



Production of alternative proteins by solid-state fermentation of marine sources

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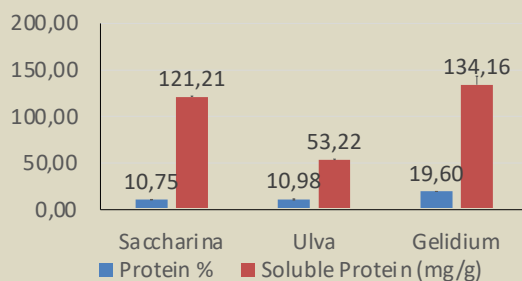
The objectives of the project “Alternative PROteins from Microbial fermentation of non-conventional SEA sources for Next-Generation food, feed and non-food bio-based applications (PROMISEANG)” is to develop novel alternative proteins from marine underexploited sources, mainly marine invertebrate and macroalgae discards and industrial biowastes, through solid-state fermentation, to generate new protein-enriched microbial biomass, which is known as single cell proteins (SCP), meeting market requirements for food, feed, and non-food (biomedicine, pharma and cosmetic) bio-based applications. Research on novel protein streams from sustainable alternative sources will contribute to increase the protein availability in the EU and reduce the actual dependency on imports.

Characterization of macroalgae

	% Moisture	% Ash	% Extractives
Gelidium waste	7.81 ± 0.12	27.38 ± 1.62	11.16 ± 0.35
Saccharina sp	11.26 ± 0.04	35.44 ± 0.80	44.65 ± 0.37
Ulva rigida	15.93 ± 0.12	32.91 ± 0.87	68.37 ± 1.12

**	Gelidium		Saccharina sp		Ulva rigida	
	Media	SD	Media	SD	Media	SD
% Moisture	6.22	0.00	5.72	0.43	4.7	0.4
% Ash	28.84	0.25	15.69	1.57	25.5	0.1
Extractives	11.16	0.35	44.65	0.37	68.4	1.1
% Lignin	15.36	0.12	6.61	1.34	7.1	1.2
% Cellulose	24.28	0.22	8.50	0.28	6.4	0.2
% Hemicellulose	11.92	0.40	2.02	0.04	1.8	0.0
Total	97.78	1.33	83.20	4.03	113.87*	2.98

Extracts analysis	Gelidium				Saccharine sp.				Ulva rigida			
	Water extractives		Ethanol extractives		Water extractives		Ethanol extractives		Water extractives		Ethanol extractives	
	Media	SD	Media	SD	Media	SD	Media	SD	Media	SD	Media	SD
Salt content (mg/g)	154.39	4.92			389.12	8.27			151.08	20.43		
Total sugars (mg/g)	10.78	1.15	8.51	0.83	4.62	0.35	7.68	0.04	3.22	0.16	5.39	0.07
Soluble protein (mg/g)	68.28	1.01	65.88	8.22	52.68	0.12	68.53	0.66	22.71	0.10	30.51	0.99
Total phenol (mg/g)	2.36	0.01	0.76	0.10	1.90	0.11	1.59	0.02	0.57	0.08	0.61	0.04
Flavonoids (mg/g)	0.47	0.25	2.31	0.10	0.23	0.06	0.50	0.16	0.07	0.02	0.70	0.07
Hydroxycinnamic acids (mg/g)	0.67	0.14	0.41	0.02	0.45	0.05	0.49	0.15	0.12	0.02	0.42	0.01
Anthocyanins (mg/g)	0.01	0.00	0.03	0.01	0.01	0.00	0.03	0.03	0.00	0.00	0.05	0.00
Chlorophyll A µg/g	96.39	4.92	60.88	0.12	23.02	2.28	245.31	9.56	4.35	0.13	169.57	4.77
Chlorophyll B µg/g	152.92	7.33	71.44	6.00	34.63	3.42	191.29	1.56	4.53	0.14	104.28	11.37
Carotenoids µg/g	85.02	2.43	36.02	2.55	43.59	1.09	108.90	4.00	5.86	1.81	59.86	5.69



Characterization of cooking waters

	Octopus Gilmar	Mussel	Squid Fesba	Tunas Serpeixe
Protein (g/L)	3.11 ± 0.04 ^a	4.86 ± 0.04 ^b	6.00 ± 0.09 ^c	33.0 ± 0.31 ^d
Salts (g/L)	1.25 ± 0.01 ^a	20.1 ± 0.83 ^b	1.46 ± 0.14 ^a	25.5 ± 0.29 ^c
Reducing sugars (g/L)	0.07 ± 0.01 ^a	0.89 ± 0.02 ^c	0.09 ± 0.00 ^a	0.32 ± 0.02 ^b

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