

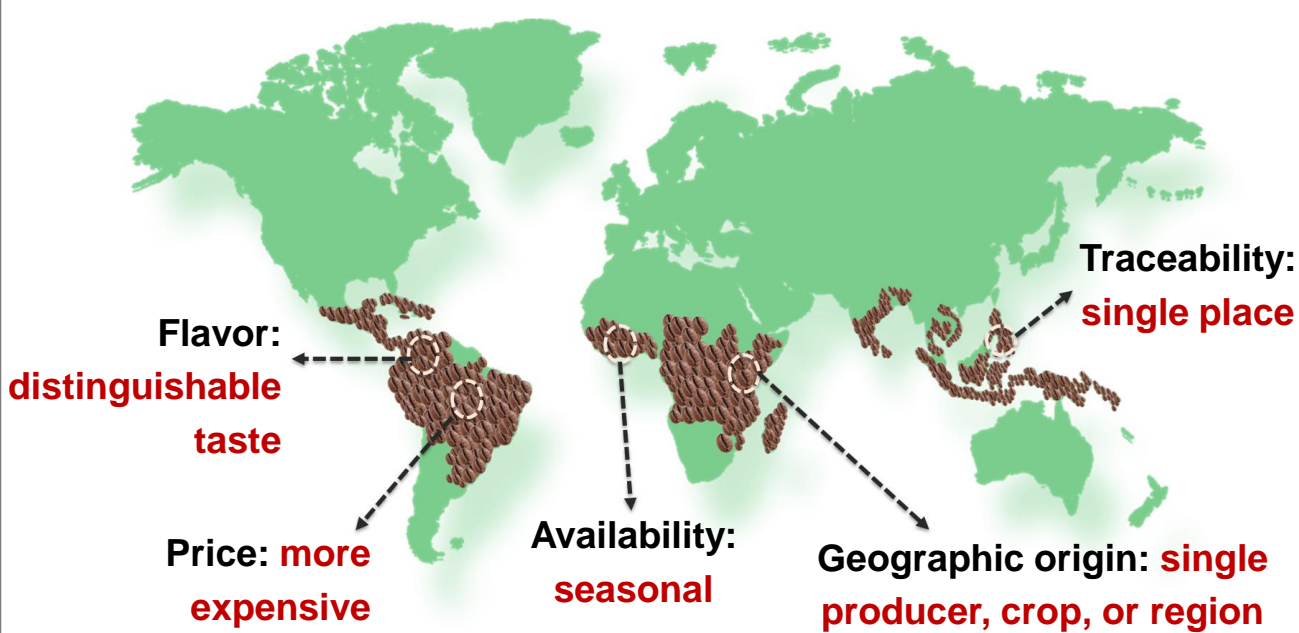
Natural volatile compound markers: Novel Authentication and Detection of Adulteration in Single-Origin Green Coffee Beans using Online SIFT-MS

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Background

- Widespread and diversified adulteration of high-quality coffee has become frequent
- Economically motivated adulteration: Market-driven adulteration due to the significant price disparity between and within the cultivars of coffee *Arabica* and *Robusta*
- Effects of coffee adulteration:
 - Economic impact
 - Roasting and brewing inconsistencies
 - Coffee products with poor sensory attributes
- Gap: Sensitive, robust, and rapid methods to detect coffee adulteration

Single-Origin Coffee Beans: Characteristics



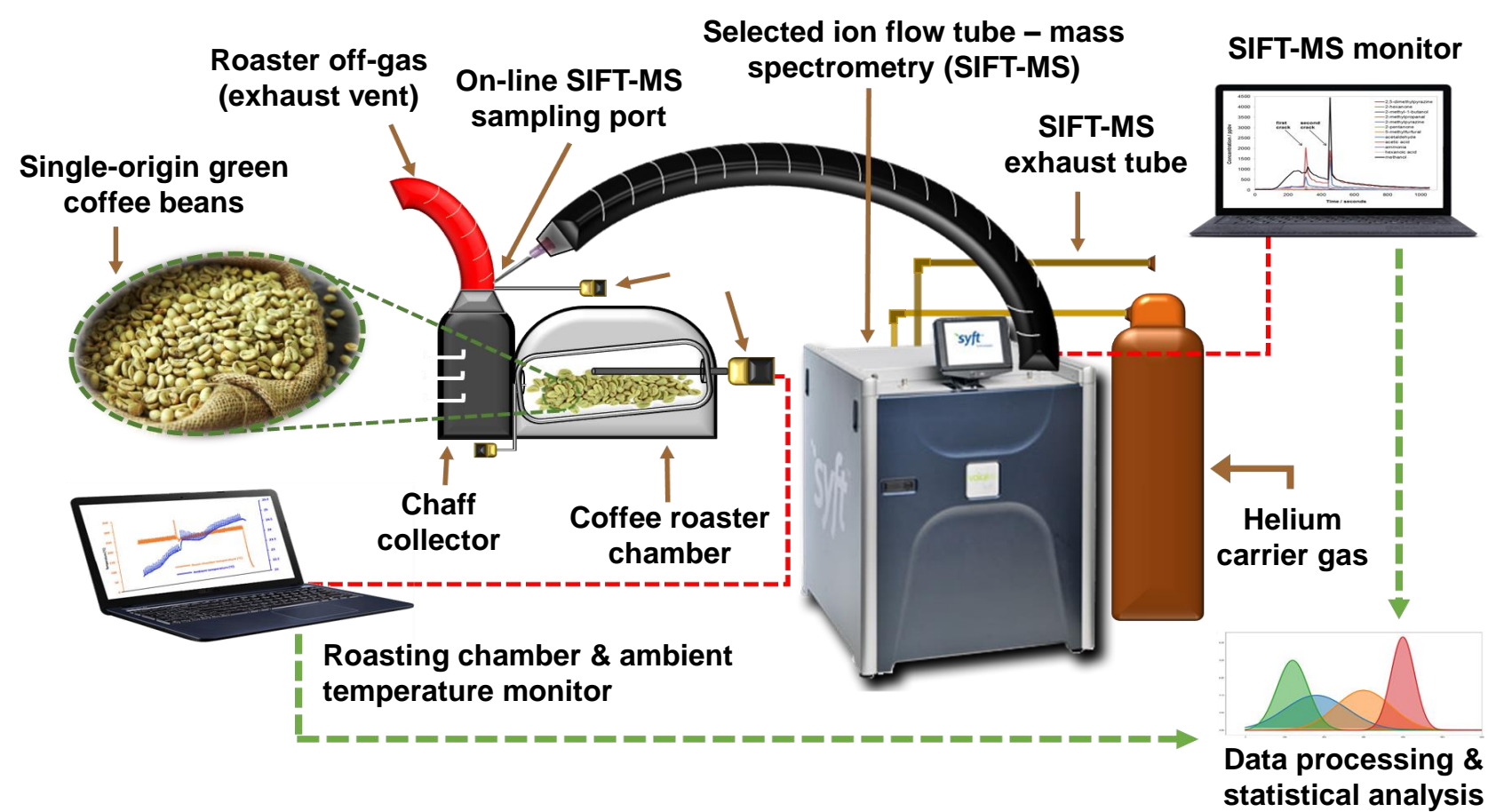
Research Objective & Significance

Develop an effective and high-throughput SIFT-MS-based analytical methodology for coffee authentication and detection of coffee adulteration

Experimental: Design

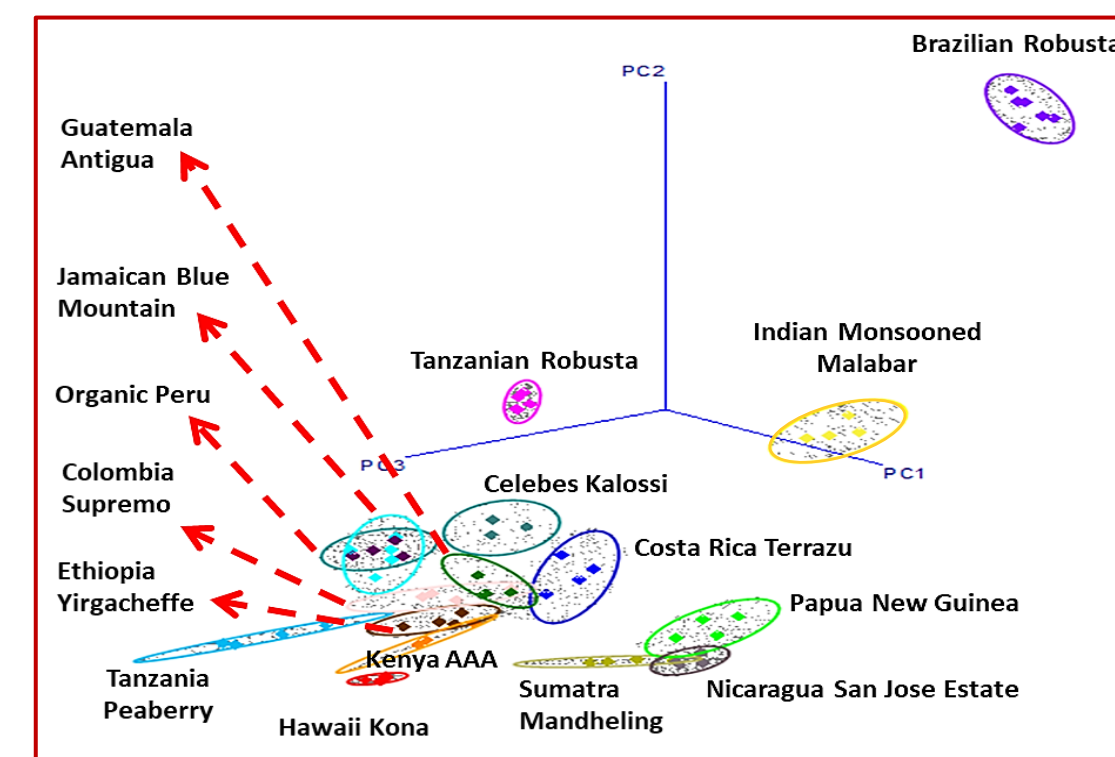
- Experiment 1:** On-line headspace analysis of volatile compounds during roasting of pure and mixed single-origin green coffee beans using selected ion flow tube- mass spectrometry (SIFT-MS)
- Experiment 2:** Develop a predictive & adaptable [volatile compound-based] model system for coffee authentication and detection of adulteration

Instrumentation: Coffee Bean Roasting with Online SIFT-MS

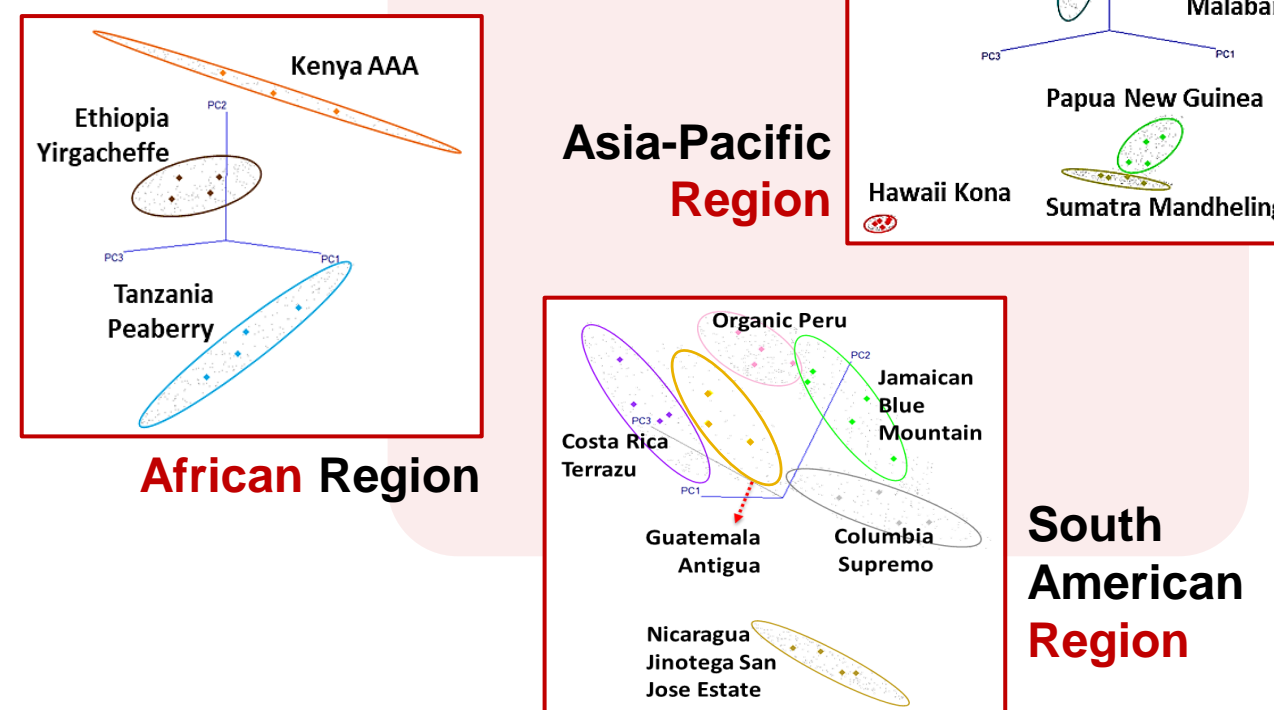


Results: Coffee Authentication with Chemometrics

SIMCA-PCA classification: 16 pure single-origin green coffee beans based on volatile compound profile

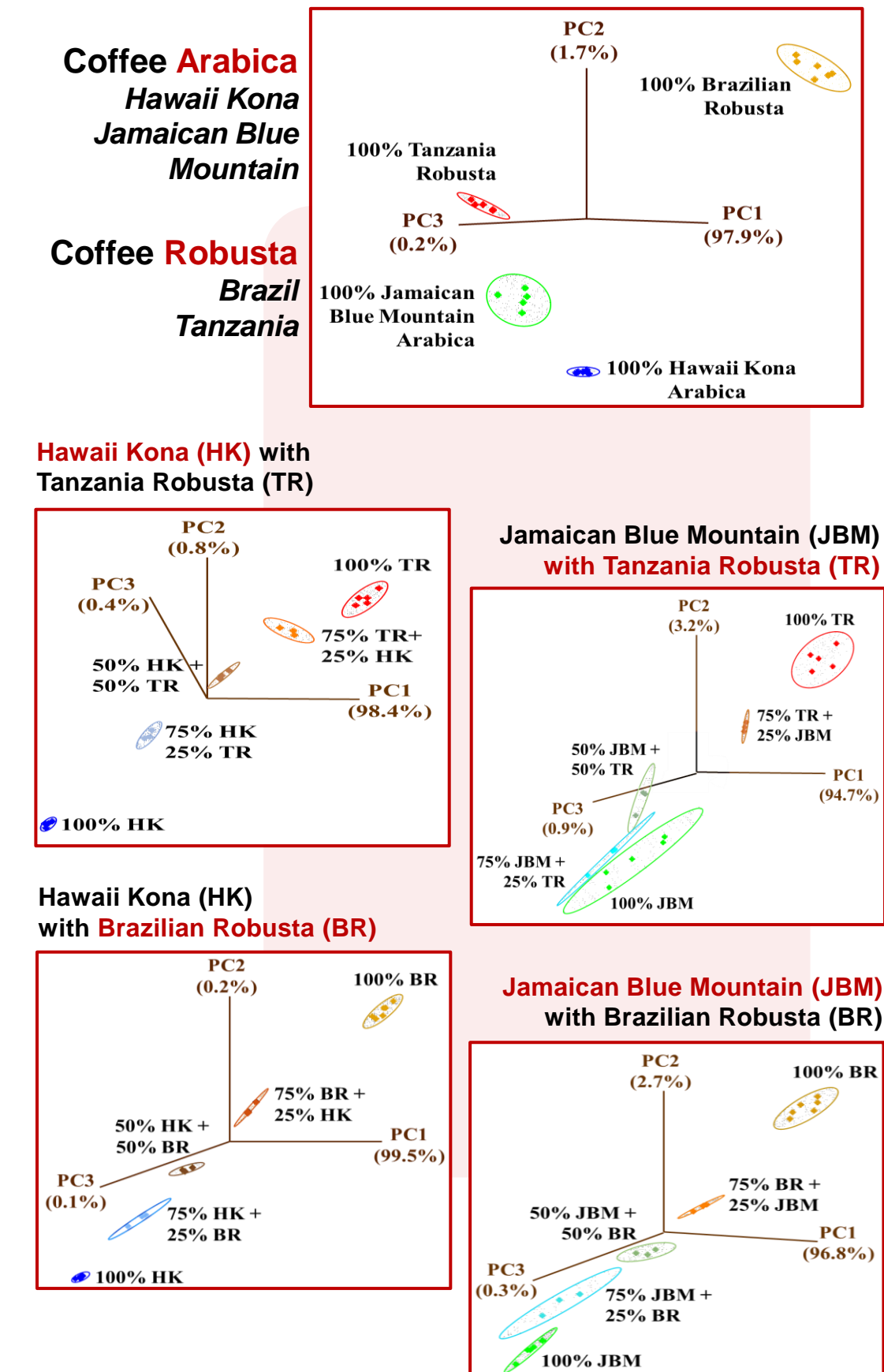


Regional-based classification of single-origin green coffee beans



Results: Coffee Adulteration with Chemometrics

SIMCA-PCA classification: Coffee Arabica vs. Coffee Robusta



Summary of Findings

- ✓ Distinct formation and development of volatile compounds during coffee roasting where emission profiles are unique for each coffee variety
- ✓ Identified key volatile markers: used in classifying single-origin coffee beans
- ✓ Adaptable model systems are convenient for classifying coffee beans based on cultivar, region of origin, or type of coffee
- ✓ Coffee adulteration was accurately predicted using model systems & has the potential to determine the identity, amount, and extent of coffee adulteration

Selected References

Gloss, A. N. et al., 2014. *Int J Mass Spectrom.* 365-366:324-337.
Toci, A. T., Farah, A., Pezza, H. R. & Pezza, L., 2016. *Crit Rev Anal Chem.* 46(2):83-92.

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