**Extraction of molecules from brown macroalgae *Sargassum muticum* by enzymatic hydrolysis improved by the use of surfactants.**

L. Vandanjon1,4, L. Vallet1,2, P. Deleris2, P. Bourseau1,5, R. Baron3, J. Dumay2

1 Université de Nantes, GEPEA, UMR CNRS 6144, Saint-Nazaire, France

2 Université de Nantes, Laboratoire MMS, EA 2160, Nantes, France

3 IFREMER, Laboratoire Biorafhe, Nantes, France

4 Université Bretagne Sud, LBCM, EA 3884, Lorient, France

5 Université Bretagne Sud, IRDL, FRE CNRS 3744, Lorient, France

*Sargassum muticum* is a proliferative brown alga constituting a large amount of biomass. This alga is not very exploited despite it contains several substances of interest (i.e. phlorotannins, polysaccharides, proteins, etc). Extraction of all these molecules without damaging any valuable component of the alga comes closer to the concept of biorefinery. The use of enzymatic hydrolysis provides a soft and specific extraction method that meets this objective. Enzymes are used to hydrolyze the cell wall of macroalgae releasing interesting molecules. But the structural complexity of the cell wall as well as the presence of cellulose fibers, sulfated fucans and alginates linked to the proteins and phenolic compounds is an obstacle to overcome.

We followed different strategies to solubilize phlorotannins, proteins and polysaccharides from *Sargassum muticum*. We compared organic solvent extraction to enzymatic extraction with alginate lyase (a specific enzyme from the marine bacteria *Pseudomonas alginovora*) and commercial enzymes (polysaccharidases and proteases). The use of 5% Dry Weight (DW) (5% by weight of hydrolyzed alga) of an enzymatic mix containing a commercial beta-glucanase (Ultraflo XL), a commercial protease (Protamex) and the alginate lyaseled after 3 hours of hydrolysis to the solubilization of 2.43% DW polysaccharides and 0.52% DW phlorotannins. These results, though better than aqueous extraction, have been further improved by using surfactants. Surfactants seem to affect both the solubilization of extracted molecules and the enzymatic action resulting in a better efficiency of the enzymatic hydrolysis. For example, the use of 0.5% volume of an anionic surfactant with 10% DW of the enzymatic mix allowed to reaching the value of 2.63% DW of solubilized phlorotannins.

Finally, we compared the influence of four different anionic and non-ionic surfactants (SDS, Tween 20, Tween 80, Triton X-100) on hydrolysis kinetics. We showed that all the surfactants have not the same effect, and that Triton X-100 is the most efficient to increase the quantity of solubilized phlorotannins during the enzymatic hydrolysis of *Sargassum muticum*.