

Development and validation of an UAE and GC-MS method to analyze monosaccharides from algae

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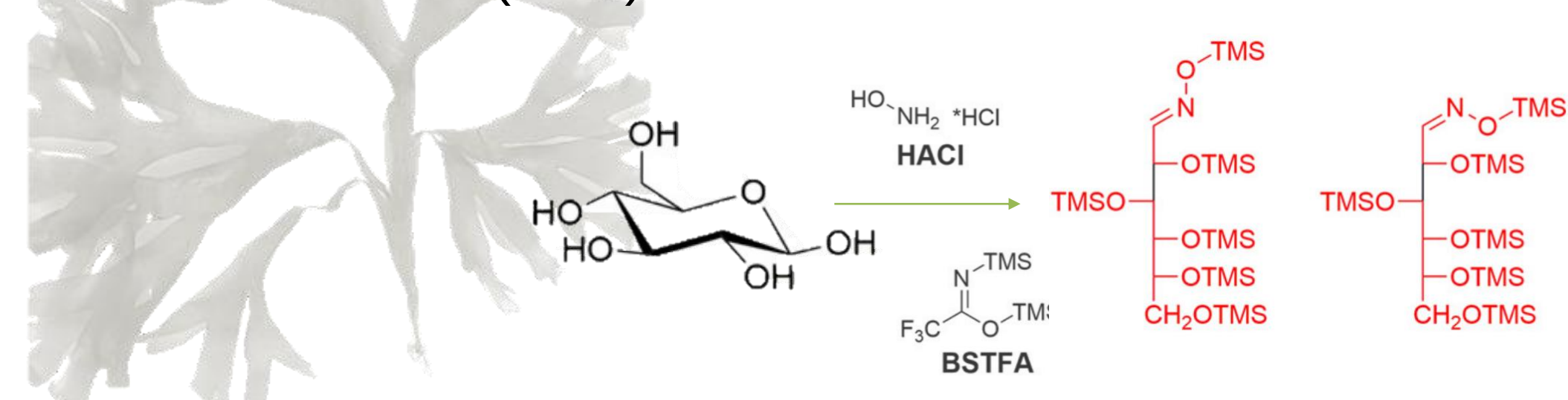
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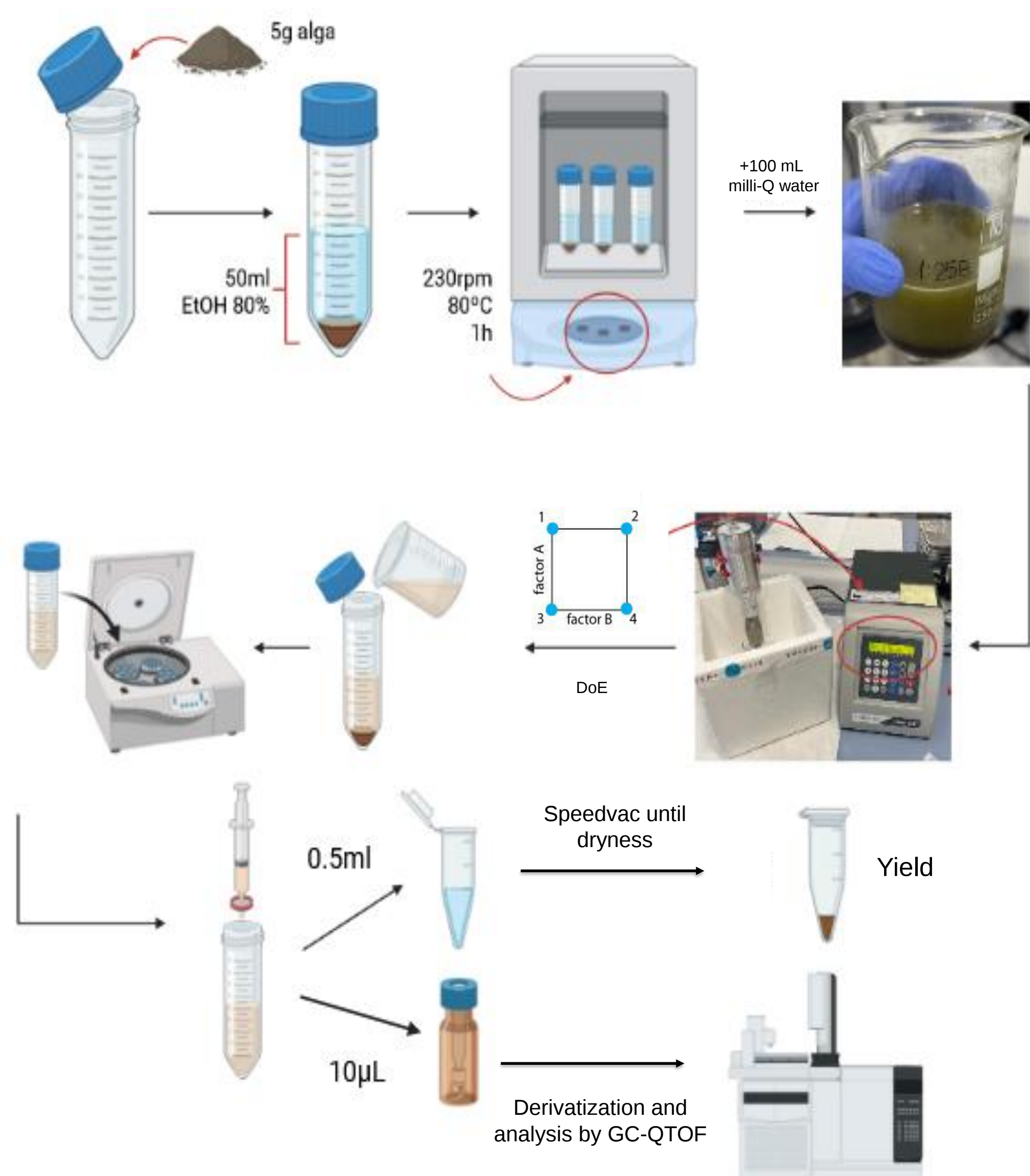
INTRODUCTION & AIM

Algae are an interesting source of bioactive compounds, whose polymeric carbohydrate fraction can be broken down to their monomers. Particularly, *Rugulopteryx okamurae* (R.o.) is an invasive alga that is difficult to remove from coast, introduced in Mediterranean sea in 2015¹. Scientific literature is trying to revalorize this type of algae in some of their main components (carotenoids or bioactive compounds).

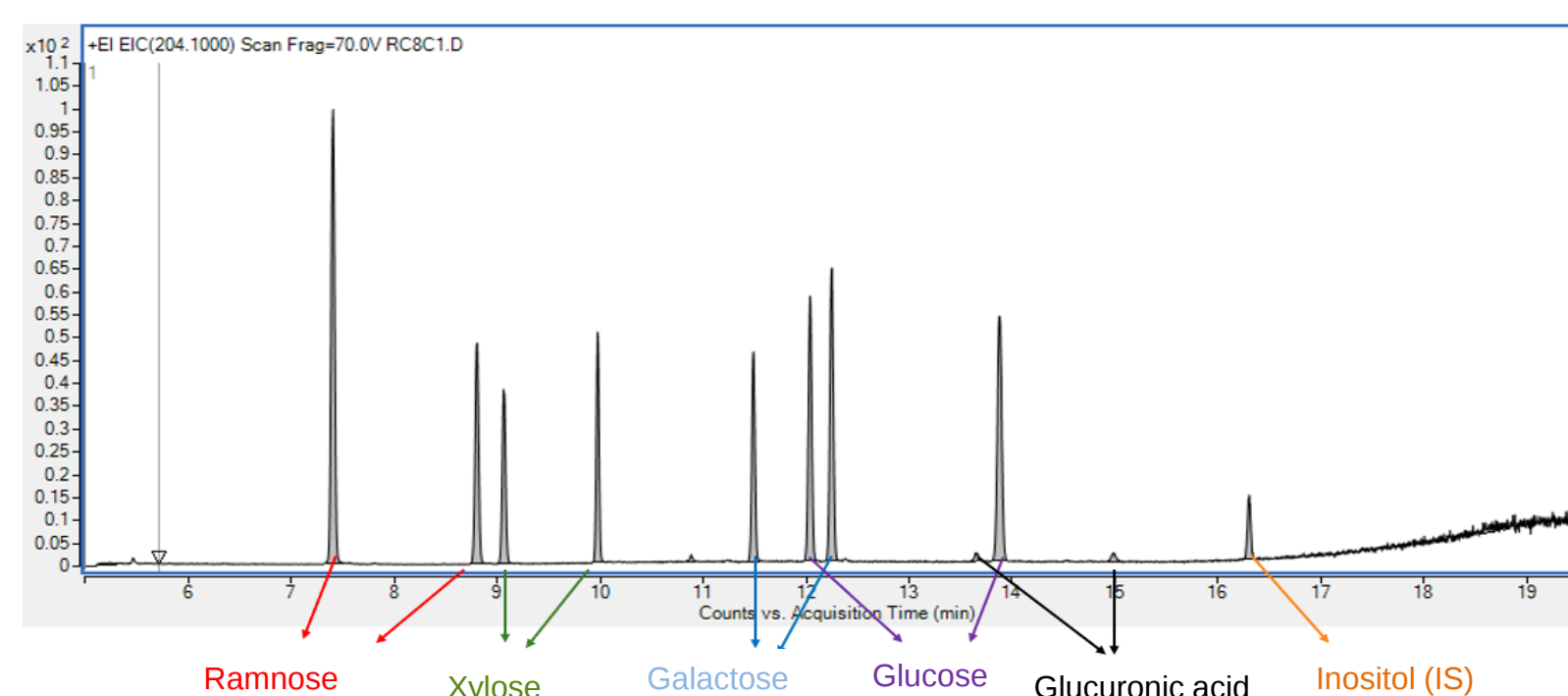
In this work, a gas chromatography coupled to mass spectrometry (GC-QTOF) method has been developed and optimized to quantify monosaccharides using oximation and silylation. Besides, an optimization of the extraction of these monomeric carbohydrates by using water and ultrasound assisted extraction (UAE) has been carried out.



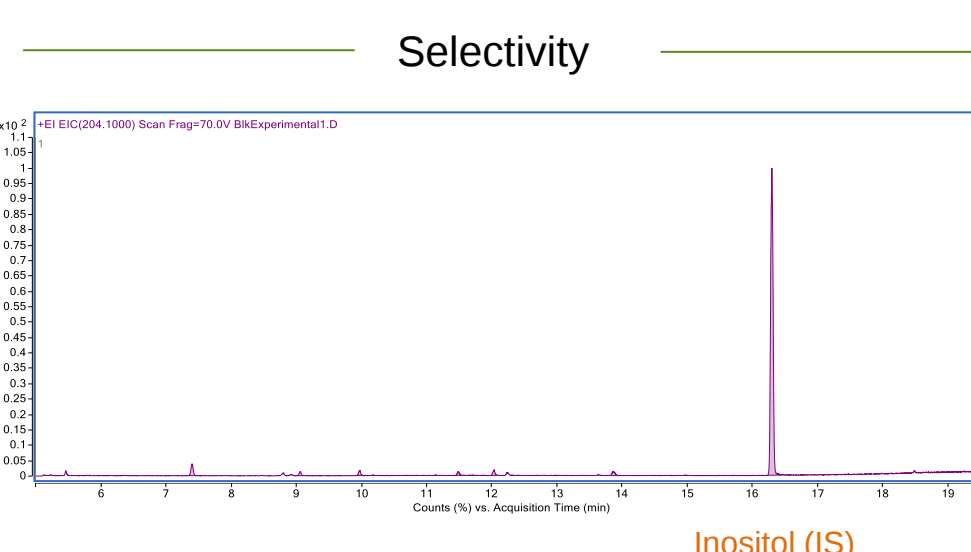
METHOD



RESULTS & DISCUSSION



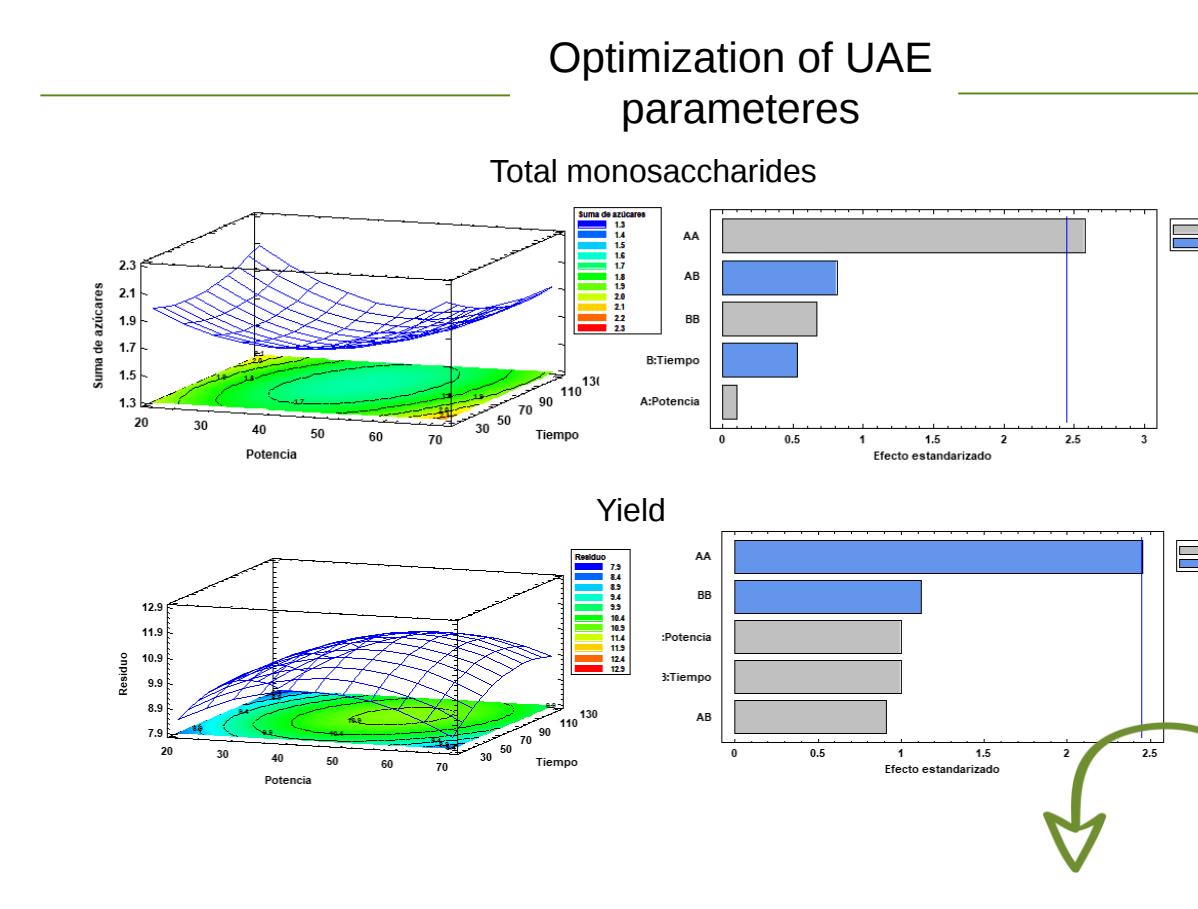
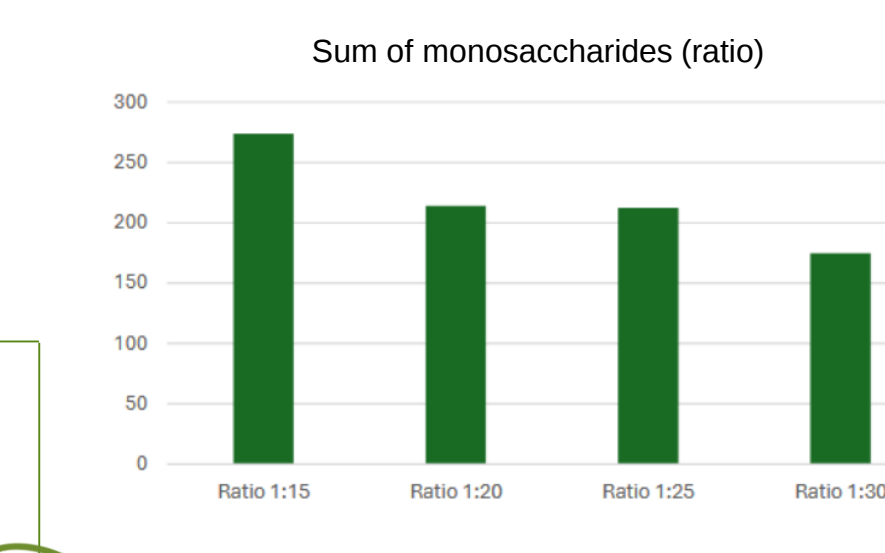
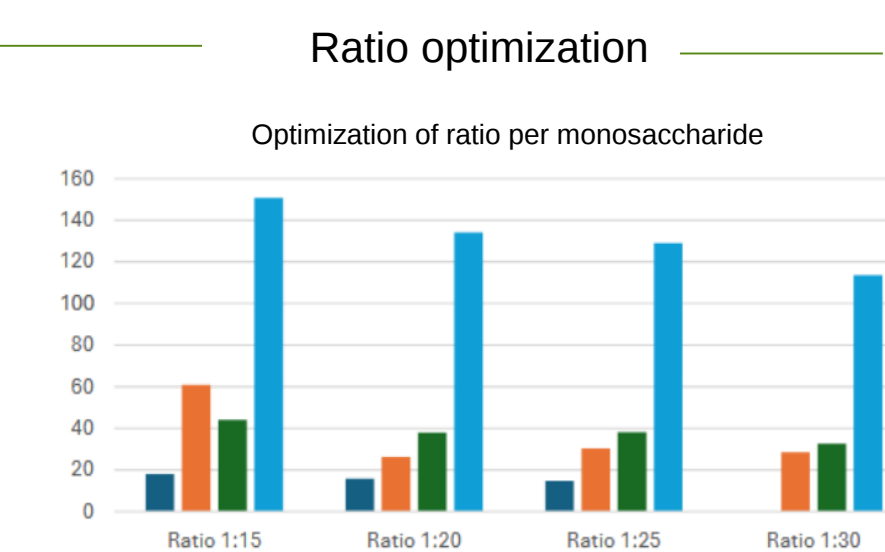
- ✓ Analysis in less than 20 min
- ✓ Main fragments (m/z): 204.09 and 191.09
- ✓ R Match > 900 (NIST)



MONOSACCHARIDE	a	b	R ²
Ramnose	-0.0176	0.9891	0.9923
Xylose	-0.0017	0.451	0.9939
Galactose	0.0024	0.3768	0.9865
Glucose	-0.0028	0.6614	0.9909
Glucuronic acid	0.0008	0.0095	0.8877
Mannitol	0.053	-0.0056	0.9938

Below quality criteria → replaced by mannitol (found in seaweed)

ANALYTE	Concentration (ppm)	Accuracy	Precision	LD / LQ (ppm)
Ramnose	0.5	94.9%	1.8%	0.15 / 0.5
	5	80.5%	2.6%	
	15	105.5%	6.4%	
Xylose	0.5	74.9%	12.8%	0.15 / 0.5
	5	111.8%	2.0%	
	15	101.3%	3.1%	
Galactose	0.5	80.0%	12.4%	0.15 / 0.5
	5	116.2%	3.8%	
	15	102.5%	2.6%	
Glucose	0.5	112.9%	3.5%	0.15 / 0.5
	5	100.4%	6.5%	
	15	98.7%	4.2%	
Mannitol	0.5	82.3%	14.2%	0.15 / 0.5
	5	95.0%	17.0%	
	15	98.9%	1.3%	



ALGA	Ramnose (mg/L)	Xylose (mg/L)	Galactose (mg/L)	Glucose (mg/L)	Mannitol (mg/L)	Total (mg/L)
R.o.	ND	ND	2.7 (0.2)	7.1 (0.3)	20 (2)	29.9
Ulva Lactuca	2.7 (0.5)	7.2 (0.6)	9 (2)	13 (1)	ND	31.7

CONCLUSION

After the validation of the method by GC-MS and the optimization of the extraction in R.o., the resulting solution may be useful in fields such as agriculture for the manufacture of environmentally friendly bio-inputs, using invasive algae as raw material, thereby promoting the circular economy.

FUTURE WORK / REFERENCES

¹Laamraoui MRet al. Rapid invasion and expansion of the invasive macroalgae *Rugulopteryx okamurae* in the Mediterranean and Atlantic: A 10-year review. 2024.