

Title: **Arsenosugars extraction from edible algae**

Student: Andreu Piqué Ortoll

Date: January 2019

Supervisor/s: Dr. José Fermín López

Departament of Chemical Engineering and Analytical Chemistry.

Nowadays, **arsenic** is a very abundant chemical element in nature. Thanks to human activities and their great ability to occur naturally and uniformly, living beings are constantly exposed to this compound. One of the main sources of obtaining arsenic for humans is the intake of organisms capable of **bio-accumulating** this element, as is the case of algae. There are many studies showing that, depending on the way in which arsenic is found (inorganic or organic), its **toxicity** affects the individual in a different way. Recall that this element can work with 4 valences (-III, 0, + III and + V) and can be found in cationic or anionic form. In algae, the predominant species of arsenic are **arsenosugars**. At this time, there is a great lack of information on the amount of arsenic that can be found in this food for humans, which entails a risk to food security and our **health**.

Currently, one of the most recommended techniques for this study is liquid chromatography coupled to a mass spectrometer with inductively coupled plasma source (**HPLC-ICP-MS**), since it has a high efficiency and provides a low limit of quantification and detection. However, one of the main problems in the field of analytics for the synthesis and isolation of arsenosugars, is that, there are no commercial patterns or reference materials available to identify them. This is because its chemical synthesis or isolation from algae includes complex procedures.

First of all, this research has focused on the optimization of extraction of arsenic species in edible algae. Focusing on the ***Fucus Vesiculosus*** algae as it was characterized in a previous work carried out in our research group and has already been proven its most common arsenosugars' accumulation. This stage has been based on the pre-treatment of the sample in order to study the effect of **methanol** in water as extracting solvent. The ICP-MS has been used for the quantification of total arsenic in the extraction, where it has been verified that the ideal proportion is 10% MeOH / 90% H₂O.

Secondly, the HPLC-ICP-MS system has been used to carry out species separation (**speciation**), in order to confirm the good optimization of the process, making a comparison of the retention times obtained with those of the reference search.

In third place and finally, this procedure has been applied for ***Kombu***, ***Nori*** and ***Wakame*** algae, where it has been possible to observe how each seaweed is a different world. Even so, arsenosugars appear as predominant species of arsenic in all these organisms.

Keywords: arsenic, bio-accumulating, toxicity, arsenosugars, health, HPLC-ICP-MS, extraction, *Fucus Vesiculosus*, methanol, speciation, *Kombu*, *Nori*, *Wakame*.