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Introduction

Algae have long been recognized as a healthy food due to their nutritional composition and content in proteins, unsaturated lipids, dietary fiber and minerals [1]. In recent years there has been an increasing consumer interest in vegetarian, natural food sources. In this context, algae could prove valuable. Therefore, deepening the knowledge on their composition as well as identifying suitable analytical methods to determine it is of relevance. In this work, nutritional composition of *Ulva rigida* (UR), *Codium tomentosum* (CT), *Palmaria palmata* (PA) and *Porphyra purpurea* (PU) edible seaweed species widely distributed in Atlantic shores was studied using a variety of standardized analytical methods.

Methods

Total lipids were measured gravimetrically as evaporated mass after petroleum-ether Soxhlet extraction of samples. Fatty acid profile was determined by gas chromatography coupled to a flame ionization detector (GC-FID). Proteins were quantified following the macro-Kjedahl method in which the nitrogen content is converted to protein using a conversion factor of 6.25. Total organic acids were determined by ultra-filtration liquid-chromatography coupled to an amperometric detector UFLC-PAD after methaphosphoric acid extraction. Minerals were identified and quantified by ICP-OES. Hydrocarbons were determined as the difference of the rest of components, following AOAC recognized methods.

Results

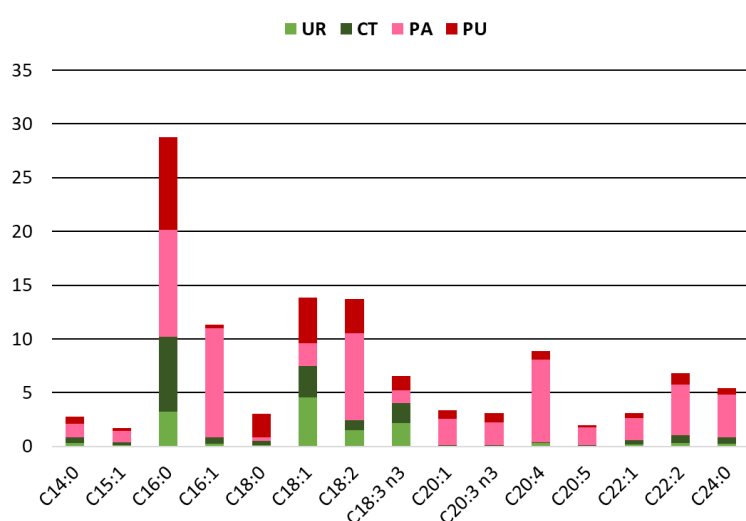
Table 1: Proximate composition (% dw)

Species	Ash	Protein	Lipids	Fiber	Organic acids
UR	28.7	16.3	0.42	42.9	-
CT	38.9	15.4	0.7	39.1	1.13
PA	23.8	21.5	0.1	46	0.82
PU	27.4	31.8	0.1	44.4	10.61

Table 2: Mineral composition (g / kg dw)

Species	Ca	Fe	K	Mg	Mn	P	Zn	As	I	F	Cl
UR	2.7	1.1	19.79	22.9	0.08	2	0.006	0.004	0.1	0.8	49.9
CT	5.1	0.1	6.7	10.4	0.03	1.3	-	0.01	0.2	0.01	8.5
PA	4.7	0.1	100	3.8	0.02	3.3	0.02	0.009	0.3	1.1	101
PU	1.5	0.2	33.5	3.1	0.02	5.8	0.03	0.03	0.08	0.6	12.1

Figure 1: Fatty acid composition (%)



Results showed that all studied species were accounted for very low levels of lipids (>1% dw), but proportion of unsaturated fatty acids was high, with *P. palmata* displaying the highest quantities (>200mg C18:1/g extract). Red algae, especially *P. purpurea* showed significant protein content, up to 30% dw. Organic acids content was heterogeneous, with only *P. purpurea* showing a high content (10.61% dw), half of which was determined as citrate. Almost all the analyzed species showed more than 40% dw of insoluble fiber. Regarding mineral content, both algae groups are greatly rich in K and Mg (>15 g / kg), with *U. rigida* also displayed a remarkable iron levels (>1 g Fe/kg). *P. palmata* in particular, showed very high levels of K and Cl (>100 g/kg). Some potentially excessive levels of minerals could be removed by osmotic treatments. Altogether, results corroborate that these edible algae are a good source of nutrients and analytical methods are suitable, in accordance with literature [2,3]. Lipid levels could be improved by employing other extraction solvent.

References

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