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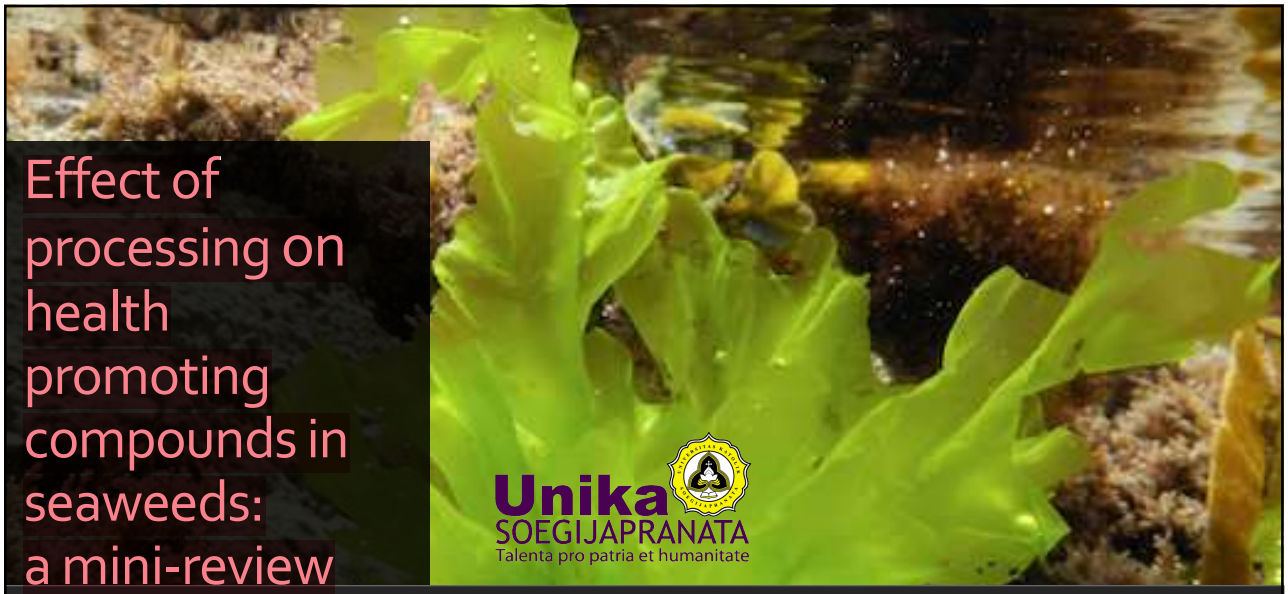
Effect of processing on health promoting compounds in seaweeds: a mini-review



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Introduction

- Carotenoids
- Polyphenols
- Fatty acids
- others

Health promoting compounds

?

Previous Published Review

- Bioactive Potential and Possible Health Effects of Edible Brown Seaweeds (Gupta et al.,2011)
- Algae as promising organisms for environment and health (Shalaby, 2011)
- Medicinal and pharmaceutical uses of seaweed natural products: A review (Smit, 2004)
- Seaweeds as a source of nutritionally beneficial compounds – A review (Kumar et al., 2008)
- Health Applications of bioactive compounds from marine microalgae (Raposo et al., 2013)

We know seaweed has bioactive compounds which is good for health, but no further research has been done on whether processing will affect said compounds bioactivities

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Aim

to review how processings affect bioactive compounds in seaweeds and analyse the possible mechanisms which affect the changes.

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Method

- Gap Analysis
- Keywords Formulation
- Literature Searching
- Literature Screening
- Data Analysis

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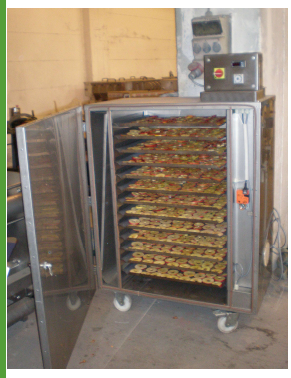
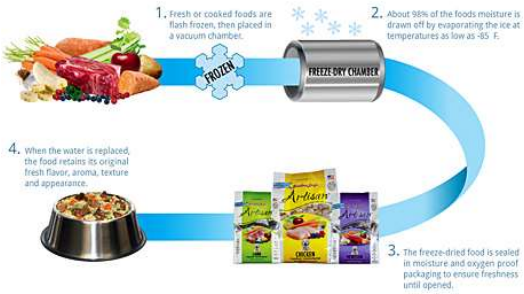
Results & Discussion:

Drying





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Results & Discussion:

Heat Processing (Boiling, Steaming & Microwave)

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Results & Discussion:

Fermentation

Effect of Drying

Species	Process	Parameter	Bioactive	Yield		Control Yield		Trend	Ref
Himanthalia elongata	oven drying	25-40°C for 24 hr	Antioxidant	0.755-1.085	g/ GAE 100 g	1.55±0.026	g GAE/100 g	30-49% loss	Gupta2011
Sargassum muticum, Bifurcaria bifurcate	oven drying	50-60°C for 48 hr	Antioxidant	1.8 ±0.063	mg/mL	5.83±0.12	% db	69.13% loss	Lann2008
	freeze drying	72 hr		5.1 ±0.062	mg/mL	5.83±0.12	mg/mL	12.53% loss	
	greenhouse-drying	72 hr		1.1 ± 0.061	mg/mL	5.83±0.12	mg/mL	81.14% loss	
	freezing	-20°C for 3 weeks		5.6 ±0.063	mg/mL	5.83±0.12	mg/mL	4.95% loss	

Species	Process	Parameter	Bioactive	Yield		Control Yield		Trend	Ref
Ascophyllum nodosum	drying (cabinet)	40°C for 48 hr	Tocopherol	66-136	mg/ kg db	90-160	mg/ kg db	15% loss	jensen 1969
Laminaria (processed)	air drying	50°C for 48 hr	Polyphenol	0.146 ±0.1	g PGE/kg	7.3 ±0.1	g PGE/kg	98% loss	antoni02001
Porphyra (processed)				4.104±0.1	g PGE/kg	5.7±0.1	g PGE/kg	28% loss	
Himanthalia elongata	Drying & rehydration	40° C for 24 hr & rehydration in water bath (20-100°C)	Polyphenol	0.2±0.0009	g GAE/100 g db	1.21±0.02	g GAE/100 g db	loss 88,3-93,2 %	cox2012

Effect of Boiling, Steaming and Microwave

Species	Process	Parameter	Bioactive	Yield		Control Yield		Trend	Ref
Himanthalia elongata	Boiling	15 min,100 C	Antioxidant	16,137.1 ± 3604	µmol Trolox/ kg db	7392.4 ± 287.7	µmol Trolox/ kg db	118.29% increase	amorim2014
	Steaming	40 min		7973.8 ± 1157	µmol Trolox/ kg db	7392.4 ± 287.7	µmol Trolox/ kg db	7.86% increase	
Laminaria (kombu)		1 hr		2828.96±620.63	mg/kg db	4372.76±1744.80	mg/kg db	35.30% loss	
Undaria pinnatifida (wakame)	boiling	20 min		5351.6±2201.30	mg/kg db	12263.18±1657.67	mg/kg db	56.36% loss	

Species	Process	Parameter	Bioactive	Yield		Control Yield		Trend	Ref
	boiling	80 & 100°C until texture reaches 30-32 N/mm		25.4	mg GAE/100 g	175.27	mg GAE/100 g	loss 85,51%	
	steaming	until texture reaches 30-32 N/mm on boiling water		119.02	mg GAE/100 g	175.28	mg GAE/100 g	loss 32,06%	
Himanthalia elongate	microwave	450 & 900 watt for 30 & 20 sec	Polyphenols	239.446	mg GAE/100 g	175.29	mg GAE/100 g	Increase 36,58%	Cox2011

Effect of Fermentation

Species	Parameter	Bioactive	Yield		Control Yield		Trend	Ref
Laminaria japonica	*Bacillus subtilis*	anti inflammatory (NO production)	±38	%	±58	%	Loss 20%	lin2016
Sargassum thunbergii	*Lactobacillus sp*	anti inflammatory	93	%	46	%	increase 47%	mun2016

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Conclusions

- Drying at high temperature, such as oven-drying, cabinet-drying, and sun-drying, reduce the content of thermal labile bioactive compounds, particularly polyphenols, possibly due to thermal degradation.
- Steaming, boiling, and microwave processing either relatively retain or increase the content of bioactive compounds, possibly due to the role of enzyme (in)activity and the level of cell lysis enhancing extraction rate
- Fermented seaweed inhibits NO (Nitric Oxide) productions which may cause inflammation in high amount due to its nature as free radicals

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Thank You