

Analysis of Ion Mobility Spectrometer Data for Evaluating Volatile Organic Compounds to Detect Potato Rot in Storage Facilities

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BACKGROUND

- Tubers in potato storage facilities are highly susceptible to rot.
- Ion Mobility Spectrometer (IMS) can be used to identify volatile organic compounds (VOCs) associated with the rot.
- Early detection and mitigation of potato rot can reduce economical losses for farmers and processors.



Figure 1: Potato storage facility

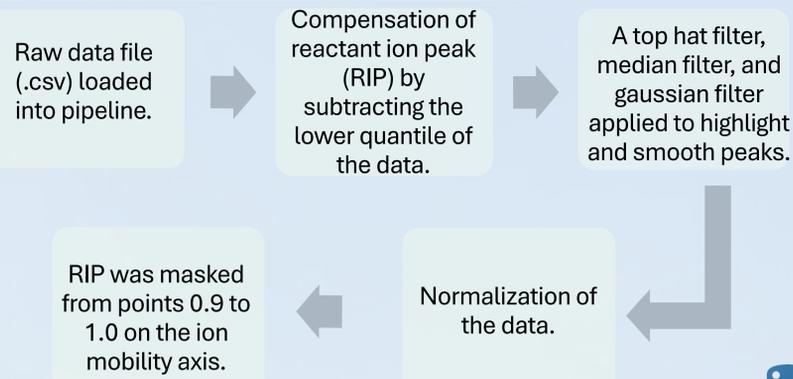
NEED

- Gas chromatography-IMS (GC-IMS) requires a data processing pipeline to denoise and visualize the data, so that VOCs can be compared among multiple samples.
- Field asymmetric IMS (FAIMS) data requires algorithm to classify samples as healthy or infected potato tubers.

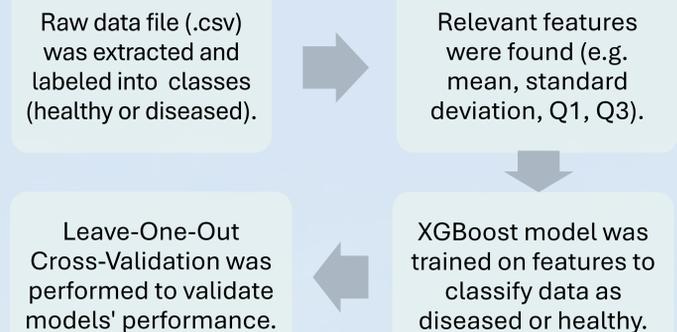
OBJECTIVES

- Develop data processing pipeline to analyze GC-IMS raw data to identify peaks associated with VOCs.
- Develop a machine learning pipeline to classify FAIMS potato data.

METHODOLOGY (GC-IMS)



METHODOLOGY (FAIMS)



RESULTS

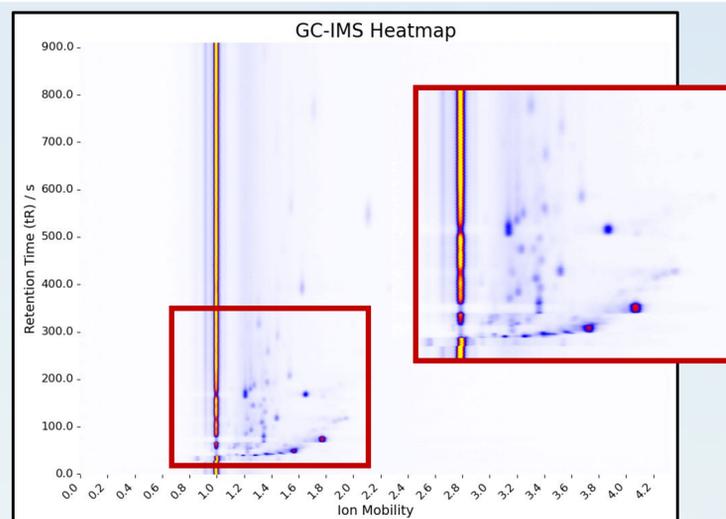


Figure 2a: Freeze dried potato sample data before pipeline

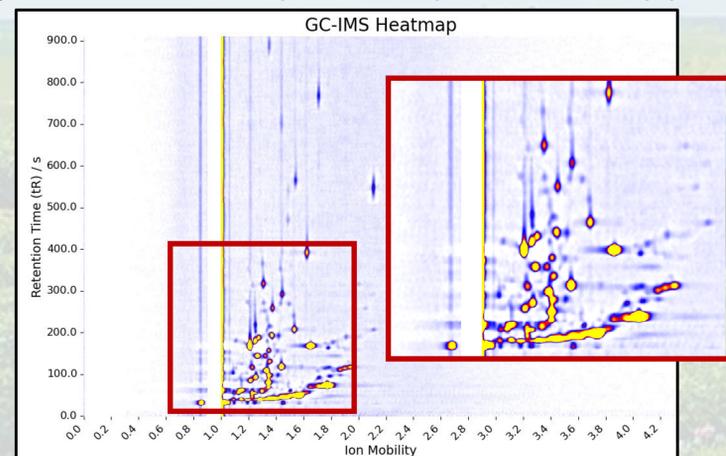


Figure 2b: Freeze dried potato sample data after pipeline

The pipeline effectively enhanced peaks and denoised the data and was similar to graphs produced by propriety software (IONyos).

RESULTS

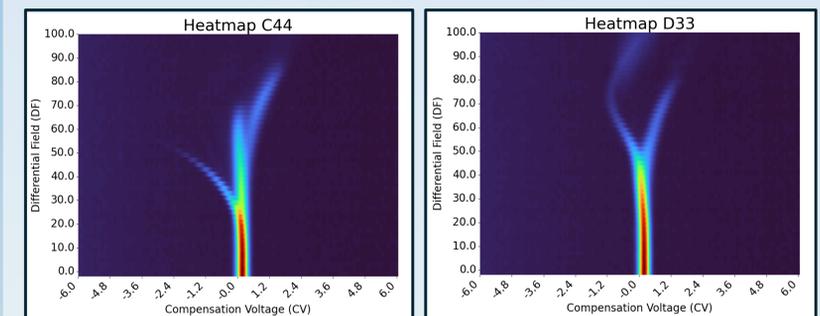


Figure 3a: Healthy sample Figure 3b: Inoculated sample

- Potato data that was measured on days 14 and 15 after inoculation was used to train and test the model.
- Preliminary results showed model to be 80-90% accurate.

Class	Precision (%)	Recall (%)	F1-Score (%)	Accuracy (%)
Diseased	100	85	92	92
Healthy	84	100	91	
Weighted Average	93	92	92	

Figure 4: Representative classification result

Acknowledgment

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