Foods 2025 Conference
The 6th International Electronic Conference on Foods
28–30 October 2025 | Online
MDPI

Development of an analytical approach to assess the persistence of Alternaria mycotoxins in tomato-based products and under simulated gastrointestinal digestion

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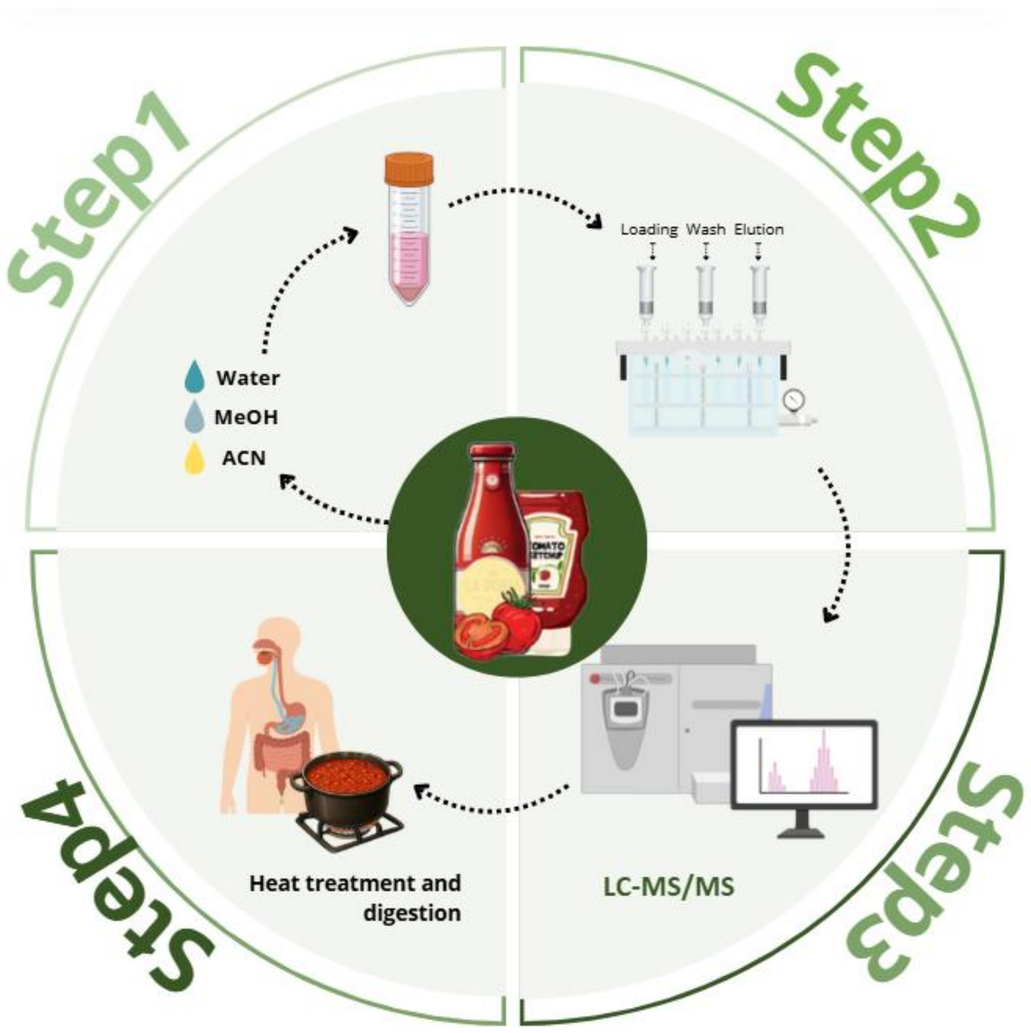
INTRODUCTION & AIM

Contamination by *Alternaria spp.* has become a significant issue in recent years, largely driven by climate change. The primary concern is its production of various mycotoxins with demonstrated toxic effects *in vitro* and *in vivo*. The most frequently detected in food products are alternariol (**AOH**), alternariol monomethyl ether (**AME**), tentoxin (**TEN**) and tenuazonic acid (**TeA**).

Although specific regulations are not yet established, in 2022 the European Union has recommended the monitoring of these toxins setting indicative levels in various food products, including processed tomatoes, that represent one of the main sources of exposure for the general population.
This study aimed to develop a rapid and straightforward analytical pipeline to monitor and quantify these toxins in tomatoes and their derived products throughout the production and digestion process.

METHOD



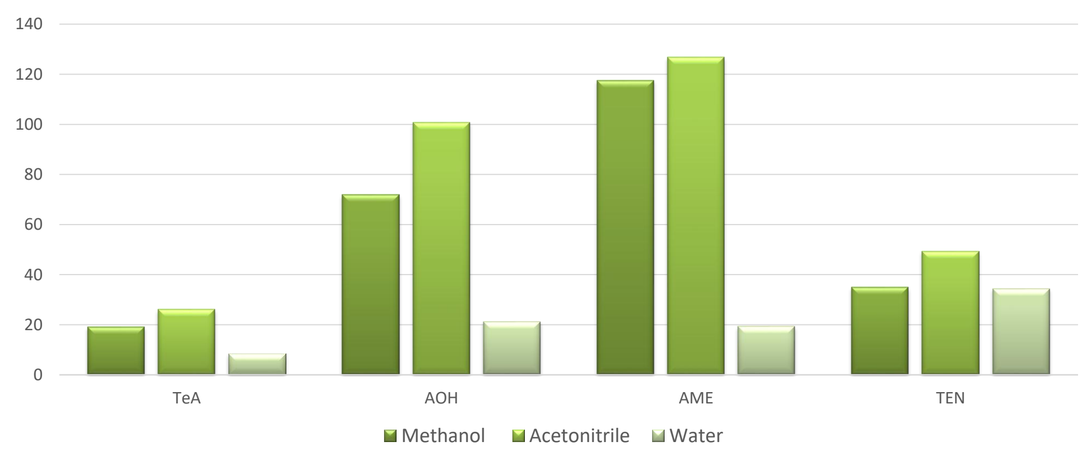
1
Optimization of the extraction using solvents most commonly reported in the literature, such as water, methanol and acetonitrile, individually and in different proportions.

2
SPE was carried out with different cartridges (Strata X, Sep-Pak) to identify the one with the highest affinity. The protocol was then optimized to maximize recovery and minimize losses

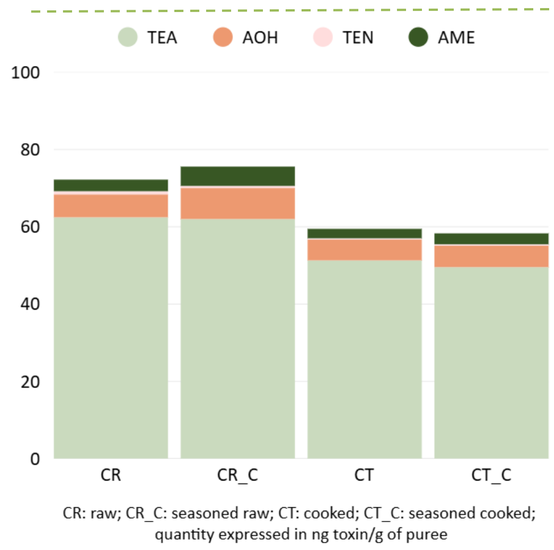
3
The Orbitrap detector was operated in positive ion acquisition mode, providing high mass resolution and mass accuracy in the parts-per-billion range.

4
Assessment of the persistence of mycotoxins under different conditions, as **heat treatment** or during a simulated **gastrointestinal digestion** of different food products, following the INFOGEST protocol.

RESULTS & DISCUSSION



Data obtained are aligned with the literature one demonstrating an higher extraction capability of the **acetonitrile**.

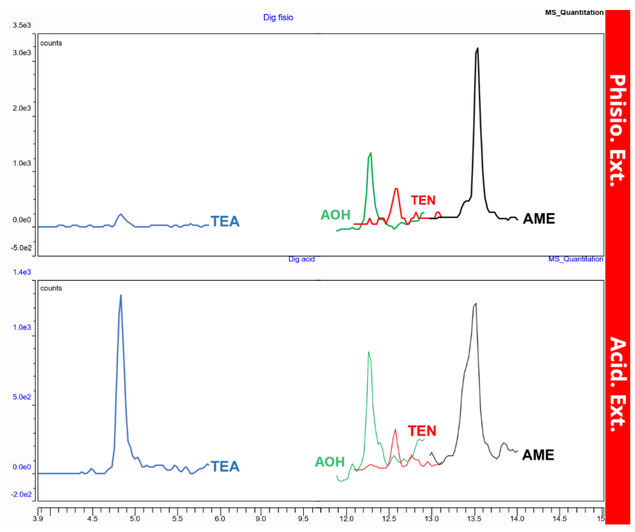


CR: raw; CR_C: seasoned raw; CT: cooked; CT_C: seasoned cooked; quantity expressed in ng toxin/g of puree

Preliminary data suggest that after 30 minutes of cooking AOH, AME, TEN remained unaltered while the detectable level of TeA toxin decreased by 25% (p-value: <.001).

In vitro digestion results suggest that AOH, AME and TEN remain unaltered in the soluble duodenal fraction after digestion.

In contrast, efficient extraction of TeA required acidification of the digestate to be detected, indicating that it has limited solubility under physiological conditions.



CONCLUSION

Further research is required to improve and standardize toxin extraction methods, considering the chemical heterogeneity of these compounds and their occurrence in diverse food matrices.

The analysis of INFOGEST data enabled the monitoring of mycotoxins throughout the simulated gastrointestinal process and the assessment of their bioaccessibility.

FUTURE WORK / REFERENCES

Future work will focus on exploring alternative processing strategies to reduce the presence of *Alternaria* mycotoxins in tomato-derived products, as well as on the development of field-deployable chemosensors to support real-time monitoring and guide the appropriate allocation of raw materials within the agri-food industry.