

Materi Presentasi

Professor's Talk Seri ke-4: 22 Juni 2023

Kerjasama:

QuaRance Consulting, SMART Fish-2 Programme-Unido Indonesia & PPUKM IPB

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PROFESSOR'S TALK

SERI #4 22 Juni 2023

"PENGEMBANGAN PRODUK BERBASIS MAKRO ALGA CAULERPA SP"



Prof. Dr. Ir. Eko Nurcahya Dewi, M.Sc
Guru Besar di Bidang Teknologi Hasil Perikanan
FPIK Universitas Diponegoro

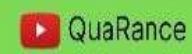
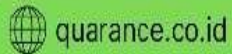
Waktu : Kamis, 10.00 - 12.00 WIB
Media : Zoom 

Diselenggarakan oleh :



Link Pendaftaran : bit.ly/ProfessorsTalk







PENGEMBANGAN PRODUK BERBASIS MAKRO ALGA *CAULERPA SP*

**EKO NURCAHYA DEWI
PRODI THP FPIK UNDIP**

JUNI, 2023

1

Pendahuluan

2

Kekuatan dan Tantangan

3

Penelitian

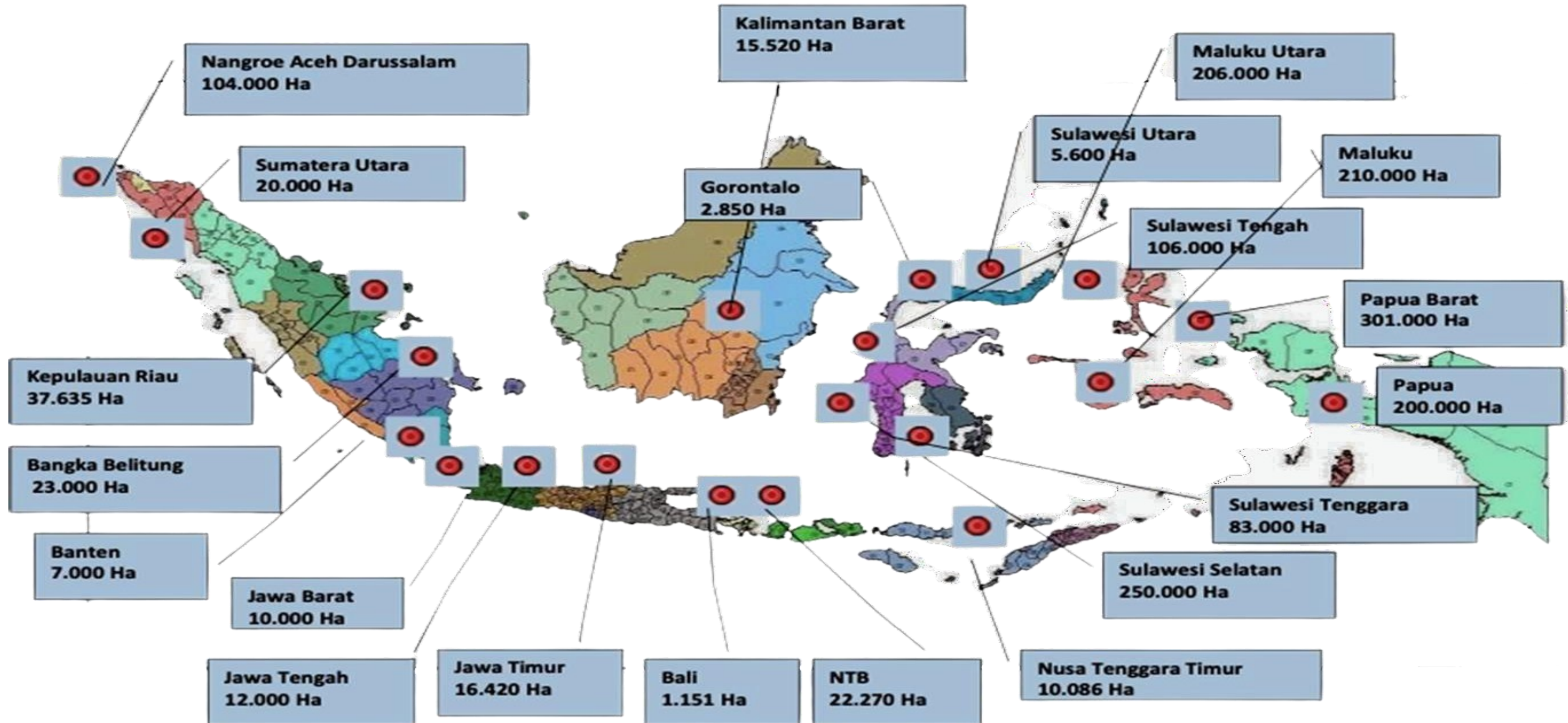
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Diskusi



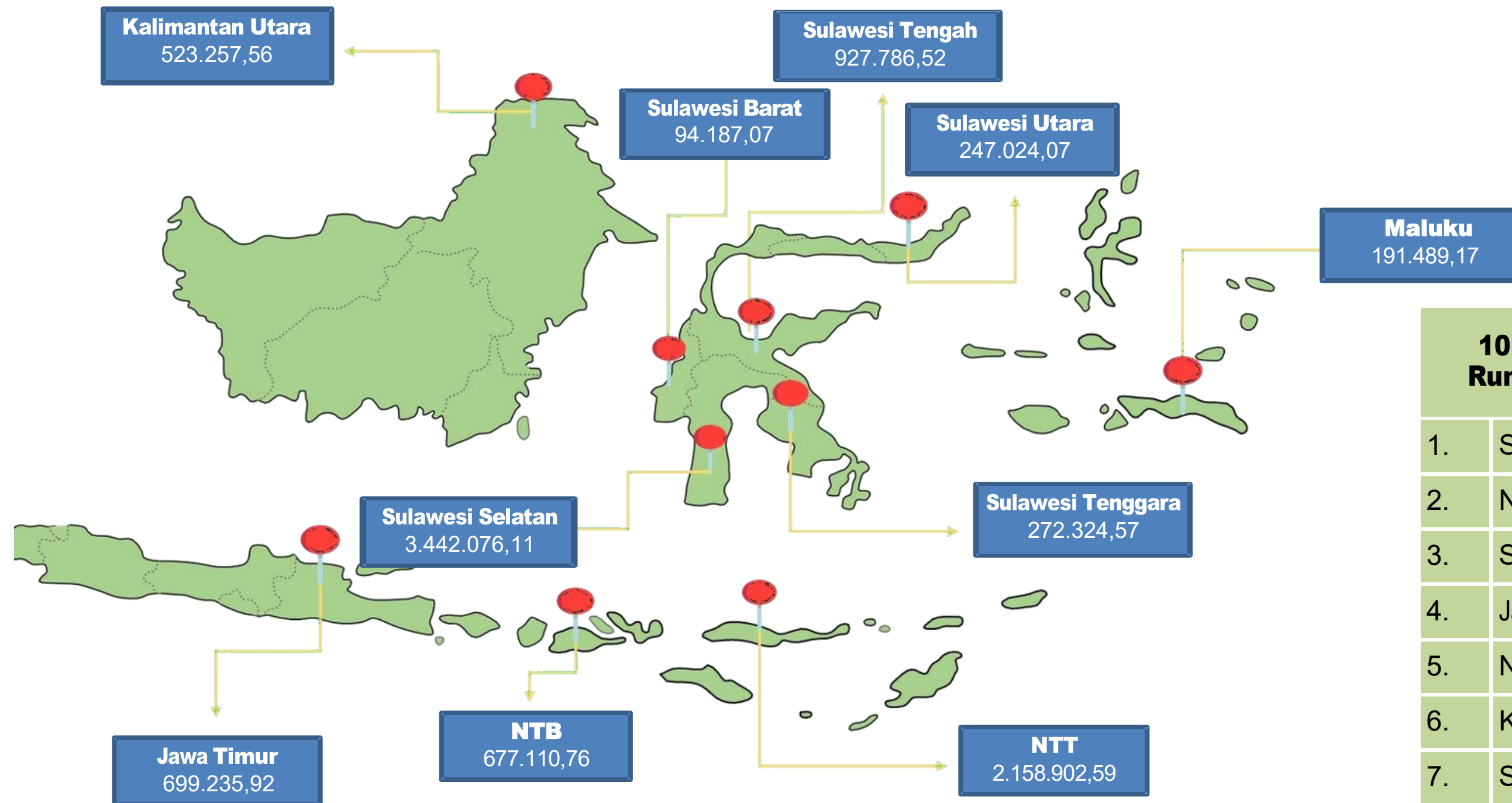
KEKUATAN

Ketersediaan lahan budidaya rumput laut di Indonesia



PROFIL RUMPUT LAUT INDONESIA

Volume Produksi Rumput Laut Indonesia Tahun 2020



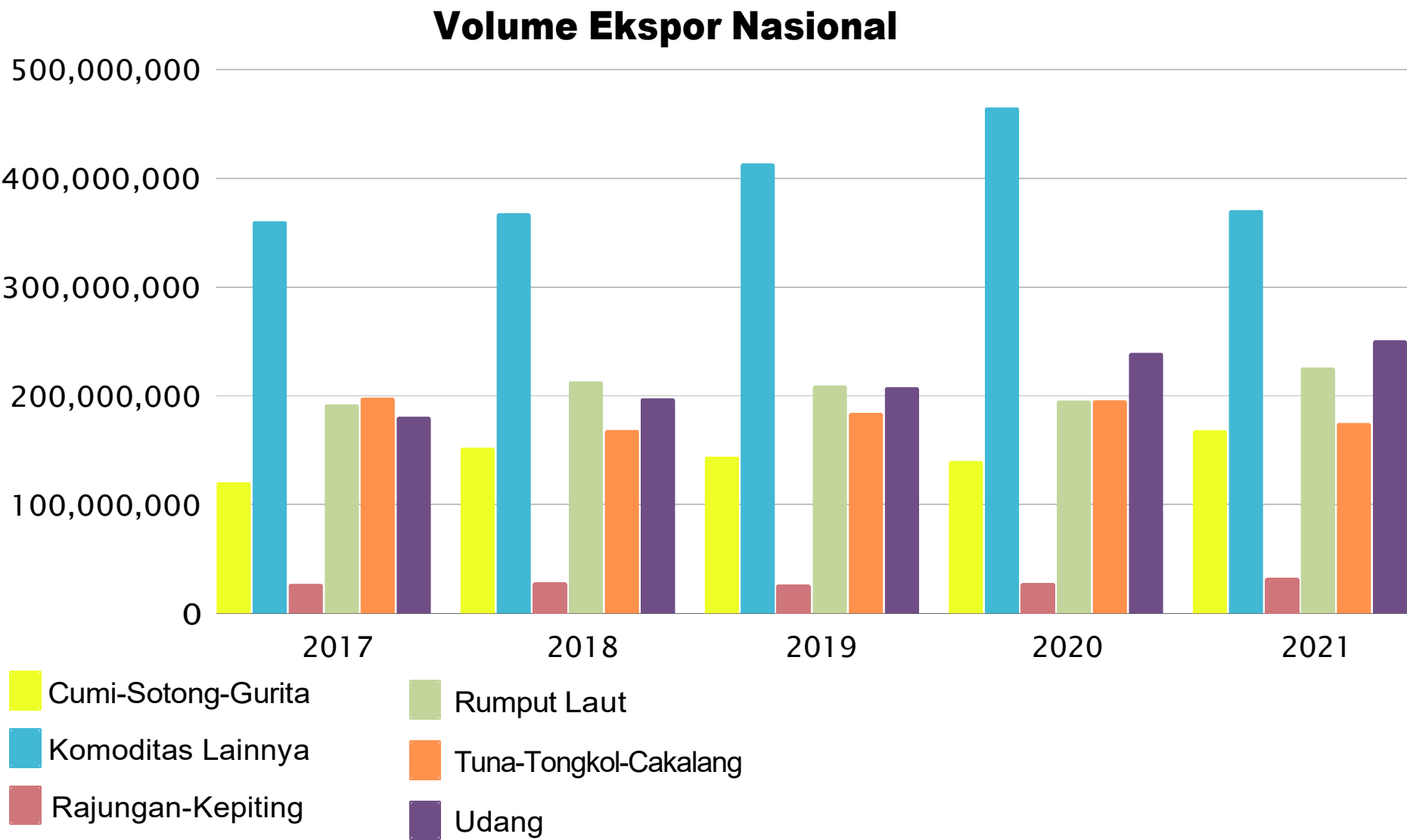
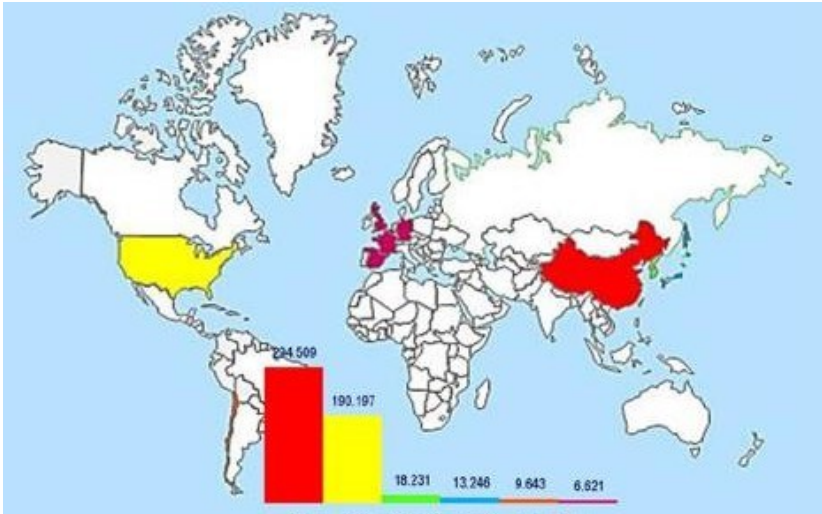
10 Provinsi Penghasil Rumput Laut Terbesar		Volume Produksi (Ton)
1.	Sulawesi Selatan	3.442.076,11
2.	Nusa Tenggara Timur	2.158.902,59
3.	Sulawesi Tengah	927.786,52
4.	Jawa Timur	699.235,92
5.	Nusa Tenggara Barat	677.110,76
6.	Kalimantan Utara	523.257,56
7.	Sulawesi Tenggara	272.324,57
8.	Sulawesi Utara	247.024,07
9.	Maluku	191.489,17
10.	Sulawesi Barat	94.187,07

Sumber : Webinar Kemenko Rumput Laut Indonesia, 25 Oktober 2022

PROFIL RUMPUT LAUT INDONESIA

Ekspor Rumput Laut Indonesia

Indonesia memiliki 550 jenis spesies rumput laut bernilai ekonomis tinggi dari sekitar 8.000 jenis yang ada di dunia (Merdekawati & Susanto, 2009). Jenis yang terbanyak adalah *Eucheuma cottoni* dengan nilai total potensinya USD10 miliar per tahun. Indonesia telah menjadi salah satu produsen utama rumput laut dunia jenis *Euchema spp.* dan *Gracilaria spp.* dan saat ini menjadi negara eksportir nomor satu dunia. Lebih dari 80% ekspor rumput laut Indonesia masih didominasi oleh bahan baku kering.



Nilai Ekspor Rumput Laut Indonesia berdasarkan Negara Tujuan Tahun 2021

Negara Tujuan	Volume Ekspor (Ton)	Nilai FOB (\$USD)
Tiongkok	175.563,3	188.394,1
Chili	2.870,2	4.561,9
Korea Selatan	5.129,8	5.403,1
Jepang	1.431,4	1.014,2
Perancis	2.470,1	3.134,9
Spanyol	1.974,5	1.039,7

KOMPETITOR PRODUKSI RUMPUT LAUT GRACILARIA

Negara	Rumput Laut Gracilaria Sp	
	Ton (Berat Basah)	Kontribusi terhadap Dunia (%)
China	3.480.850	95,63
Indonesia	1.431,4	1.014,2
Vietnam	11.150	0,31
Republik Korea	1.769	0,05
Taiwan Tiongkok	976	0,03
Chili	21.672	0,60
Maroko	273	0,01
Spanyol	0,13	0,00

Sumber : KKP (2022), BPS (2022), Trademap (2019), Kementerian Investasi, 2022

PELUANG PRODUKSI RUMPUT LAUT



9.059.114

SATU DATA
Statistik Kelautan Perikanan
Angka Produksi 2021



4.195.000

Kapasitas Potensi Penyerapan Rumput Laut
untuk Pengolah Dalam Negeri dan Pasar
Ekspor



5.011.856

Hasil Survey Komoditas Perikanan Potensi
Rumput Laut 2021 seri 2



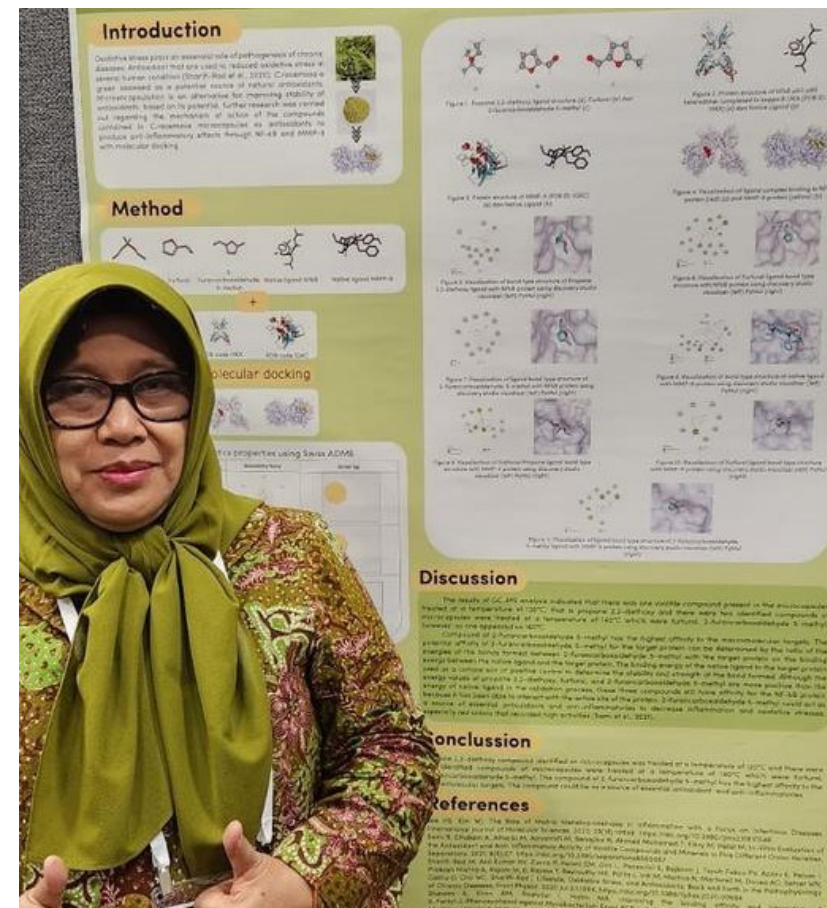
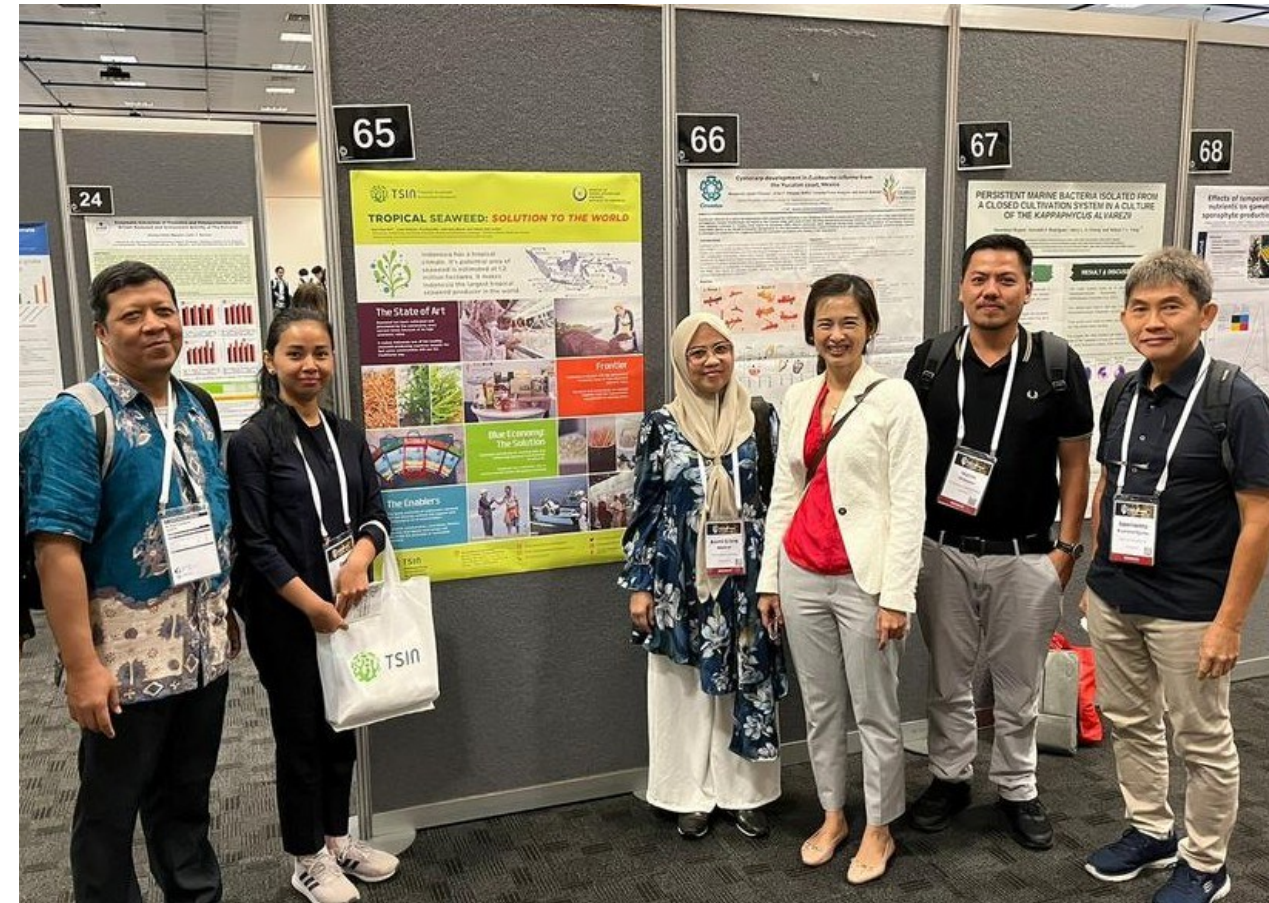
9.059.114

Estimasi Ketersediaan Rumput Laut
Berdasarkan Data Eskpor 2021 & Analisa
Lapangan

*Sumber : Indra Santoso/ Arli/ Webinar Peluang dan Tantangan Rumput Laut Indonesia 2023
(Satu Data KKP, BPS, ASTRULI, ARLI)*

TANTANGAN TENTANG RUMPUT LAUT





Black Campaign / Tobacman Issue



Status “Rumput Laut & Hasil Olahannya : Carrageenan & Agar - Agar” tetap berada dalam “Daftar Produk - Produk Organik USDA” Periode 2023 - 2028 seperti pada Periode 2018 - 2023 US

Terima kasih atas dukungan & kerjasama seluruh pihak khususnya Duta Besar RI, YM Rosan P. Roeslani beserta Jajarannya di KBRI Washington DC US.

Salam hormat dari Washington DC Safari Azis Asosiasi Rumput Laut Indonesia (ARLI) ID

- 12 Mei 2023 -

Diversifikasi Produk Rumput Laut

Pemanfaatan rumput laut selain jenis *Eucheuma sp*, *Gracilaria sp*, membuka peluang rumput laut yang lain untuk dikembangkan



Ulva lactuca → *Nori*



Saragassum → *Alginate*



Caulerpa → *Direct Food*

ANGGUR LAUT



Sumber :

<https://www.kompasiana.com/alfonsina207/64885e924d498a3b0e4fba42/anggur-laut-yang-tersembunyi-di-pinggiran-pesisir-kepulauan-kei>



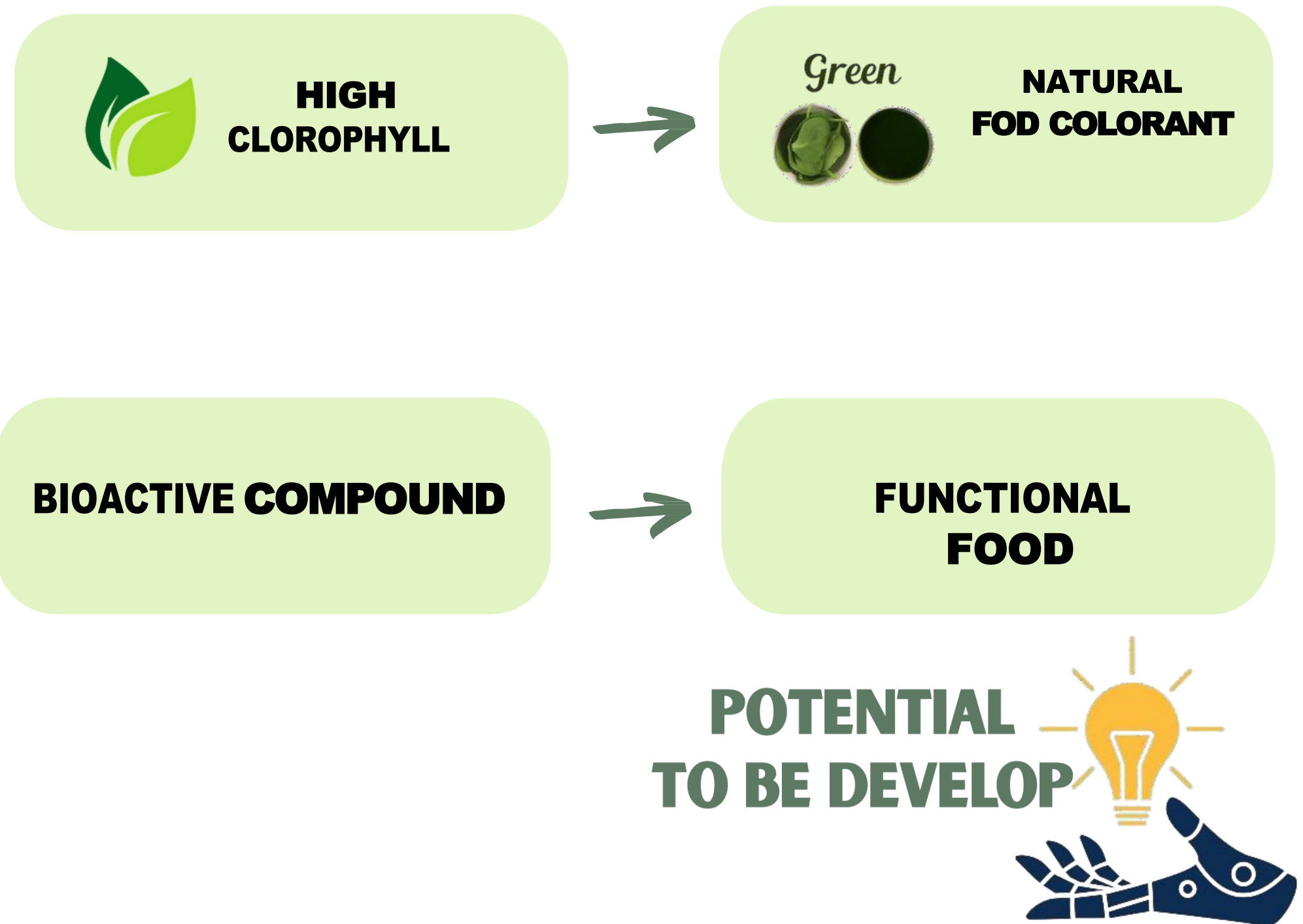
FGD Pengembangan Caulerpa dan Ulva

Caulerpa racemosa

One species of green seaweed, known as “lawi-lawi”, “latoh” or “sea grape/anggur laut”.

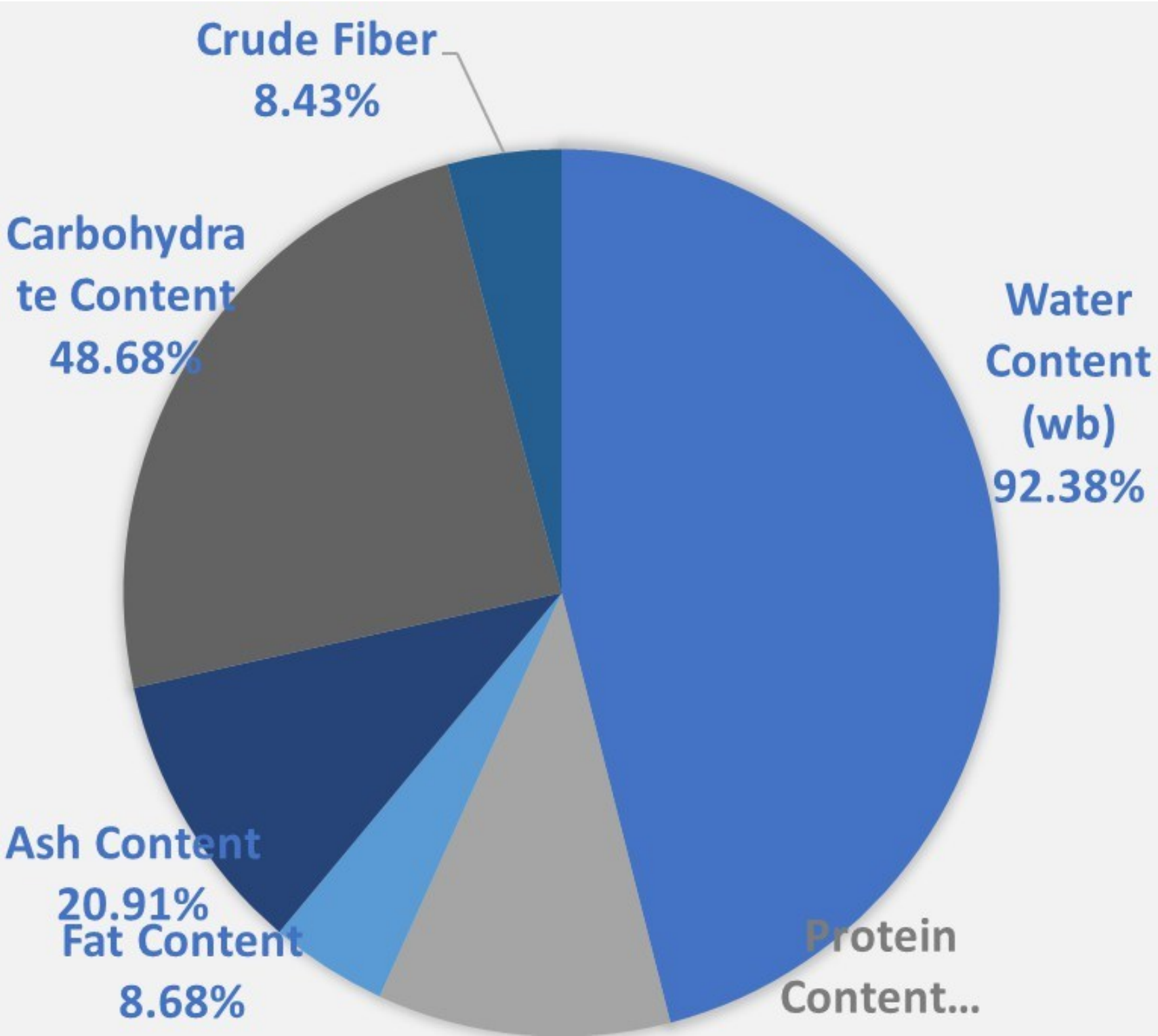


(Caulerpa racemosa)



Nutrition Composition of *Caulerpa* sp.

(Ma'ruf *et al.*, 2013)



Caulerpa racemossa	
Parameter	
L-Glutamicacid	1.209,76 ppm
L-Asparagine	Tidak terdeteksi
L-Serine	586.52 ppm
L-Threonin + L-Glycine	2.792,51 ppm
L-Alanine	658.96 ppm
L-Arginine	652.78 ppm
L-Valine	557.19 ppm
L-Leucine	763.14 ppm
L- Lysine	996.03 ppm

Sumbang Saran : Penelitian Yang Sudah Dilakukan

Effects of thermal treatments on the characterization of microencapsulated chlorophyll extract of Caulerpa racemosa

Caulerpa sp :

- Anti kanker, anti bakteri, anti inflamasi, anti diabetik, dan anti plasmodial (Darmawan et al., 2020). Memiliki zat bioaktif sebagai anti oksidan, menurunkan tekanan darah, dan dipercaya sebagai makanan kecantikan (Tapotubun et al., 2018)
- Kaya akan berbagai nutrisi yang dibutuhkan oleh tubuh manusia, termasuk asam amino, asam lemak tak jenuh dan mineral.

Firda, H., Junaidi, M., & Setyono, B. D. H. (2022). THE EFFECT OF HARVESTING ON THE PRODUCTION AND ANTIOXIDANT ACTIVITY OF SEA GRAPE (*C. racemosa*) BY RIGID QUADRAN. Indonesian Journal of Aquaculture Medium, 2(1), 54-64. Untuk memperoleh kadar antioksidan, pertumbuhan bobot mutlak dan laju pertumbuhan spesifik yang optimal dalam budidaya anggur laut *Caulerpa racemosa*, digunakan umur panen 30-40 hari.

Hasil uji proksimat laboratorium Balai Besar Perikanan Budidaya Air Payau (BBPBAP) Jepara menunjukkan bahwa *Caulerpa* sp hasil budidaya di tambak mengandung protein 25,61%; lemak 3,16%; serat 30,67% dan BETN 25,86%.

SEAWEED FARMING:

Assessment on the Potential of
Sustainable Upscaling for Climate,
Communities and the Planet



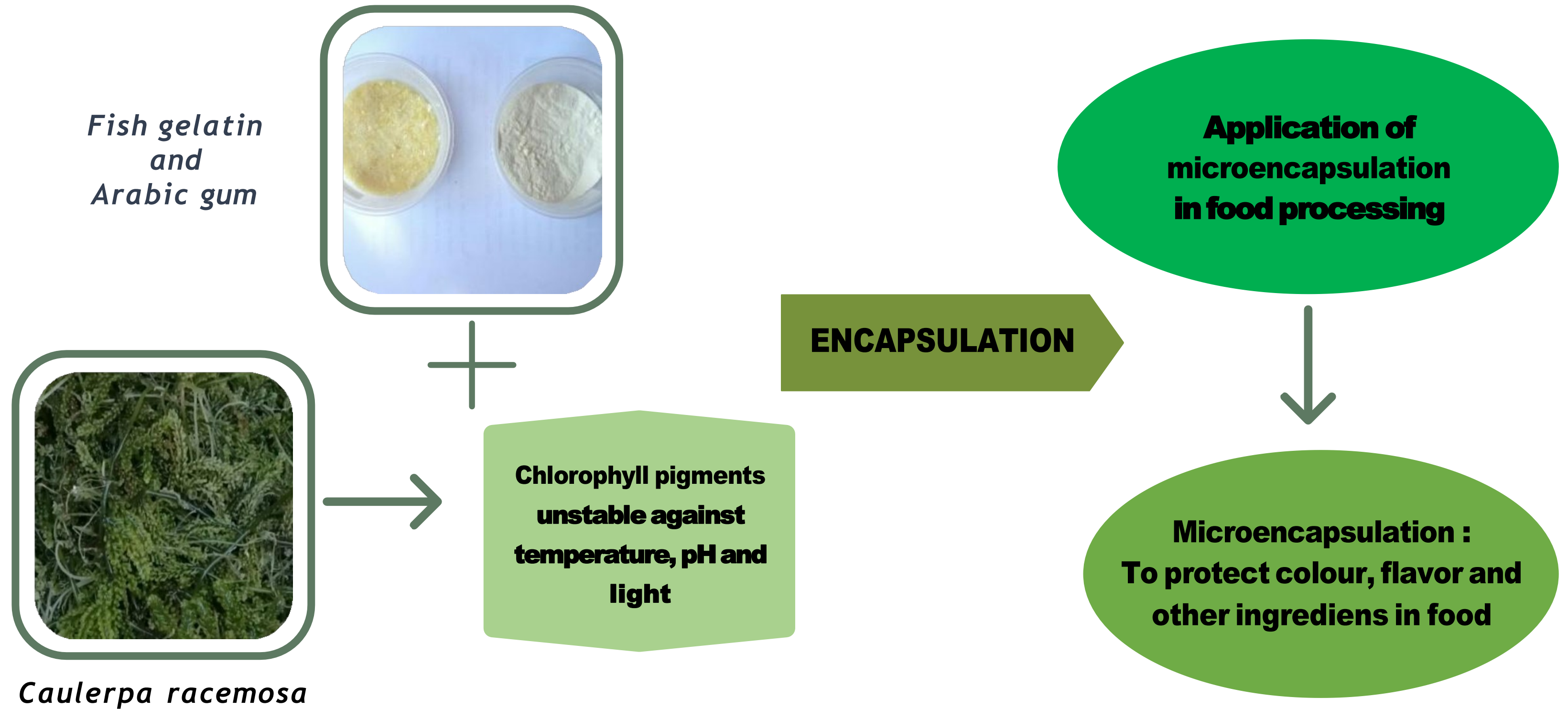
MATERIAL



C. racemosa (Sea grape) obtained from Karimun Java Island, North Java Sea. The weed was extracted using acetone ratio 1:4 (dried powder/solvent)

Gelatin obtained through the extraction process of tilapia scales, with 128.20 Bloom of gel strength, pH 5.3, viscosity 2.6 cps, moisture content 7.7%, yellowish color, and categorized as type A.

INTRODUCTIONS



ANALYSIS

CHLOROPHYLL

ANTIOXIDANT ACTIVITY

FTIR

SEM

TOTAL PHENOLS

COLOR

PSA

DEGRADATION KINETICS

CHLOROPHYLL-A AND CHLOROPHYLL-B CONTENT

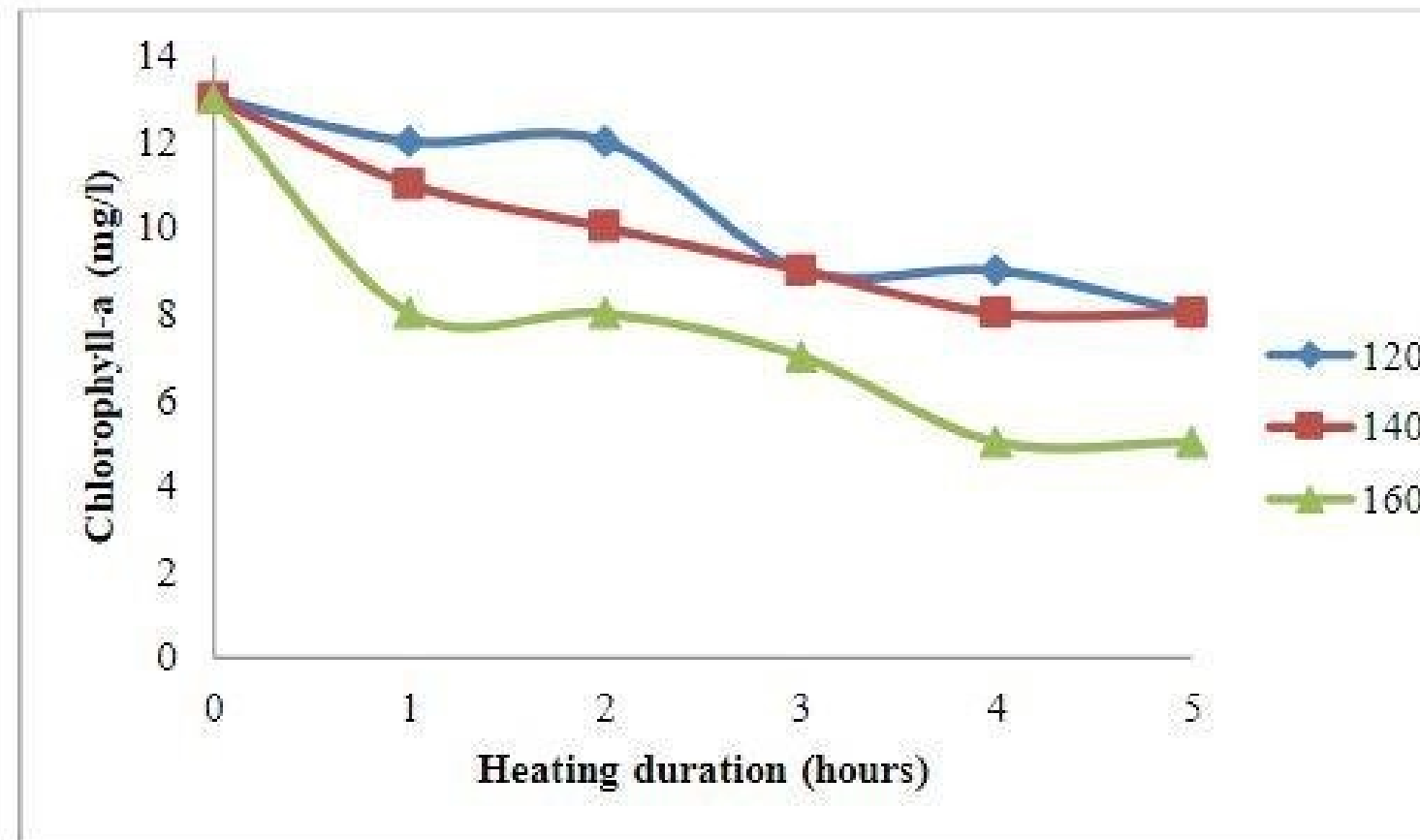


Figure 1. The content of chlorophyll-a

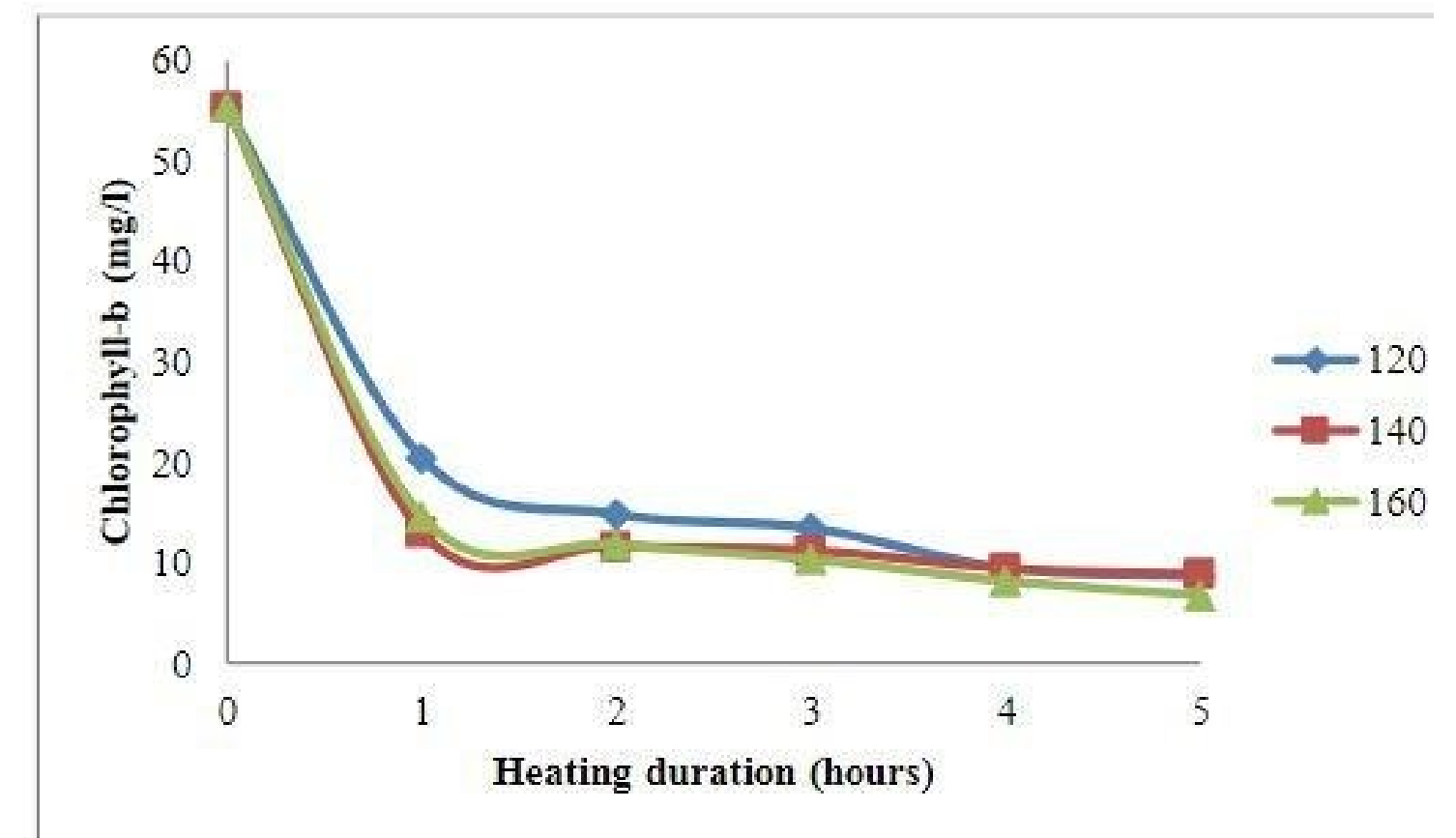


Figure 2. The content of chlorophyll-b

It showed that the heating process more easily damaged chlorophyll-b than chlorophyll-a

TOTAL PHENOLS

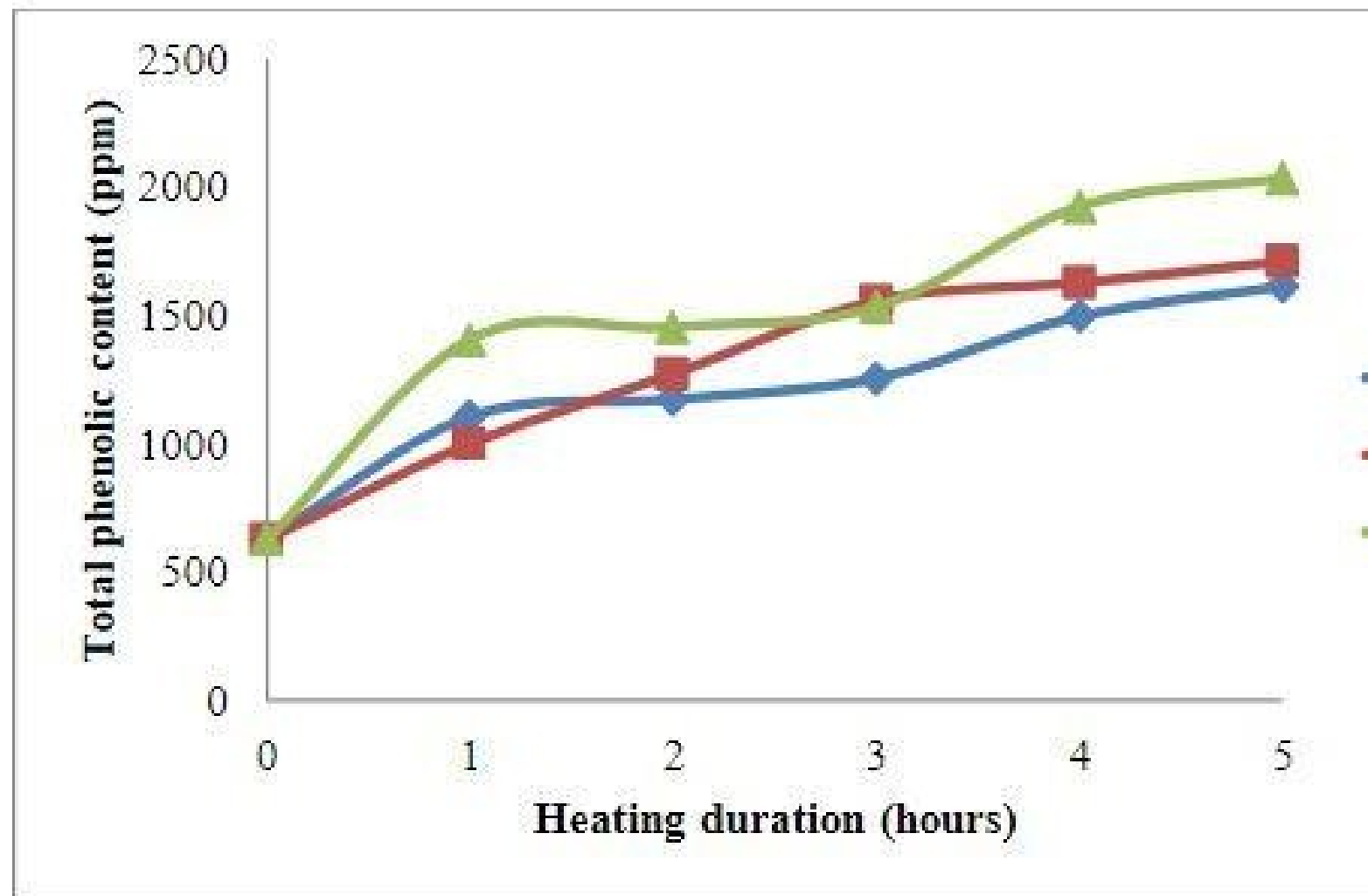
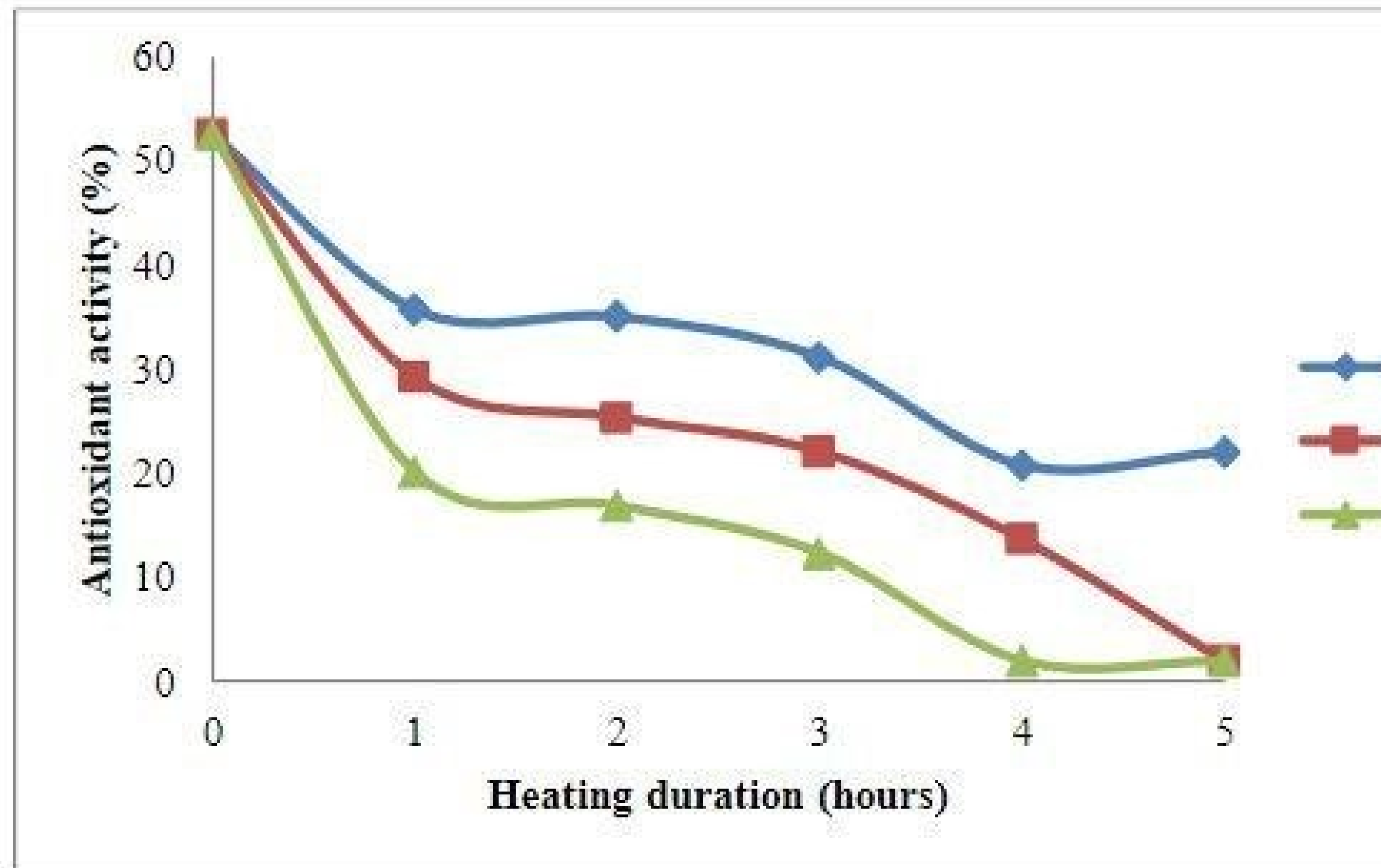


Figure 3. Total phenolic content

The heating treatment on the microcapsules increased the total phenolic content. It showed that the heating could initiate degradation of polyphenol.

ANTIOXIDANT ACTIVITY



The antioxidant activity of chlorophyll microcapsules decreased during heating at different temperature and long time of heating. It because the chlorophyll was degraded by heating treatment

THE DISCOLORATION OF MICROCAPSULES DURING HEATING

Microcapsules	L	a*	b*	ΔE
Without heating	39.67±1.15	-18.00±0.00	35.33±0.58	-
120°C, 1 hr	41.67±2.08	-15.00±0.00	38.67±0.58	5.50±1.67
120°C, 2 hrs	42.00±1.00	-14.00±0.00	39.33±1.15	6.36±1.68
120°C, 3 hrs	41.00±1.00	-12.33±0.58	39.33±0.58	7.16±0.40
120°C, 4 hrs	41.33±0.58	-12.00±0.00	38.33±0.58	7.04±0.75
120°C, 5 hrs	42.33±0.58	-11.67±0.58	39.33±0.58	8.09±0.59
140°C, 1 hr	38.67±0.58	-8.67±0.58	37.33±0.58	9.73±0.63
140°C, 2 hrs	37.33±0.58	-7.33±0.58	36.00±0.00	10.96±0.45
140°C, 3 hrs	35.00±1.00	-6.00±0.00	35.00±1.00	13.03±0.88
140°C, 4 hrs	34.00±1.73	-6.00±1.00	34.33±1.15	13.48±2.31
140°C, 5 hrs	34.00±1.00	-4.33±0.58	34.33±0.58	14.95±0.42
160°C, 1 hr	25.67±0.58	1.67±0.58	27.33±0.58	25.45±0.27
160°C, 2 hrs	23.33±1.15	3.67±0.58	24.67±0.58	29.19±1.99
160°C, 3 hrs	15.33±0.58	6.00±0.00	16.33±0.58	39.11±1.43
160°C, 4 hrs	10.00±1.00	5.00±0.00	9.67±0.58	45.48±0.70
160°C, 5 hrs	9.33±2.08	2.33±0.58	5.67±0.58	47.07±3.06

COLOR

During heating, the intensity of green color decreased as indicated by a decreased in the value of a* (-). Heating at 160°C, the color a* changed to (+), which indicated the color of red

Note: Data ± standard deviation

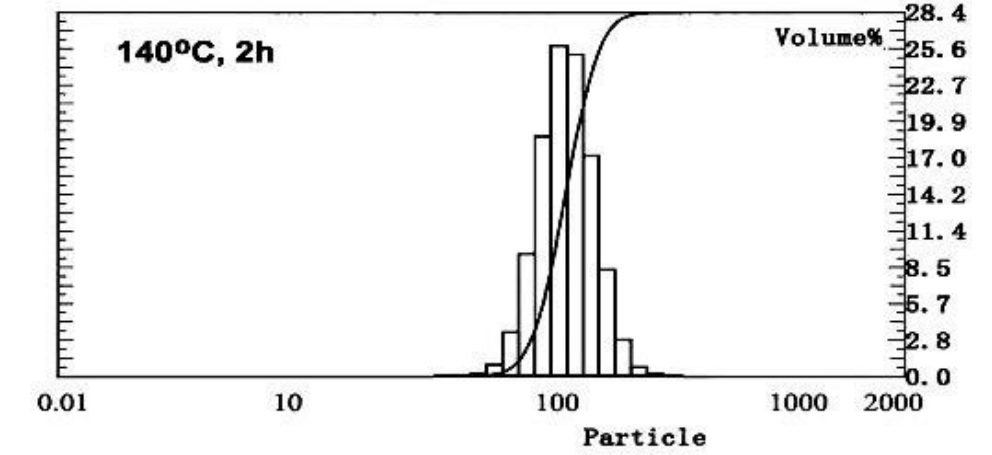
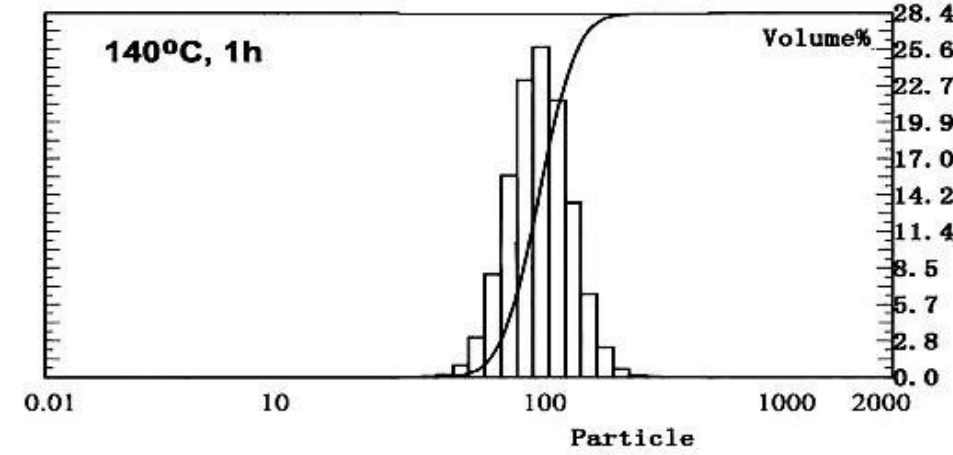
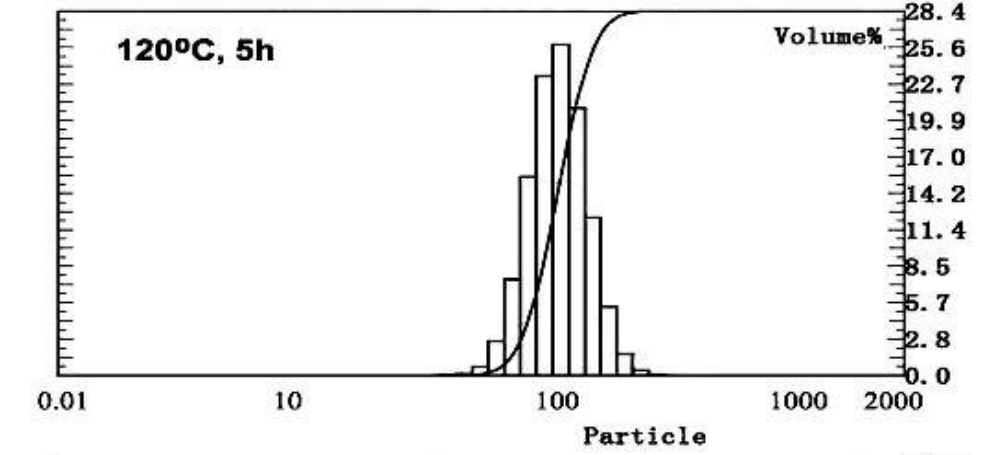
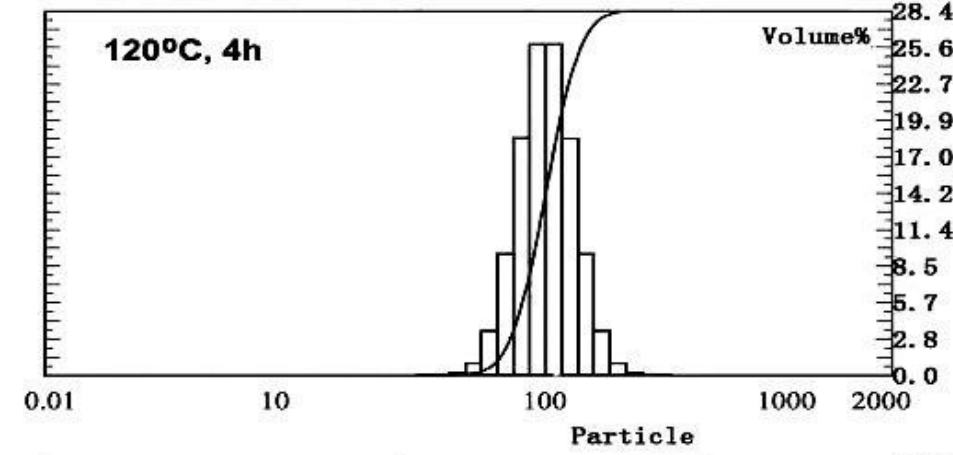
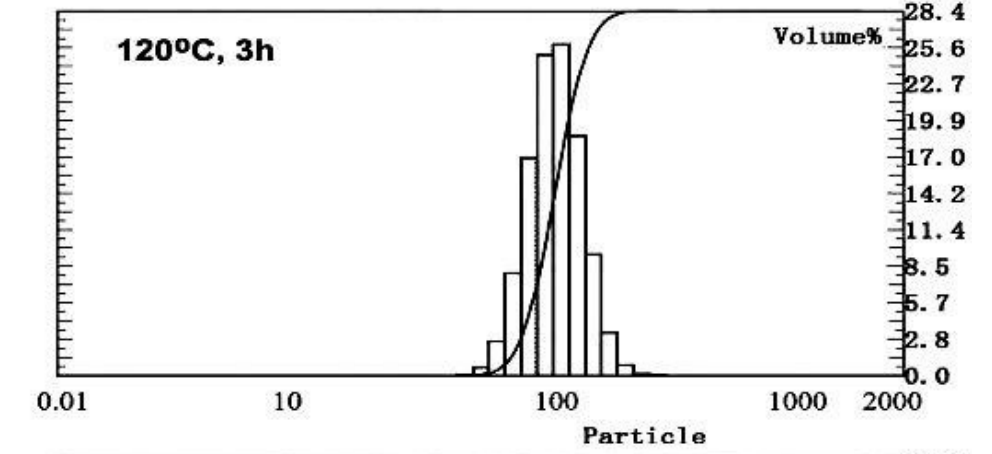
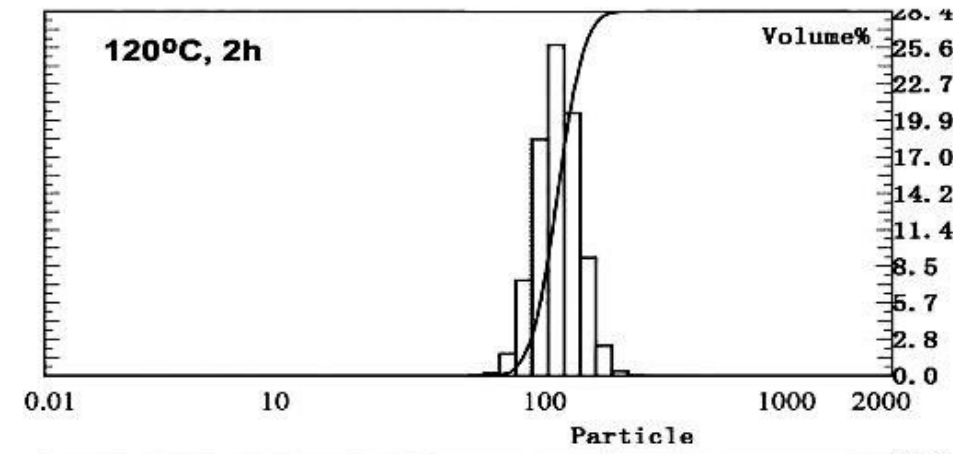
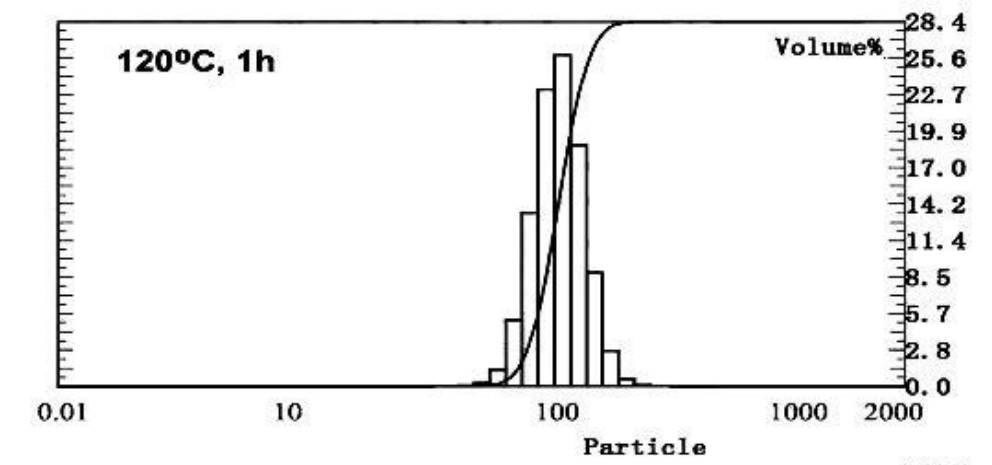
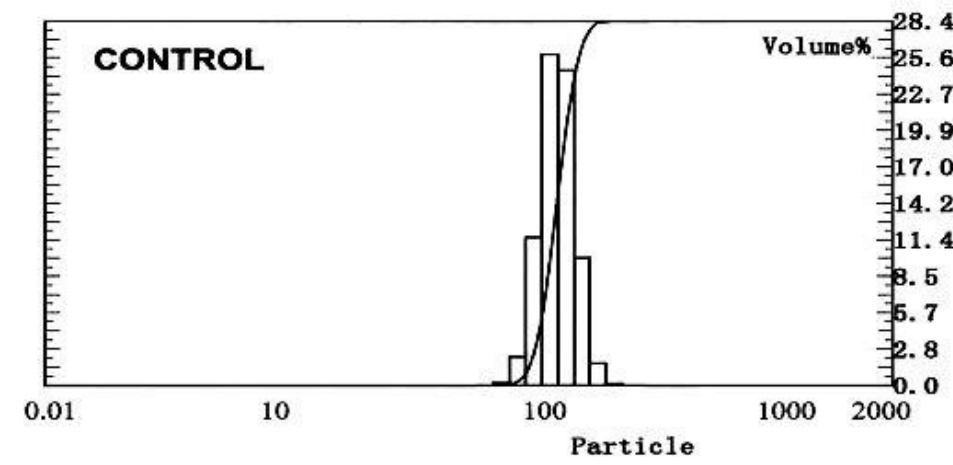
PARTICLE SIZE AND MORPHOLOGY OF MICROCAPSULES

The average of particle size with heating treatment and duration ranged from 91.58-112.51µm.

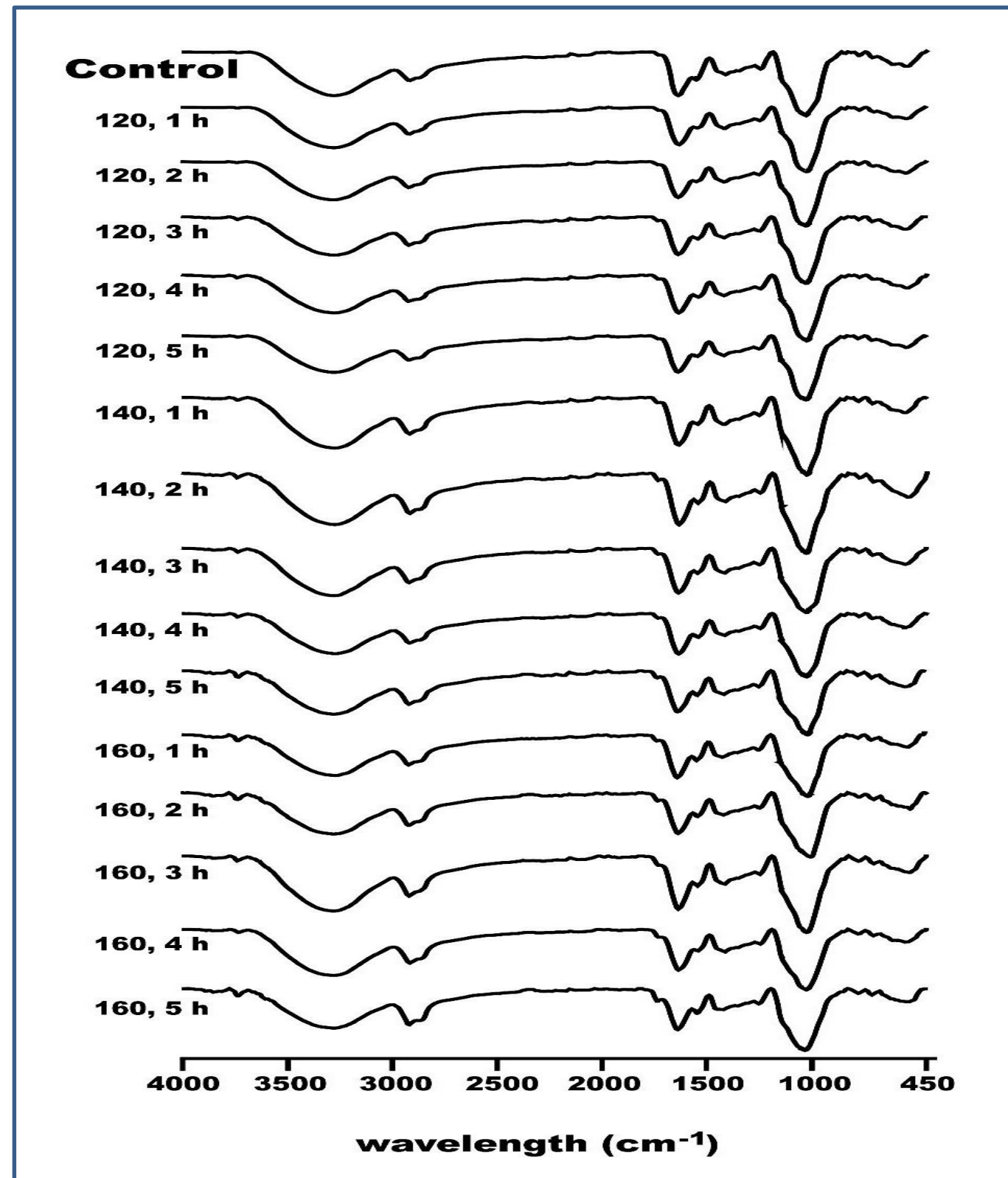
The size of the microcapsules was affected by the microencapsulation process, such as freeze drying method.

PARTICLE SIZE AND MORPHOLOGY OF MICROCAPSULES				
Microcapsules	D10 (µm)	D50 (µm)	D90 (µm)	Span (µm)
Without heating	88.55	109.28	134.33	0.42
120°C, 1 hr	73.20	98.42	131.81	0.60
120°C, 2 hr	80.35	103.69	133.58	0.51
120°C, 3 hrs	69.40	95.95	132.44	0.66
120°C, 4 hrs	67.70	94.55	131.94	0.68
120°C, 5 hrs	70.24	99.38	140.34	0.71
140°C, 1 hr	69.56	100.19	144.05	0.74
140°C, 2 hrs	78.49	108.90	150.86	0.66
140°C, 3 hrs	71.42	102.08	145.72	0.73
140°C, 4 hrs	72.11	103.27	147.54	0.73
140°C, 5 hrs	67.10	98.24	143.63	0.78
160°C, 1 hr	60.56	89.46	131.98	0.80
160°C, 2 hrs	59.81	94.59	149.60	0.95
160°C, 3 hrs	63.33	90.79	129.93	0.73
160°C, 4 hrs	59.67	87.59	128.38	0.78
160°C, 5 hrs	68.40	96.71	136.45	0.70

PARTICLE SIZE AND MORPHOLOGY OF MICROCAPSULES

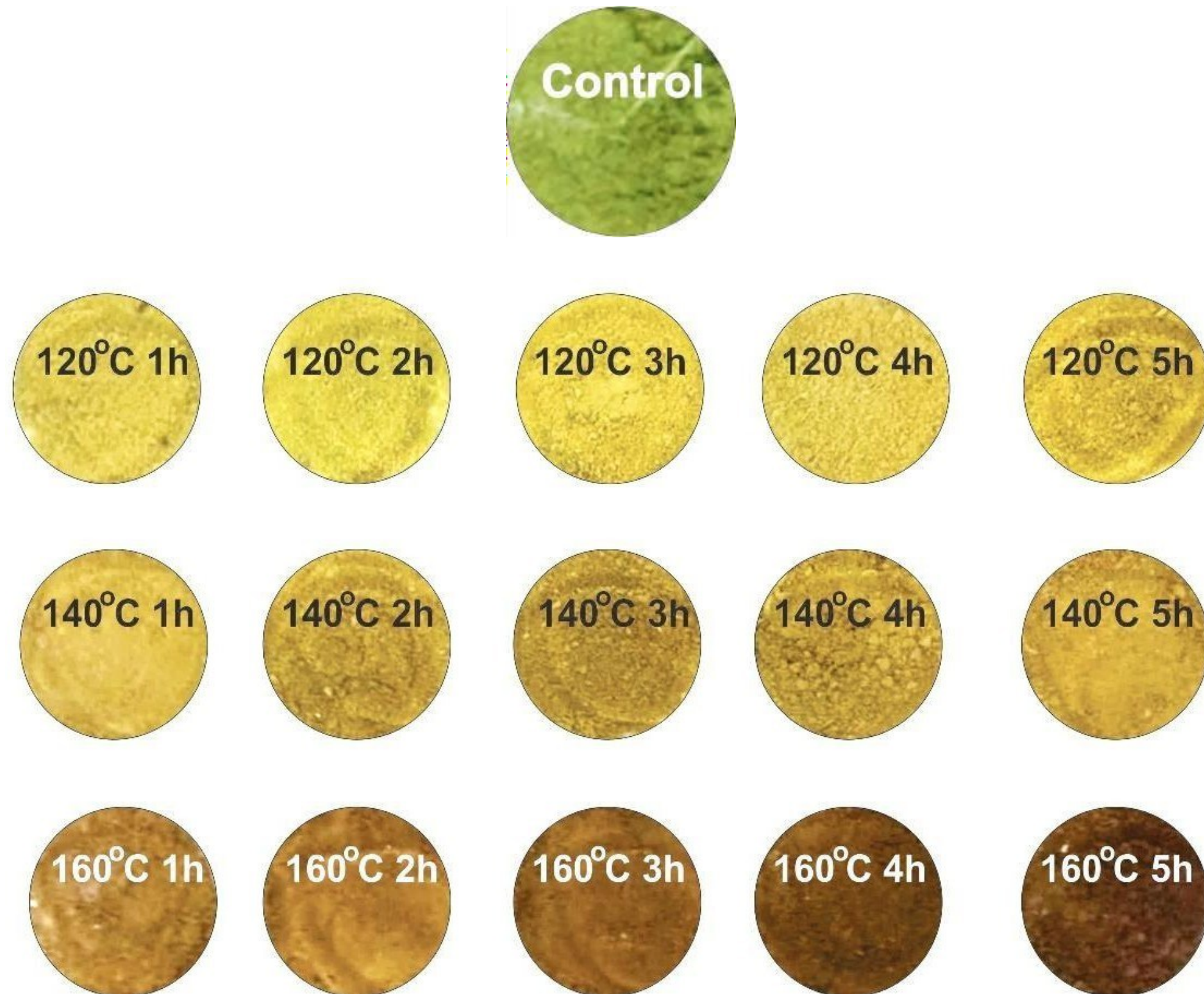


FUNCTIONAL GROUPS WITH FITR

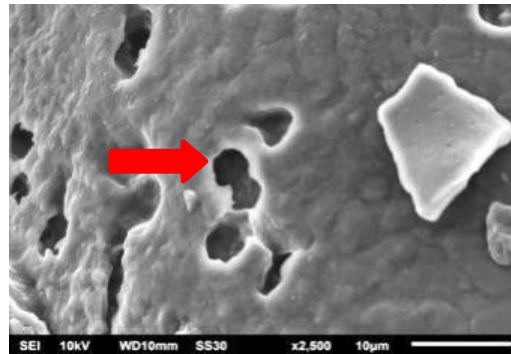


According to FTIR spectra, there were C=O bond representing chlorophyll and coating materials that appear at a wavelength around 1600 cm⁻¹. It showed that there was an interaction between chlorophyll and coating materials.

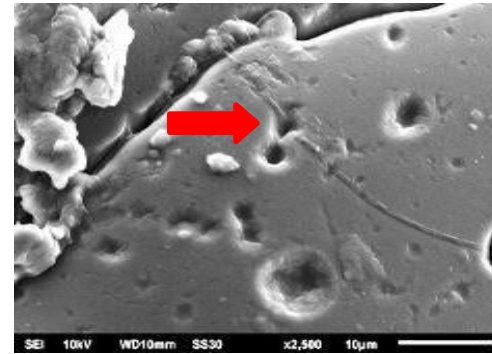
COLOUR OF MICROCAPSULES AT DIFFERENT TEMPERATURES AND HEATING TIMES



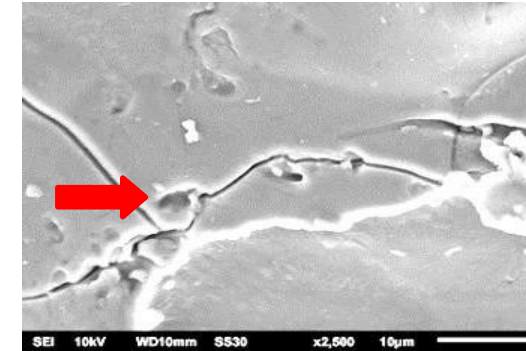
SEM Morphology Analysis of Microcapsules at Different Temperatures and Heating Times



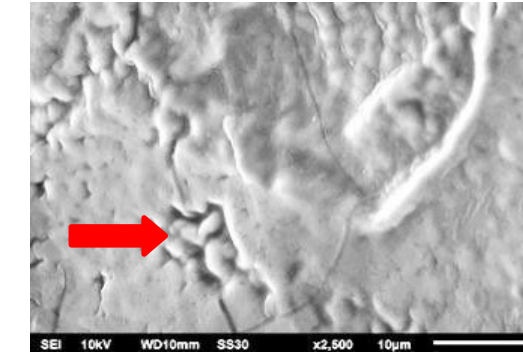
Control



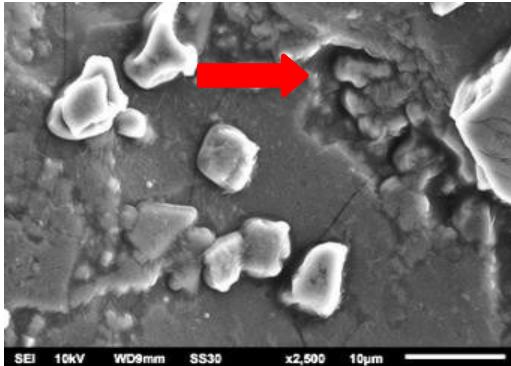
120°C, 1 h



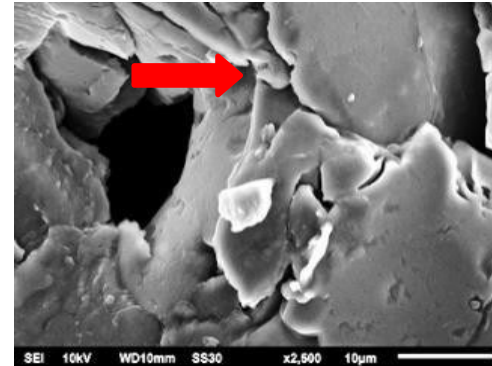
120°C, 2 h



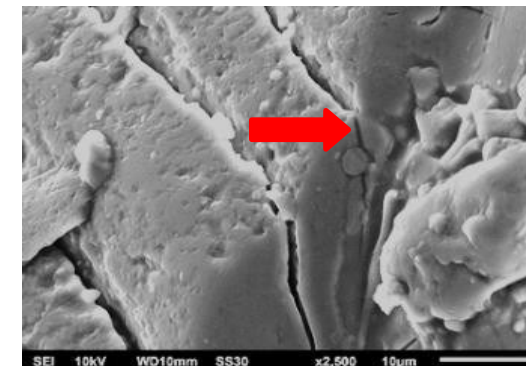
120°C, 3 h



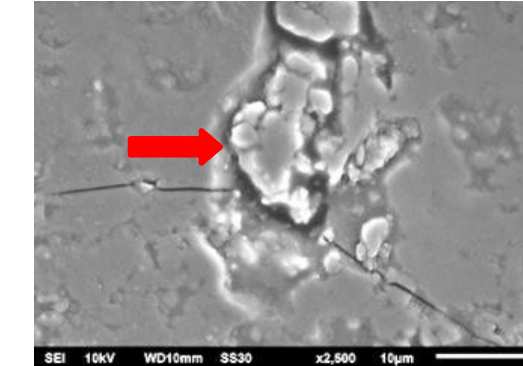
120°C, 4 h



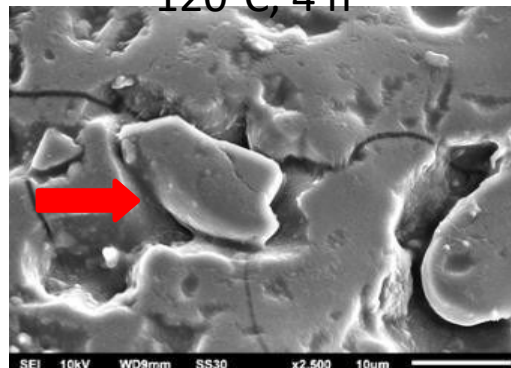
120°C, 5 h



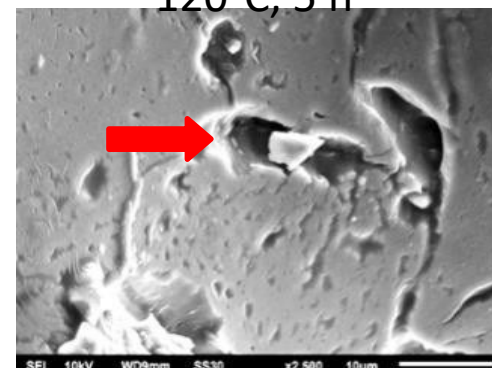
140°C, 1 h



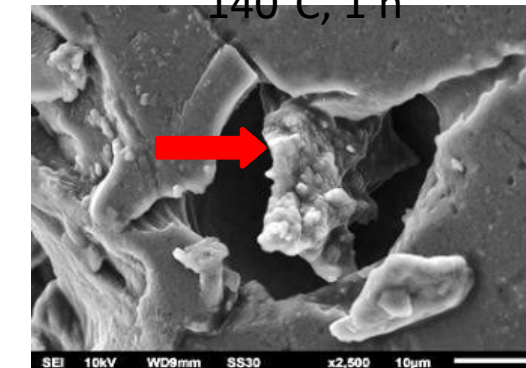
140°C, 2 h



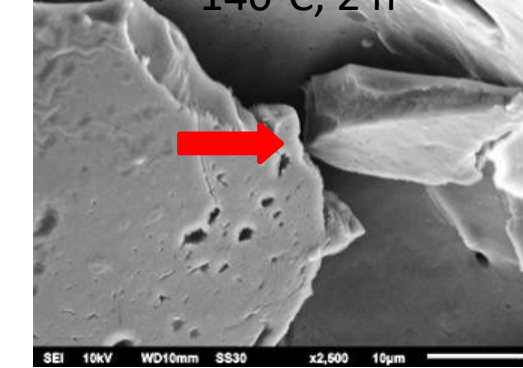
140°C, 3 h



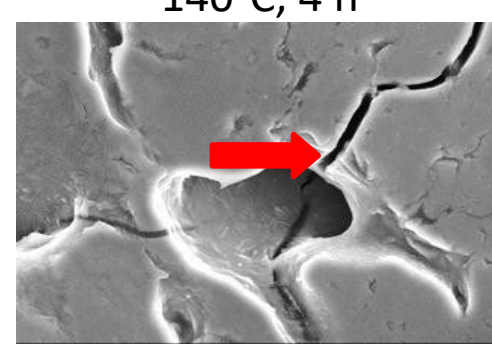
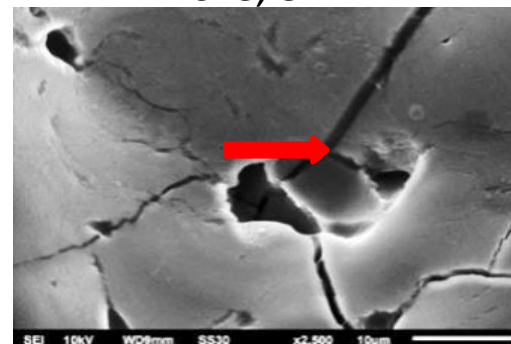
140°C, 4 h



140°C, 5 h



160°C, 1 h



160°C, 2 h

160°C, 3 h

160°C, 4 h

160°C, 5 h

Characterization of *Caulerpa racemosa* yogurt processed using *Lactobacillus bulgaricus* and *Streptococcus thermophilus*

Dewi, E.N. and Purnamayati, L.

ABSTRACT

The modification of low-fat probiotic drinks is a value-added product and can be classified as a healthy drink. *C. racemosa* is a Chlorophyceae seaweed with high food fibre and functional compounds, including phenolic and chlorophyll as antioxidants. This study aimed to determine the effect of different lactic acid bacteria on the characteristics of the probiotic drink products by combining *C. racemosa* with low-fat cow's milk. *C. racemosa* and low-fat cow's milk with a ratio of 3:4 was fermented with *L.bulgaricus* (A), *S thermophilus* (B), and a combination of both (C). The products were analysed for protein and fat content, dietary fibre, total phenolic content, antioxidants activity, total lactic acid bacteria, total acid, pH, and with a sensory test for consumer preference. The addition of the different lactic acid bacteria had effects on the fat, antioxidants, dietary fibre, and total acid contents, while protein and total phenolic contents were not significantly different. The combination of *L. bulgaricus* and *S. thermophilus* produced a probiotic drink with the lowest amount of dietary fibre (1.27%) and total acid (0.64%), with antioxidant activity IC50 of 183.57 ppm and total phenolic content of 0.11 mg GAE/g. The preference test showed that the panellists preferred yogurt fermented with *L. bulgaricus* and *S. thermophilus* for its aroma, texture, and colour.

Application of Caulerpa racemosa Extract as A Natural Colorant for Raw Noodles



Control

A

B

C

Note :

Control : Raw noodle with no addition of *C. racemosa* extract

- A : Raw noodle with addition of *C. racemosa* extract concentration 25%
- B : Raw noodle with addition of *C. racemosa* extract concentration 50%
- C : Raw noodle with addition of *C. racemosa* extract concentration 75%

COLOR ASSAY OF NOODLES

Treatment	Color			Degrees Hue (°Hue)
	L*	a*	b*	
Control	66.70 ± 0.85 ^a	0.72 ± 0.07 ^a	18.10 ± 0.17 ^a	87.71 ± 0.20 ^a
A	60.86 ± 1.32 ^b	-6.65 ± 0.19 ^b	19.84 ± 0.18 ^b	71.31 ± 0.58 ^b
B	55.08 ± 1.37 ^c	-14.89 ± 0.20 ^c	15.20 ± 0.19 ^c	45.56 ± 0.66 ^c
C	47.52 ± 1.24 ^d	-17.79 ± 0.27 ^d	12.87 ± 0.23 ^d	36.56 ± 1.61 ^d

The Effect of Chlorophyll in Alginate Based Edible Film in Inhibiting Spoilage of Fish Snacks

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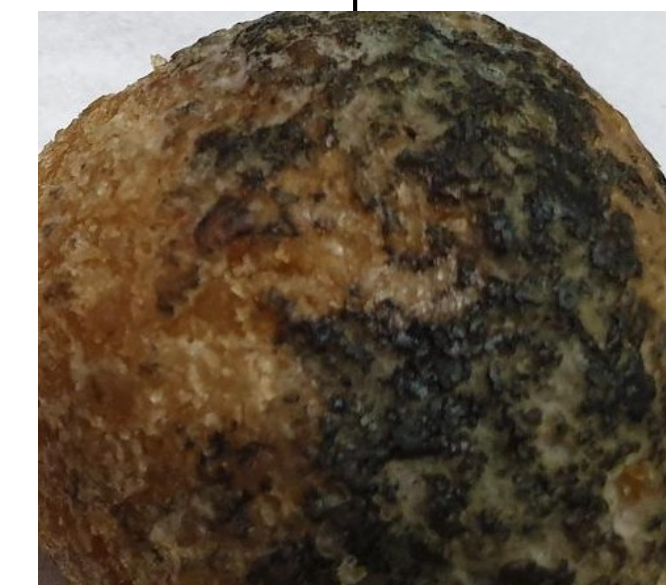
Analysis of Edible Film



Physical Characteristics Test of Edible film
(Thickness, tensile strength, modulus young, elongation and WVTR)

The edible film were also studied for their antioxidant activity,
phenolic compound, FTIR , imhibition zone, idenfication of fungi

Edible Film Application and Inhibition Zone



Fish bubble potato were coated (A) and uncoated (B) with edible film

Total Phenol and DPPH Antioxidant Edible Film

No.	Sample	Total Phenol (mgGAE/100 g sample)	DPPH Antioxidant Activity (%)
1	Control	0,883 ± 0,01 ^a	9,334 ± 0,05 ^a
2	0,5% Microcapsule	4,293 ± 0,01 ^b	21,735 ± 0,02 ^b
3	1,0% Microcapsule	6,664 ± 0,05 ^c	56, 566 ± 0,01 ^c
4	1,5% Microcapsule	8,163 ± 0,01 ^d	61,724 ± 0,02 ^d

Optimum DPPH scavenging activity was around 62% with 1.5% *Caulerpa* sp. microcapsules.

Fungi Identification on Fish Bubbles Potato Snack

Samples	Days storage	
	3	6
Control	Grey fungi started growth 	Positive : <i>Rhizopus</i> sp (black colour all surface) 
Fish bubble potato snacks with edible film	Negatif 	Positive : <i>Rhizopus</i> sp at the part of the surface 

KESIMPULAN

Ketersediaan dan keberlangsungan bahan baku *Caulerpa* sp perlu diperhatikan mengingat potensinya sebagai bahan pangan dan sumber bahan aktif sangat potensial

TERIMA KASIH

