



Chemical Characterization and Authentication of Crocus Sativus (Saffron) Using LC-q-ToF-MS and Advanced Chemometrics

Anthi Panara, Reza Aalizadeh and Nikolaos Thomaidis*



Laboratory of Analytical Chemistry, Department of Chemistry, National and Kapodistrian University of Athens, Panepistimioupolis Zografou, 15771 Athens, Greece, e-mail: ntho@chem.uoa.gr

Crocus Sativus (Saffron)

Origin

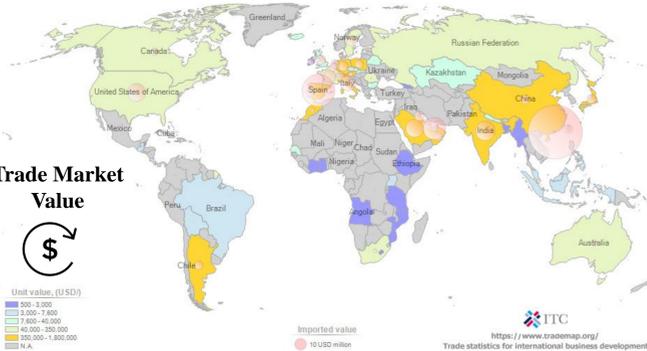


A Saffron is a spice derived from the flower of Crocus sativus plant, commonly known as "saffron crocus" and it belongs to the Iridaceae family. It is cultivated mainly in countries like Iran, India, Italy, New Zealand, Spain, Portugal, Greece and Morocco.

Trade Market Value



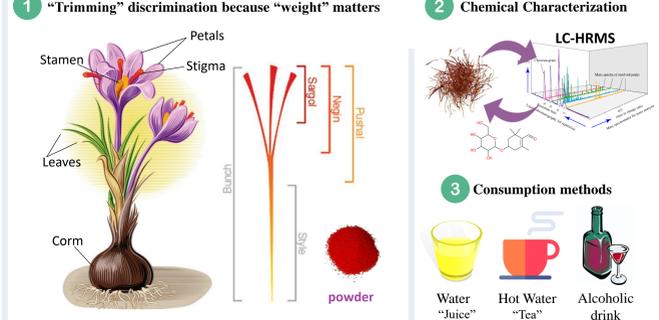
List of importing countries for "Saffron" in 2018



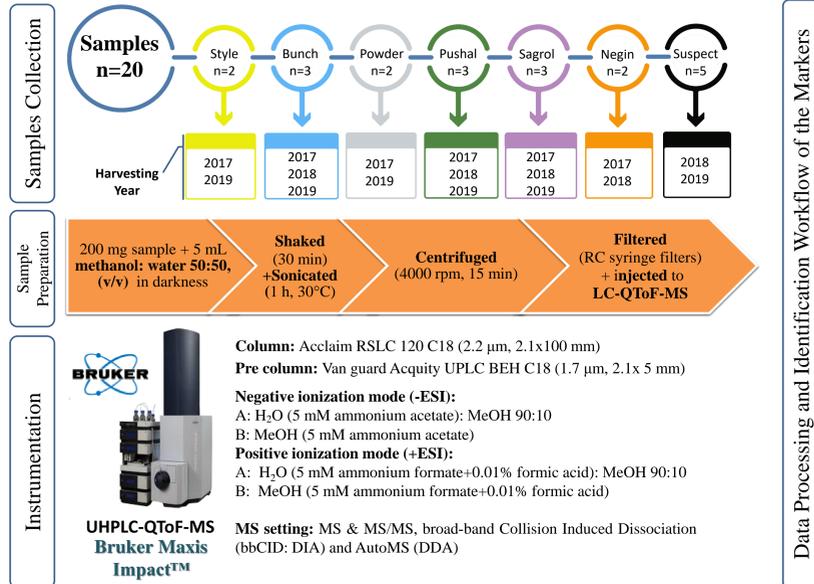
Health Benefits

- Anti-Depressant
- Anti-Parkinson
- Anti-Alzheimer
- Anti-Hypertensive
- Anti-Atherosclerotic
- Antioxidant
- Anti-Inflammatory
- Genoprotective
- Anti-Tumorigenic

Research is needed on...

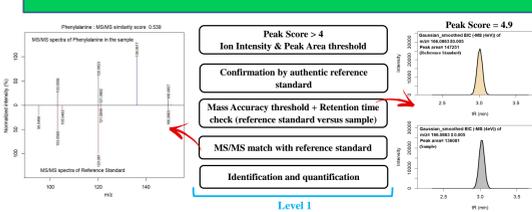


Methodology



Data Processing and Identification Workflow of the Markers

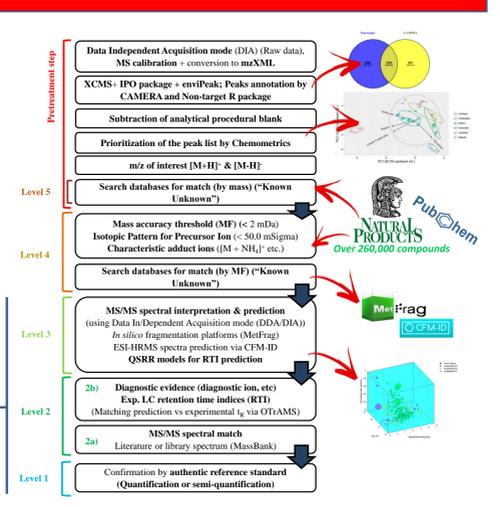
Target Screening workflow



Suspect Screening workflow

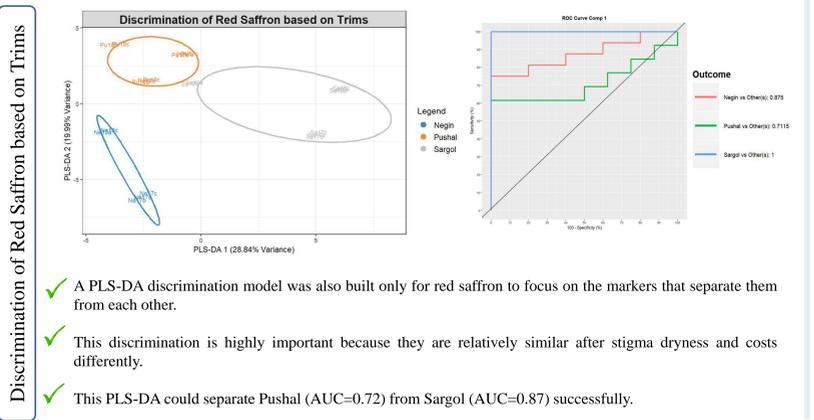
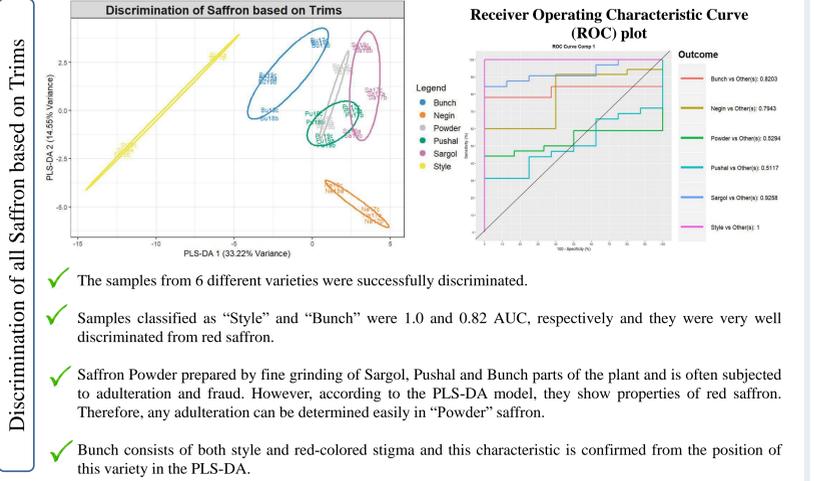


Non-target Screening workflow

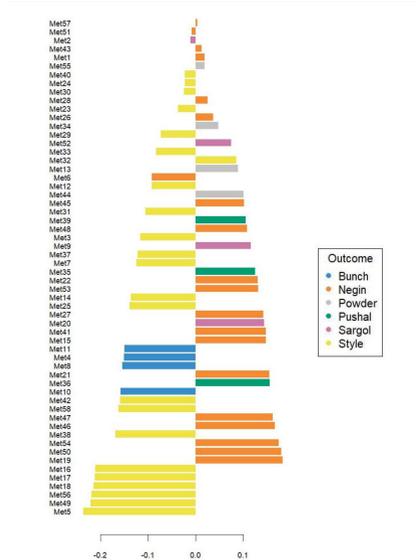


Time, Effort & Number of False Positives....

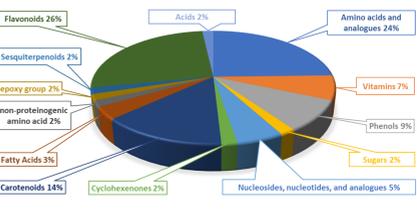
Results



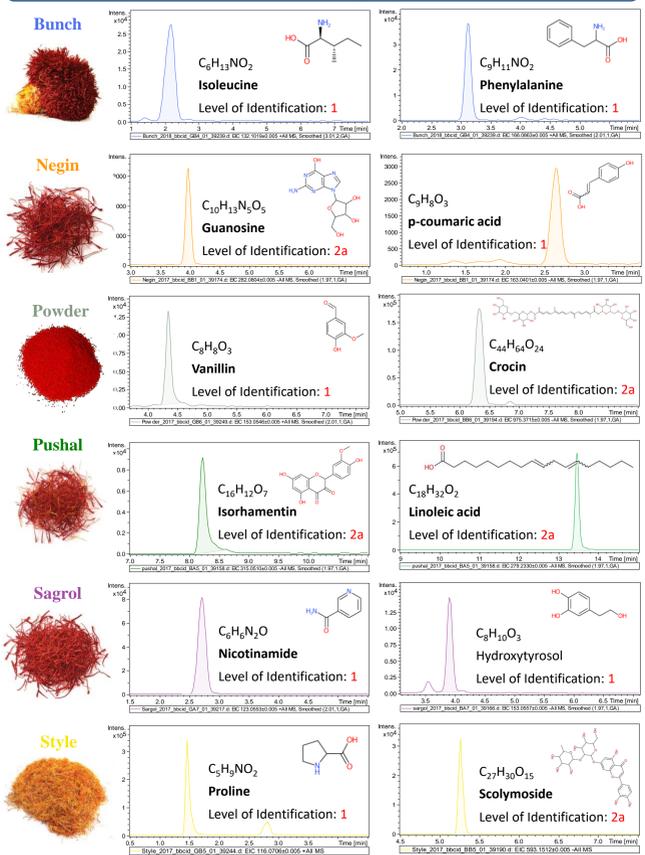
Contribution of metabolites used by PLS-DA model and "Trims" discrimination



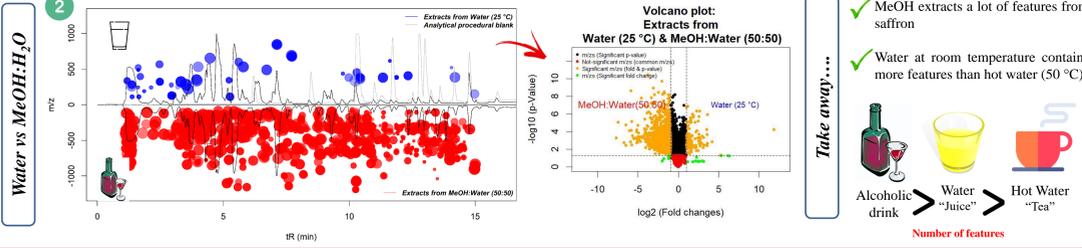
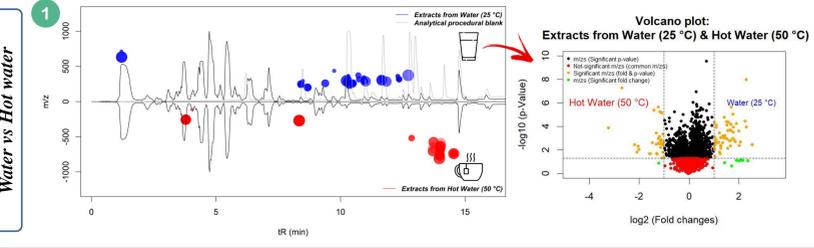
Overall Chemical Content of Saffron



Example of top 2 metabolites identified at high abundance according to each "Trimming" method



Consumption methods



Conclusions

- Six different varieties of saffron were chemically characterized and the authenticity study was conducted.
- The sample preparation method was simple and effective. The analysis was performed by Liquid-Chromatography High Resolution Mass Spectrometry (LC-HRMS).
- PLS-DA was a useful tool for discriminating the saffron samples, which were prepared by various trimming methods.
- Although it was observed that the bioactive content of each category is affected by the harvesting year, the samples of different harvesting years can be grouped and discriminated from the other varieties.
- Totally, 60 metabolites were identified by target, suspect and non-target screening workflows. These compounds belonged to amino acids, vitamins, flavonoids, carotenoids, antioxidants, phenolic compounds, cyclohexanones and fatty acids.
- The bioactive content of saffron is affected by the way of cooking. High temperature destroys important components. The proposed ways to drink saffron are in cool water or an alcoholic drink.