2023 Master internship at University of Cadiz

TITLE

Analytical tools in viticulture, agri-food and forensic chemistry

LAB & PEOPLE

- Name of the hosting lab: AGR291
- General activities of the lab:
    - Development and application of separation and spectroscopic methods of interest in wine, food and forensic chemistry
    - Automation of sample preparation and interpretation of analytical results
    - New methods for characterization and detection of food fraud
    - Advanced methods for determining food components of interest and materials used in their production and preservation
    - Use of waste and by-products from the agri-food industry
    - Evaluation of new techniques for the preparation of alcoholic beverages
    - Quality in analytical laboratories
    - Machine learning techniques in analytical sciences

- Website: agr291.uca.es
- Number of staff / PhD: 9/8
- Supervisor name and contact: Ana Ruiz (ana.ruiz@uca.es) / +34956016775

TOPIC OF THE INTERNSHIP

- Scientific context of the internship (max 20 lines)

  We offer internship positions related to the following research lines:

    - Effects of cultivation techniques on final fruit quality

The student will work on the effect of cultivation techniques on final fruit quality. Several different kind of compounds will be determined to evaluate the fruit quality, including organic acids, sugars, phenolic compounds and volatile compounds.

Both, extraction methods and separation methods will be used during the internship.

The student will be able to develop extraction methods for the target compounds. Solid phase extraction, solid phase microextraction, headspace analysis, thermal desorption, ultrasound-assisted extraction, microwave-assisted extraction, pressurized liquid extraction and enzymatic extraction could be developed by the student to produce the extracts for later analysis.

Regarding the chromatographic work. The student will develop methodologies for the identification of the compounds of interest through ultra-high performance liquid chromatography coupled to mass spectrometry (UHPLC-MS) and analysis of these compounds by ultra-high performance liquid chromatography coupled to diode array detection (UHPLC-DAD). For volatiles compounds, the student will work with HS-GC-MS, TD-GC-MS or SPME-GC-MS.

Keywords

Analytical chemistry, food characterization, food frauds, wine production, machine learning.

Bibliography

Our full scientific production can be found at :
https://produccioncientifica.uca.es/grupos/8272/publicaciones

Our most recent 20 papers are the following ones :

2023

1. The effect of ripening on the capsaicinoids composition of Jeromin pepper (Capsicum annuum L.) at two different stages of plant maturity
   Food Chemistry, Vol. 399

2. Sulfur dioxide-free Verdejo wines through the use of a pure stilbene extract: exploring possible synergistic effect with glutathione
   Journal of the Science of Food and Agriculture, Vol. 103, Núm. 3, pp. 1152-1160

3. Response Surface Methodology Optimization for Analytical Microwave-Assisted Extraction of Resveratrol from Functional Marmalade and Cookies
   Foods, Vol. 12, Núm. 2

4. Optimizing an Enzymatic Extraction Method for the Flavonoids in Moringa (Moringa oleifera Lam.) Leaves Based on Experimental Designs Methodologies
   Antioxidants, Vol. 12, Núm. 2

5. Optimization of a New Ultrasound-Assisted Extraction Method of Caffeic Acid from the Aerial Parts of Coriandrum sativum by Using Experimental Design and Ultra-Performance Liquid Chromatography
   Separations, Vol. 10, Núm. 2

6. Optimization of a Microwave-Assisted Extraction Method for the Recovery of the Anthocyanins from Jabuticaba By-Products
   Agronomy, Vol. 13, Núm. 2

7. Grapevine shoots extract as an alternative to SO2 in rosé wines. A double approach: Classical measurements and 1H NMR metabolomics
   Food Control, Vol. 152

8. Capsaicinoid Content in the Pericarp and Placenta of Bolilla Peppers (Capsicum annuum L.) throughout the Ripening of the Fruit at Two Different Stages of Plant Maturation
   Agronomy, Vol. 13, Núm. 2

9. A Rapid Method for Authentication of Macroalgae Based on Vis-NIR Spectroscopy Data Combined with Chemometrics Approach
   Water (Switzerland), Vol. 15, Núm. 1

2022

1. Analytical Methods and Application of Separation Techniques in Food Science
   Separations

2. Co-precipitation of grape residue extract using sub-and supercritical CO2technology
   Journal of CO2 Utilization, Vol. 61

3. Assessment of Volatile Compound Transference through Firefighter Turnout Gear
   International Journal of Environmental Research and Public Health, Vol. 19, Núm. 6

4. Article Optimal Design Approach Applied to Headspace GC for the Monitoring of Diacetyl Concentration, Spectrophotometric Assessment of Phenolic Compounds and Antioxidant Potential in Different Fermentation Processes of Barley
   Applied Sciences (Switzerland), Vol. 12, Núm. 1

5. Antioxidant Activity of Aqueous and Ethanolic Extracts of Coconut (Cocos nucifera) Fruit by-Products
   Agronomy, Vol. 12, Núm. 5

6. Analysis of compounds with oenological interest in somatic variants of grapevines
   Horticulturae, Vol. 8, Núm. 1

7. An ultrasound-based technique for the analytical extraction of phenolic compounds in red algae
   Arabian Journal of Chemistry, Vol. 15, Núm. 2

8. An electrochemical alternative for evaluating the antioxidant capacity in walnut kernel extracts
   Food Chemistry, Vol. 393

9. A microwave-based extraction method for the determination of sugar and polyols: Application to the characterization of regular and peaberry coffees
   Arabian Journal of Chemistry, Vol. 15, Núm. 3

10. A comparison study between ultrasound–assisted and enzyme–assisted extraction of anthocyanins from blackcurrant (Ribes nigrum L.)
    Food Chemistry: X, Vol. 13

11. A New Electrochemical Method to Determine Tryptophan in Fruit Juices: Development and Validation
    Foods, Vol. 11, Núm. 14

- Tasks and duties entrusted to the student:

1. To prepare a research proposal based on the literature provided by the supervisor (1-2 weeks)
2. To run a training period in the lab (2-3 weeks) with the supervisor and the technicians
3. To develop the research proposal (2-6 months)
4. To prepare 3 reports :
    a. Initial report including the research proposal
    b. Intermediate report including information about the training period and the starting results from the training period
    c. Final report including
        i. All data obtained from the intership period
        ii. Critical evaluation of the data, including the data analysis
        iii. A draft of a manuscript to be evaluated by the supervisor. In case the results are excellent it will be proposed to be prepared for a scientific publication

- Skills to be acquired or developed:

    - Experience in research duties

    - Training in specific analytical procedures

    - Training in data analysis

PROFILE OF THE DESIRED STUDENT

- Minimum level of study required: Running a master degree

- Field(s) of study: chemistry, food or environmental studies

- Scientific skills : basic experience in labs

- Language skills required : English

THE INTERNSHIP ASSIGNMENT:

Desired duration of the internship (in months): 3-6 months

Desired Starting date of the mission: Any time between *September 2023 to March 2024 to be finished by July 2024*

Indicative weekly schedule: *25h / week*

Remuneration : *No*

Internship agreement: *an internship agreement will be signed.*

To SEA-EU students:

If you're interested please send your CV and letter of motivation to the scientist in charge, email ana.ruiz@uca.es before the date 30/09/ 2023.