Group: Laboratory of Organic Chemistry (ORC)

Project: Detection of ergot alkaloids using ambient ionisation mass spectrometry.

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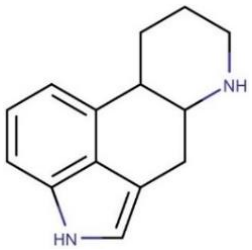
Introduction

A major challenge for agriculture and the food industries is contamination with mycotoxins, typically produced by a cross-talk between fungi and complex matrix. Among these, ergot alkaloids (EAs)., including ergometrine, ergotamine, ergocristine, ergokryptine, ergosine, and ergocornine are characterized by tetracyclic ergoline ring core. EAs that contaminate cereal crops and food products are highly toxic, causing ergotism disease, leading to hallucinations, vomiting, weakness, and even death.



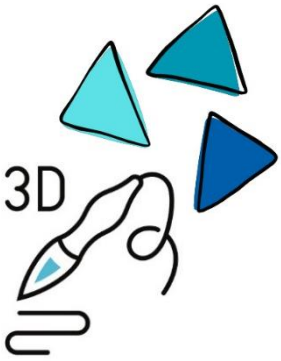
Tetracyclic ergoline ring

Routine methods for mycotoxin detection are highly sensitive, selective, and reproducible but time-consuming, expensive, and involve extensive sample preparation. Ambient ionisation mass spectrometry (AIMS) is a collection of techniques in which analytes are ionised outside a vacuum source in ambient conditions, requiring little to no sample preparation. AIMS that are relatively quick and suitable for on-site application offers valuable tools for mycotoxin detection and contamination monitoring. Two approaches are of specific interest and can be explored within this thesis project: (i) Paper Spray (PS) is an AIMS technique where high voltage is applied to the triangular paper containing the sample, inducing ionisation resembling ESI. PS is affordable, paper can be modified, sample preparation is not complex, and allows on-site testing with (trans)portable MS; (ii) MasSpec Pen is another AIMS technique that can be applied for on-site testing on 3D surfaces. The device is a hand-held interface directly linked to the MS. MasSpec Pen is disposable, repeatable, and biocompatible for rapid sample identification.

Objectives

The objectives of the project are to develop AIMS method that can be applied on-site for ergot alkaloids detection using PS and/or a designed and constructed MasSpec Pen-like device.

Methodology



- PS-MS: method development for EAs standards
- 3D-printing: creating a MasSpec Pen-like device
- MasSpec Pen-like device-MS: method development for EAs standards
- LC-MS/MS: comparison of the results
- Data analysis

Requirements

- Full-time availability – the project duration is 6 months
- MSc or BSc thesis student

Contact information

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