



2023 Master internship at University of Cadiz



TITLE : Use of waste macroalgae to develop bioactive nanoparticles

LAB & PEOPLE

- Name of the hosting lab: RESEARCH GROUP: Chemistry and Characterization of Food and Beverages
- General activities of the lab: Determination and quantification of analytes of different chemical families in food (algae) and beverages using chromatographic techniques. Sensory study of food and beverages
- Website: <https://produccioncientifica.uca.es/unidades/3407/detalle?lang=gl>
- Number of staff / PhD: 6
- Supervisor name and contact: Remedios Castro Mejías

TOPIC OF THE INTERNSHIP

- Scientific context of the internship (max 20 lines)

The provinces of Cádiz and Huelva have an extensive coastline where it is common to see abundant seaweed arrivals after storms. In addition, since 2016 the coasts of Cádiz and Huelva have suffered a considerable invasion of an alga of Asian origin, *Rugulopteryx okamuræ*, which has developed on the southern coasts of the peninsula, without a natural limit that controls its expansion. This species has caused serious effects from an environmental, economic and social point of view. It is well known that algae are products rich in bioactive components, which can be applied in multiple fields, mainly food, cosmetics or medical applications. However, to date, the composition of the algae species present in the arrivals has not been studied in depth, nor the changes that the arrival process itself can induce in said composition. Therefore, it is to be expected that those waste algae could become an economic and abundant source of bioactive compounds, in addition to giving a second use to a large volume of waste that, for the most part, is transferred to landfills for disposal.

For this, it is intended to chemically characterize the arrival algae (autochthonous and invasive) of the provinces of Cádiz and Huelva, in order to determine the content of bioactive components (polyphenols, carotenoids and fatty acids) and their viability to produce extracts rich in these components. Well-consolidated and green extraction techniques will be used. In addition, the application of natural deep eutectic solvents (NADES) is also proposed for the first time to obtain extracts rich in bioactive components from macroalgae and will be compared with the other extraction techniques mentioned above. Subsequently, the selected extracts will be purified through the precipitation of nanoparticles using supercritical fluid technologies with the aim of increasing their effectiveness as a nutraceutical. Finally, we propose to evaluate the nutraceutical potential of nanoparticles in a murine model of experimental depression.

- Keywords : Waste algae, Rugulopteryx okamurae, waste management, nanoparticles, bioactive compounds, nutraceutical, green extraction, NADES, depression, murine model
- Bibliography:

- Berk et al. (2013) doi:10.1186/1741-7015-11-200
- Capuron et al. (2017) doi:10.1007/7854_2016_14
- Chinnarasu et al. (2015) doi:10.1016/j.supflu.2014.11.008
- Cikoš et al. (2018) doi:10.3390/md16100348
- Cotas et al. (2020) doi:10.3390/life10030019
- Dhir et al. (2017) doi:10.1002/9781119155195.ch12
- Gomes-Dias et al. (2022) doi:10.1007/s11947-022-02812-5
- Guamán-Balcazar et al. (2017) doi:10.1016/j.supflu.2017.05.031
- Montes et al. (2019) doi:10.1016/j.jcou.2019.03.021
- Montes et al. (2022) doi:10.1007/s00217-022-04127-3
- Rico et al. (2017) doi:10.1007/978-981-10-1950-0_12
- Rocha et al. (2022) doi:10.3390/md20120789
- Saldarriaga-Hernández et al. (2021) doi:10.1021/acssuschemeng.7b02074
- Yang et al. (2006) doi:10.1016/j.bmcl.2006.05.081

- Tasks and duties entrusted to the student: Development of the analytical methodology for the extraction of polyphenols in algae. Development of the specific chromatographic methodology for the analysis of polyphenols in algae. Application to different species
- Skills to be acquired or developed: Development of extensive knowledge in extraction and chromatographic techniques.

PROFILE OF THE DESIRED STUDENT

- Minimum level of study required: graduate
- Field(s) of study: Analytical techniques applied to foods
- Scientific skills: Knowledge of extraction and chromatographic techniques. High skills in analytical laboratories
- Language skills required : English

THE INTERNSHIP ASSIGNMENT:

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

Desired Starting date of the mission: *(please indicate the level of flexibility)* High level of flexibility about starting date

Indicative weekly schedule: *25 h/week*

Remuneration

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, remedios.castro@uca.es, before 30 September, 2023.