Green and Sustainable extraction of bioactive compounds from *Salicornia ramosissima*

Ana Margarida Silva[1], João Lago[1], Manuela M. Moreira[1], Cristina Delerue-Matos[1], Francisca Rodrigues[1*]

[1]REQUIMTE/LAQV, Polytechnic of Porto - School of Engineering, Rua Dr. António Bernardino de Almeida, 431, Portugal.

*francisca.rodrigues@graq.isep.ipp.pt

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Introduction

Salicornia ramosissima:

- Halophyte plant;
- Grows in saltmarshes, mainly in the coastline of Europe from the Arctic to the Mediterranean, including Portugal ;
- Tolerates high salt concentration;
- In gastronomy, is an alternative to salt and the leaves are used for human;
- Presents antioxidant, anti-inflammatory, anti-diabetic and anticancer properties.

Microwave-assisted extraction (MAE):

- Alternative to conventional extractions (CE);
- Green extraction method;
- Quick heating, lower solvent requirements, clean process and low cost;
- High extraction rate and short extraction time;
- Recover of high-added value compounds.

References:

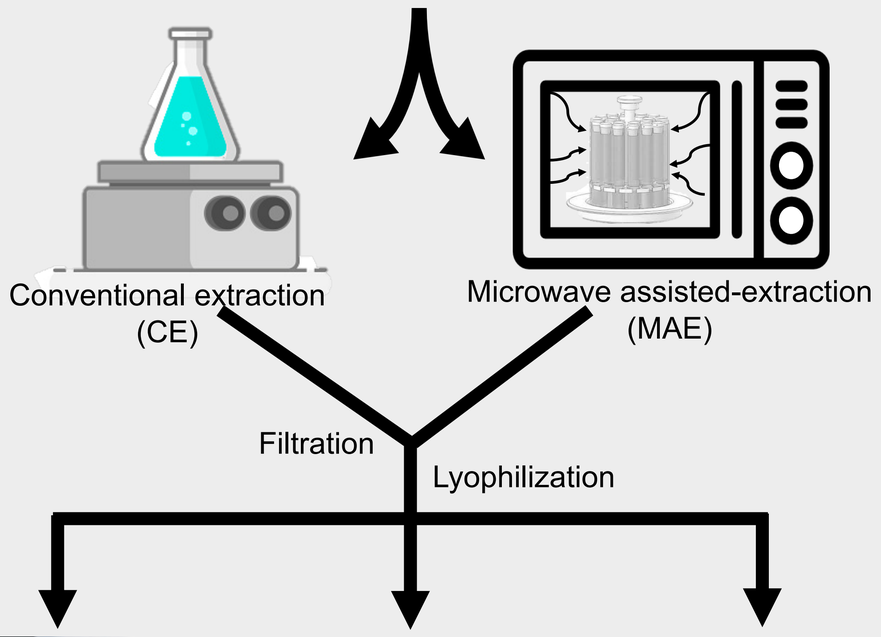
[1] Flowers, T.J.; Colmer, T.D. *New Phytol.* **2008**, *179*, 945–963.

[2] Lima, A.R.; *et al*. *Food Chem.* **2020**, *333*, 127525.

[3] Ferreira, D.; *et al*. *Biomed. Pharmacother.* **2018**, *107*, 283–291.

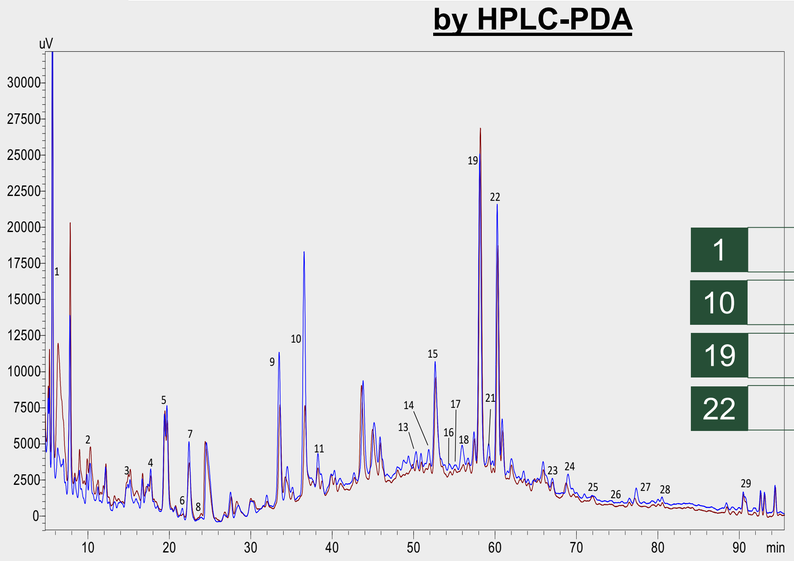
[4] Panja, P. *Curr. Opin. Food Sci.* **2018**, *23*, 173–182.

Material and Methods



Results

Identification and quantification of phenolic compounds by HPLC-PDA



1	Gallic acid
10	Ferulic acid
19	Myricetin
22	Kaempferol

Determination of TPC, TFC and antioxidant activities

Extracts	TPC (mg GAE/g dw)	TFC (mg CAE/g dw)	ABTS (µg AAE/g dw)	FRAP (µmol FSE/g dw)
CE	15.02 ± 2.01*	8.44 ± 0.45	15.55 ± 0.78	60.61 ± 6.64
MAE	8.34 ± 1.22	8.41 ± 0.45	17.74 ± 2.95*	65.56 ± 8.68

Conventional extraction (CE); Microwave-assisted extraction (MAE); Gallic acid equivalents (GAE); Catechin equivalents (CAE); Ascorbic acid equivalents (AAE); Ferrous sulphate equivalents (FSE).

Effect of *S. ramosissima* extracts in cell viability (%)

Extracts		Concentration (µg/mL) 0.1	1	10	100	1000
Caco-2	CE	128.60	121.87	120.26	123.54	118.44
	MAE	100.09	95.11	88.73	89.92	86.55
HT29-MTX	CE	124.61	119.25	113.47	99.42	97.04
	MAE	123.98	123.99	113.42	109.95	94.32

Discussion

Determination of TPC, TFC and antioxidant activities:

- For TPC and TFC, CE extract exhibited the highest values. The statistical analysis showed differences (p<0.01) in TPC assay between CE and MAE extracts.
- Regarding antioxidant activity, MAE showed the best results. For ABTS assay, the statistical analysis (p<0.05) revealed significant differences between extracts.

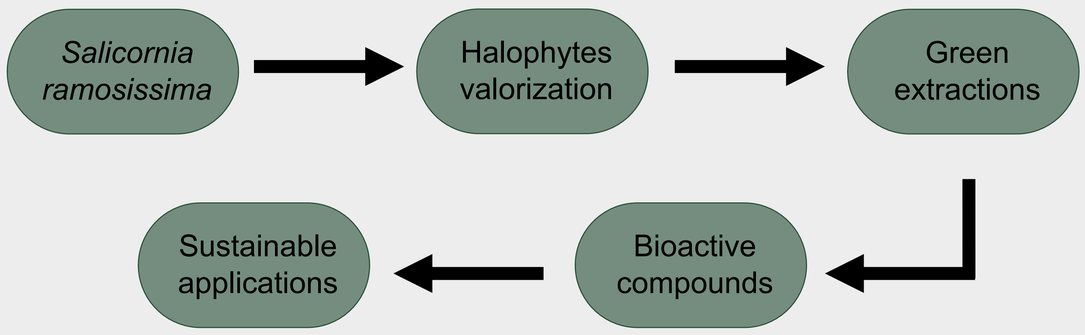
Identification and quantification of phenolic compounds by HPLC-PDA:

- Phenolic acids and flavonols are the principal constituents, being responsible of 50% and 40% of the total phenolic composition.
- Myricetin was the compound present in highest amounts (0.4250 and 0.4655 mg myricetin/g dw for CE and MAE extracts, respectively).
- Gallic acid is the major phenolic acid found in both extracts (0.2105 and 0.1553 mg gallic acid/g dw, respectively).

Effect of *S. ramosissima* extracts in cell viability:

- The viability of Caco-2 decreased to 86.55% after exposure to the highest concentration of MAE.
- The HT29-MTX viability did not decrease after exposure to the different concentrations. At the highest concentration tested, the viability was 97.04% and 94.32%, respectively, for the CE for MAE extracts.

Conclusion



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