)

### Frontier Labs Products used:

Multi-Shot Pyrolyzer (EGA/PY-3030D), Ultra ALLOY<sup>+</sup>-5