EFFECTS OF DRYING PROCESSES ON LYSINE, LEUCINE **AND GLYCINE CONTENT IN WILD** SEAWEED, ULVA LACTUCA

Authors: Muhammad Idham Shukor, Deny Susanti, Normawaty Mohammad Nor, Muhammad Taher, Nurul Iman Aminudin

Prepared By: Muhammad Idham Shukor



Introduction

Reduce the overall analysis cost by increasing the productivity







Green Seaweed, Ulva lactuca

- Family *Ulvaceae*
- Phylum Chlorophyta
- Degree of water salinity or symbiosis with bacteria

Amino Acids

- Higher than those found in terrestrial plants
- Cosmetic production

Drying Methods

- Decrease the water activity to inhibit growth microbe
- Maintaining a quality of product
- Reduced storage volume



Purpose Research objectives

• To examine the effect of the drying process on the amino acid content in wild *U. lactuca*

• To determine the suitable method of extraction that produce a higher yield amino acids content of interest from wild U. lactuca

Hypothesis

Different type of drying process used will affect the content of individual and amino acids of interest (leucine, lysine and glycine) of wild *U. lactuta*.

Drying process will affect the overall crude protein, amino acids, moisture, pigments and lipids content extracted from wild *U. lactuca*.



Methodology

Seaweed Collection and Preparation



Merambong Island, Pontian, Johor, Malaysia January, 2020

Drying Process

Sun-drying Air -drying

Removal of Pigments and Lipids

Washing with acetone



Cyro-Grinding

Frozen in a bath of dry ice and acetone Ground until visual changed is observed



Methodology Cont...

Protein Determination

Kjeldahl method Kjeldahl tablet (Missori catalyst) Triplicate



Soxtec system Solvent n-hexane Temp (126-130 °C)

Extraction of Amino Acids

Acid hydrolysate method Microwave assisted extraction procedure Internal standard (AABA)



Characterisation by HPLC

Waters 1525 HPLC Injection vol $(10 \,\mu L)$ Temp (36 °C)



 $4 \mu m$ AccQ Tag Column ($3.9 \times 150 mm$) Flow rate (1.0 mL/min)

Fluorescence detector (250-395 nm)

Methodology Cont...

Statistical Analysis

GraphPad Prism (Version 9.0 trial, 2021 GraphPad Software, Inc) Two-ways analysis of variance (ANOVA) Tested using paired t-test and p-value Significant differences (p < 0.05) Confidence level (95 %)





	Average (%)					
Amino Acids	Air-Dry		Sun-Dry			
	w/w	TAAs	w/w	TAAs		
Нур	0.107 ± 0.023^{mo}	1.410 ^{kl}	0.107 ± 0.006^{mo}	1.311 ^{mn}		
Asp ^N	0.902 ± 0.144^{a}	11.889 ^a	0.965 ± 0.039 ^a	11.827 ^a		
Ser ^N	0.447 ± 0.076^{cg}	5.892 ^{de}	0.471 ± 0.014^{cg}	5.773 ^{fg}		
Glu ^ℕ	0.881 ± 0.145^{a}	11.612 ^a	0.975 ± 0.032 ^a	11.950 ^a		
Gly ^ℕ	0.550 ± 0.096^{bd}	7.249 ^c	0.582 ± 0.011^{bd}	7.133 ^{cd}		
His ^E	0.118 ± 0.020^{mo}	1.555 ^{kl}	0.097 ± 0.005^{mo}	1.189 ^{mn}		
Arg ^N	0.504 ± 0.064^{bf}	6.643 ^d	0.483 ± 0.025 ^{cf}	5.920 ^{ef}		
Thr ^E	0.436 ± 0.069^{ch}	5.747 ^{df}	0.453 ± 0.101 ^{ci}	5.552 ^{fi}		
Ala ^ℕ	0.678 ± 0.100^{b}	8.936 ^b	0.745 ± 0.012^{b}	9.131 ^b		
Pro ^N	0.392 ± 0.063 ^{ck}	5.167 ^{ei}	0.438 ± 0.013^{dk}	5.368 ^{gk}		
Tyr ^ℕ	$0.169 \pm 0.048^{\text{Im}}$	2.227 ^j	$0.221 \pm 0.013^{\text{Im}}$	2.709 ¹		
Val ^E	0.533 ± 0.078^{be}	7.025 ^c	0.576 ± 0.014^{be}	7.060 ^{ce}		
Met ^E	0.129 ± 0.057^{mn}	1.700 ^{jk}	0.150 ± 0.018^{mn}	1.838 ^{lm}		
Lys ^E	0.403 ± 0.078^{cj}	5.312 ^{eh}	0.441 ± 0.024 ^{cj}	5.405 ^{gj}		
lle ^E	0.346 ± 0.050^{fl}	4.560 ^{gi}	0.378 ± 0.012^{fl}	4.633 ^{jk}		
Leu ^E	0.561 ± 0.082^{bc}	7.394 ^c	0.619 ± 0.020^{bc}	7.587 ^c		
Phe ^E	0.427 ± 0.062 ^{ci}	5.628 ^{dg}	0.458 ± 0.014^{ch}	5.613 ^{fh}		

different at p < 0.05.

The superscripts letter (N) referring to NEAAs while (E) is EAAs.

Key Findings Amino Acids Extraction Yield

Values within the same column with different superscripts letters (a-o) are significantly

Key Findings

Crude Chemical Composition of U. lactuca

During	Percentage Yield (%)				
Method	Amino acids	Moisture	Crude	Pigments	
			Protein	and Lipids	
Sun-Dry 1	8.178 ^{BCac}	25.171 ^{Aac}	10.273 ^{Bab}	5.039 ^{BCae}	
Sun-Dry 2	7.932 ^{BCae}	27.091 ^{Aa}	9.742 ^{Bae}	5.161 ^{BCad}	
Sun-Dry 3	8.365 ^{BCab}	26.021 ^{Aab}	9.455 ^{Bae}	3.425 ^{BCae}	
Average	8.158 ±	26.095 ±	9.823 ±	4.542 ±	
	0.217 ^{BCa}	0.962 ^{Aa}	0.415 ^{Ba}	0.969 ^{Cb}	
Air-Dry 1	6.163 ^{BCae}	19.704 ^{Aae}	10.635 ^{Ba}	7.530 ^{BCab}	
Air-Dry 2	8.455 ^{BCa}	16.442 ^{Aae}	9.820 ^{BCad}	16.375 ^{Ba}	
Air-Dry 3	8.144 ^{BCad}	20.658 ^{Aad}	9.894 ^{Bac}	7.644 ^{BCac}	
Average	7.587 ±	18.935 ±	10.116 ±	10.517 ±	
	1.243 ^{BCa}	2.211 ^{Ab}	0.451 ^{BCa}	5.074 ^{Ba}	

Values within the same row (A-C) are significantly different at p < 0.05.

Values within the same column (a-e) are significantly different at p < 0.05.



Percentage of Crude Chemical Composition in U. lactuca



Implications

Research, Theory and Practice

A higher yield amino acids content of interest can be extracted from the same seaweed sample with different drying method applied.

2

Utilisation of seaweed ulva lactuca can be a promising alternative for cosmetic activity and plant-based food supplement due to the high content of bioactive compounds thus, can be practiced in the future.

3

Traditional drying method can be used in future research specifically during the pretreatment of seaweed as it is proven to be efficient and cost effective.

Pre-treatment of seaweed sample need to be highlighted in future research as it is proven to increase the yield of extracted compound of interest.

Originality

Research value

Provide the study on the effects of different drying methods (sun-drying and air-drying) towards the amino acids, moisture, protein, pigments and lipids content in Malaysian green seaweed, Ulva lactuca.

The results are proven based on the significant value obtained using Two-ways analysis of variance (ANOVA).



Green seaweed, U. lactuca



Harvested seaweed limited to one location only (Merambong Island)

Research Limitation



Extraction procedure limited to one parameter only (drying method)

LOCATION

PARAMETER

