



## 2023 Master internship at the 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: Gerardo Fernández Barbero ([gerardo.fernandez@uca.es](mailto:gerardo.fernandez@uca.es)) / +34649130647

### TOPIC OF THE INTERNSHIP

- Scientific context of the internship (max 20 lines)

We offer internship positions related to the following research lines:

- Extraction techniques of natural compounds and antioxidants in fruits, vegetables and mushrooms.
- Chromatographic analytical methods.

The student will work on the development of extraction techniques for natural products and compounds with marked antioxidant activity in fruits, plants and mushrooms. Among the

extraction techniques that the student will be able to study are ultrasound-assisted extraction, microwave-assisted extraction, pressurized liquid extraction and enzymatic extraction.

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).

### **Keywords**

Analytical chemistry, food characterization, fruits, plants, mushrooms, extraction techniques, chromatographic analysis.

### **Bibliography**

My full scientific production can be found at :

<https://produccioncientifica.uca.es/investigadores/112509/publicaciones>

My most recent 20 papers are the following ones :

## **2023**

**Title 1:** Application of Direct Thermal Desorption–Gas Chromatography–Mass Spectrometry for Determination of Volatile and Semi-Volatile Organosulfur Compounds in Onions: A Novel Analytical Approach.

**Journal:** Pharmaceuticals, 2023, 16 (5), Article ID: 715.

**DOI:** 10.3390/ph16050715

**Title 2:** Optimization of a Microwave-Assisted Extraction Method for the Recovery of the Anthocyanins from Jaboticaba By-Products.

**Journal:** Agronomy, 2023, 13 (02), Article ID: 00556.

**DOI:** 10.3390/agronomy13020556

**Title 3:** Optimizing an Enzymatic Extraction Method for the Flavonoids in Moringa (*Moringa oleifera* Lam.) Leaves based on Experimental Designs Methodologies.

**Journal:** Antioxidants, 2023, 12 (02), Article ID: 0369.

**DOI:** 10.3390/antiox12020369

**Title 4:** 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.

**Journal:** Agronomy, 2023, 13 (02), Article ID: 00435.

**DOI:** 10.3390/agronomy13020435

**Title 5:** The effect of ripening on the capsaicinoids composition of Jeromin pepper (*Capsicum annuum* L.) at two different stages of plant maturity.

**Journal:** Food Chemistry, 2023, 399, 133979.

**DOI:** 10.1016/j.foodchem.2022.133979

## 2022

**Title 6:** Essential Mineral Content (Fe, Mg, P, Mn, K, Ca, and Na) in Five Wild Edible Species of *Lactarius* Mushrooms from Southern Spain and Northern Morocco: Reference to Daily Intake.

**Journal:** Journal of Fungi, 2022, 8 (12), Article ID: 1292.

**DOI:** 10.3390/jof8121292

**Title 7:** Optimization of a Microwave Assisted Extraction Method for Maximum Flavonols and Antioxidant Activity of Onion Extracts.

**Journal:** Antioxidants, 2022, 11 (12), Article ID: 2393.

**DOI:** 10.3390/antiox11122393

**Title 8:** Ultrasound-Assisted Extraction of Betalains from *Opuntia* Fruit Pulp of Different Color Varieties.

**Journal:** Agronomy, 2022, 12 (11), Article ID: 02604.

**DOI:** 10.3390/agronomy12112604

**Title 9:** Optimization of an Enzyme-Assisted Extraction Method for the Anthocyanins Present in Açai (*Euterpe oleracea* Mart.).

**Journal:** Agronomy, 2022, 12 (10), Article ID: 02327.

**DOI:** 10.3390/agronomy12102327

**Title 10:** Ultrasound-Assisted Extraction of Total Phenolic Compounds and Antioxidant Activity in Mushrooms.

**Journal:** Agronomy, 2022, 12 (08), Article ID: 01812.

**DOI:** 10.3390/agronomy12081812

**Title 11:** Evaluation of the Effect of Different Co-Solvent Mixtures on the Supercritical CO<sub>2</sub> Extraction of the Phenolic Compounds Present in *Moringa oleifera* Lam. Leaves.

**Journal:** Agronomy, 2022, 12 (06), Article ID: 01450.

**DOI:** 10.3390/agronomy12061450

**Title 12:** Optimization through a Box–Behnken Experimental Design of the Microwave-Assisted Extraction of the Psychoactive Compounds in Hallucinogenic Fungi (*Psilocibe cubensis*).

**Journal:** Journal of Fungi, 2022, 8 (6), Article ID: 598.

**DOI:** 10.3390/jof8060598

**Title 13:** Exposure to Essential and Toxic Elements via Consumption of Agaricaceae, Amanitaceae, Boletaceae, and Russulaceae Mushrooms from Southern Spain and Northern Morocco.

**Journal:** Journal of Fungi, 2022, 8 (5), Article ID: 545.

**DOI:** 10.3390/jof8050545

**Title 14:** Co-precipitation of grape residue extract using sub- and supercritical CO<sub>2</sub> technology.

**Journal:** Journal of CO<sub>2</sub> Utilization, 2022, 61, Article ID: 102010.

**DOI:** 10.1016/j.jcou.2022.102010

**Title 15:** Extraction of Antioxidant Compounds from Onion Bulb (*Allium cepa* L.) Using Individual and Simultaneous Microwave-Assisted Extraction Methods.

**Journal:** Antioxidants, 2022, 11 (5), Article ID: 846.

**DOI:** 10.3390/antiox11050846

**Title 16:** Toxic elements and trace elements in *Macrolepiota procera* mushrooms from southern Spain and northern Morocco.

**Journal:** Journal of Food Composition and Analysis, 2022, 108, Article ID: 104419.

**DOI:** 10.1016/j.jfca.2022.104419

**Title 17:** Optimization of an Ultrasound-Assisted Extraction Method Applied to the Extraction of Flavonoids from Moringa Leaves (*Moringa oleifera* Lam.).

**Journal:** Agronomy, 2022, 12 (02), Article ID: 00261.

**DOI:** 10.3390/agronomy12020261

**Title 18:** A comparison study between ultrasound-assisted and enzyme-assisted extraction of anthocyanins from blackcurrant (*Ribes nigrum* L.).

**Journal:** Food Chemistry: X, 2022, 13, 100192.

**DOI:** 10.1016/j.fochx.2021.100192

**Title 19:** Analysis of Compounds with Oenological Interest in Somatic Variants of Grapevines.

**Journal:** Horticulturae, 2022, 8(1), Article ID: 22.

**DOI:** 10.3390/horticulturae8010022

**Title 20:** Comparison of different processing approaches by SVM and RF on HS-MS eNose and NIR Spectrometry data for the discrimination of gasoline samples.

**Journal:** Microchemical Journal, 2022, 172, 106893.

**DOI:** 10.1016/j.microc.2021.106893

- 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*

*Erasmus grant / 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, [gerardo.fernandez@uca.es](mailto:gerardo.fernandez@uca.es) before the date 31/09/2023.*