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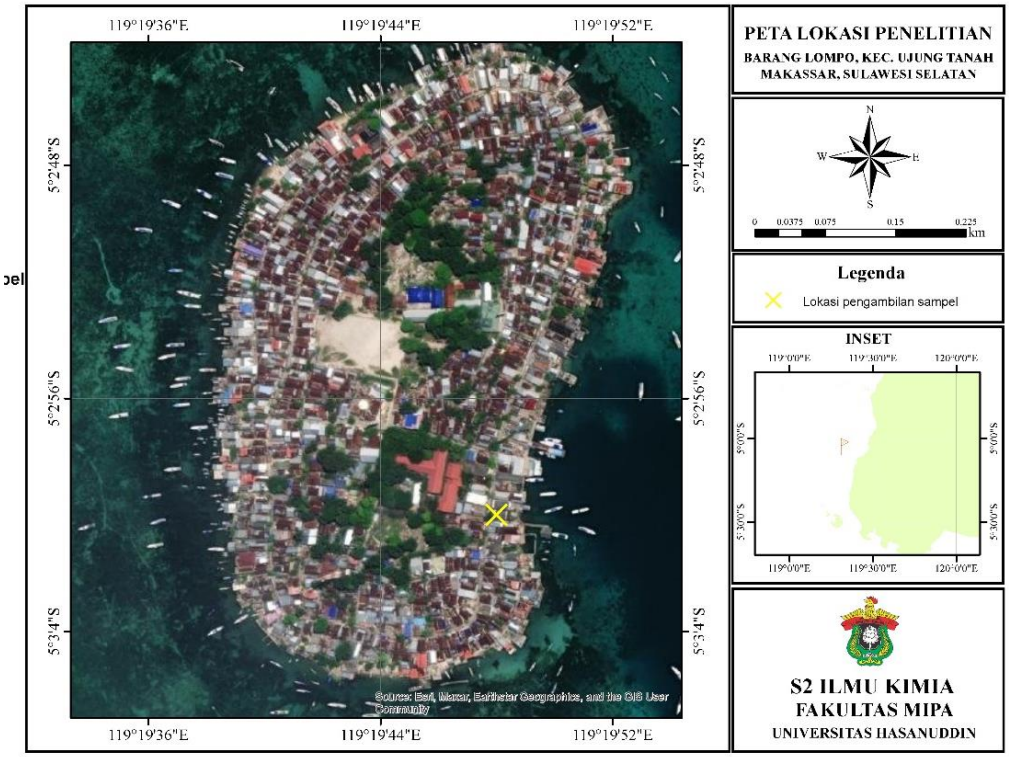
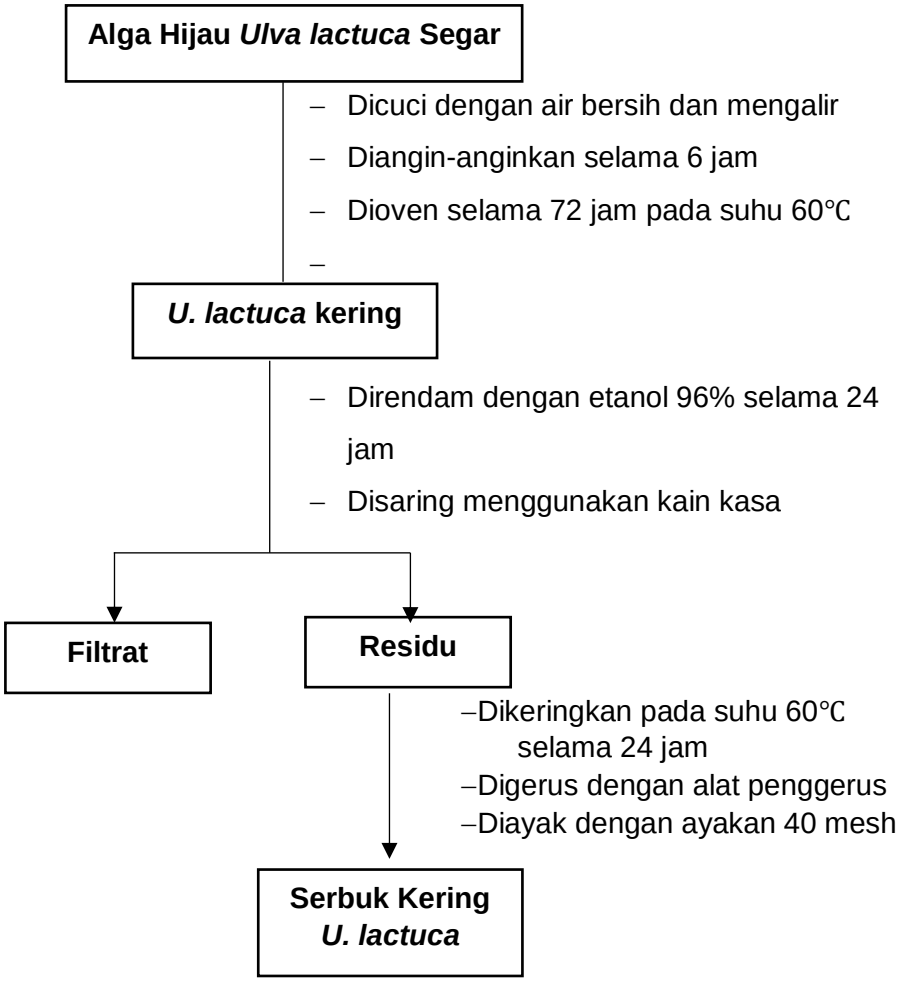
LAMPIRAN-LAMPIRAN

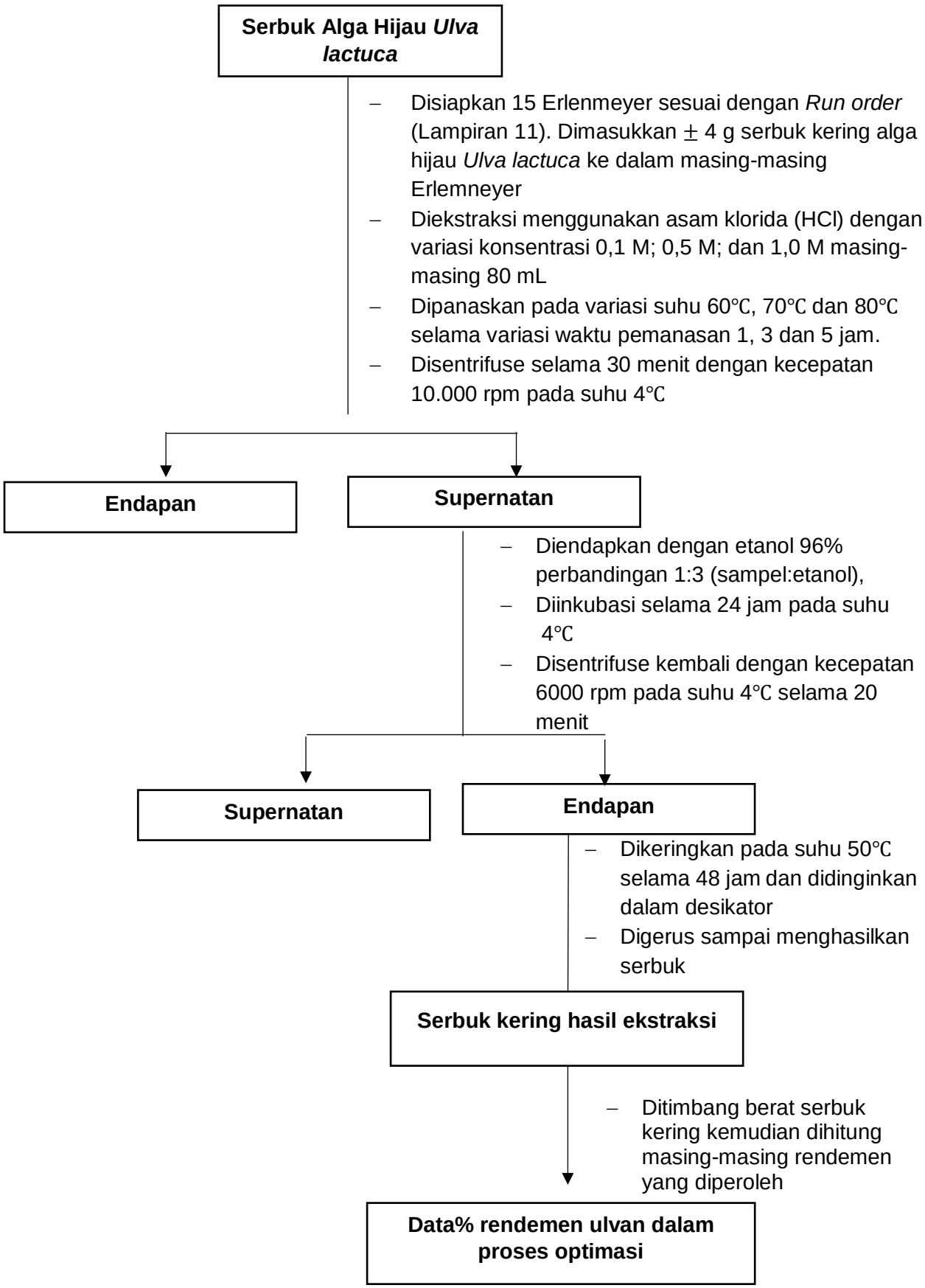
Lampiran 1. Lokasi Pengambilan Sampel Alga Hijau *Ulva lactuca*



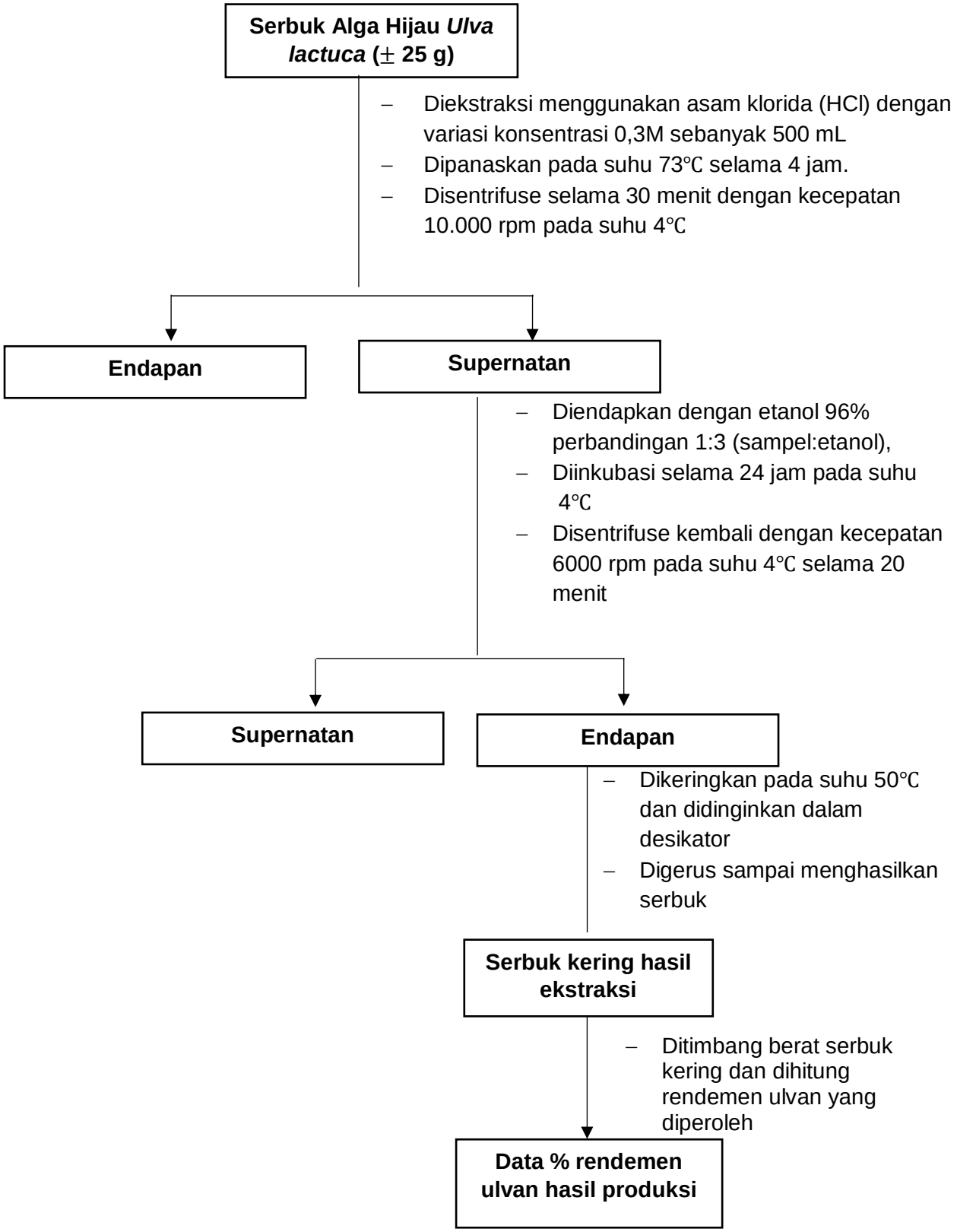
Lampiran 2. Skema Persiapan Sampel Alga Hijau *Ulva lactuca*



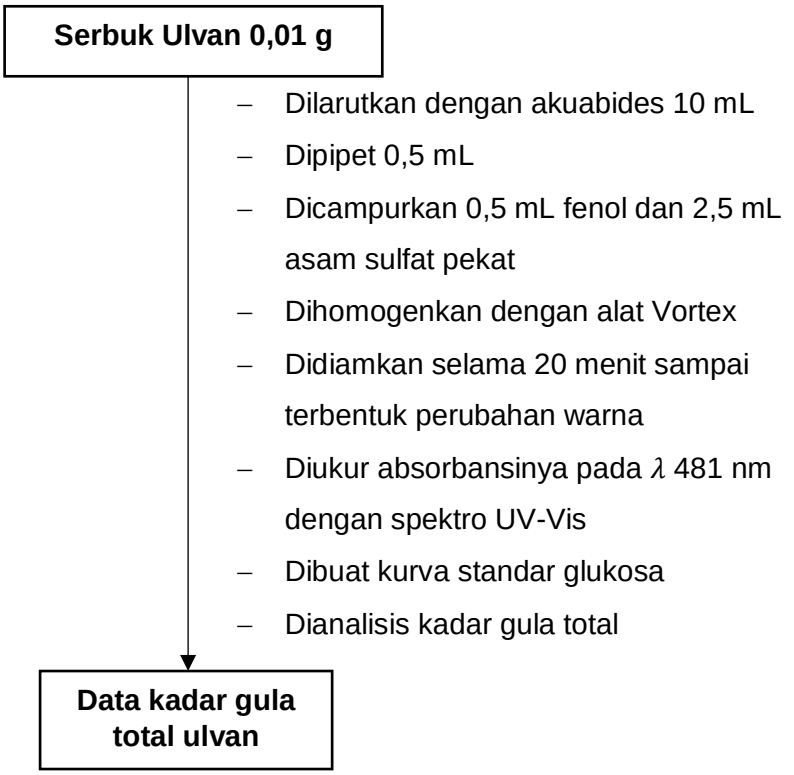
Lampiran 3. Skema Proses Optimasi Ekstraksi Ulvan



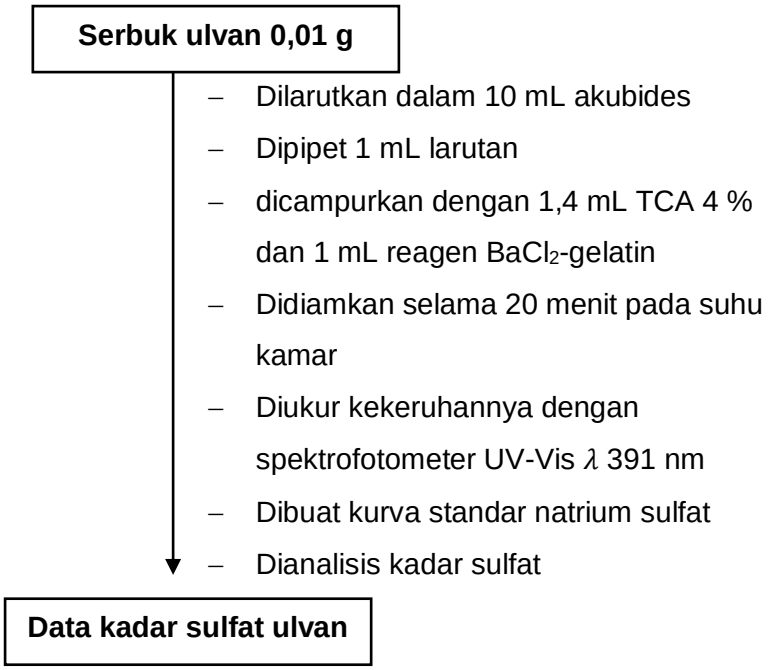
Lampiran 4. Skema Proses Produksi Ulvan



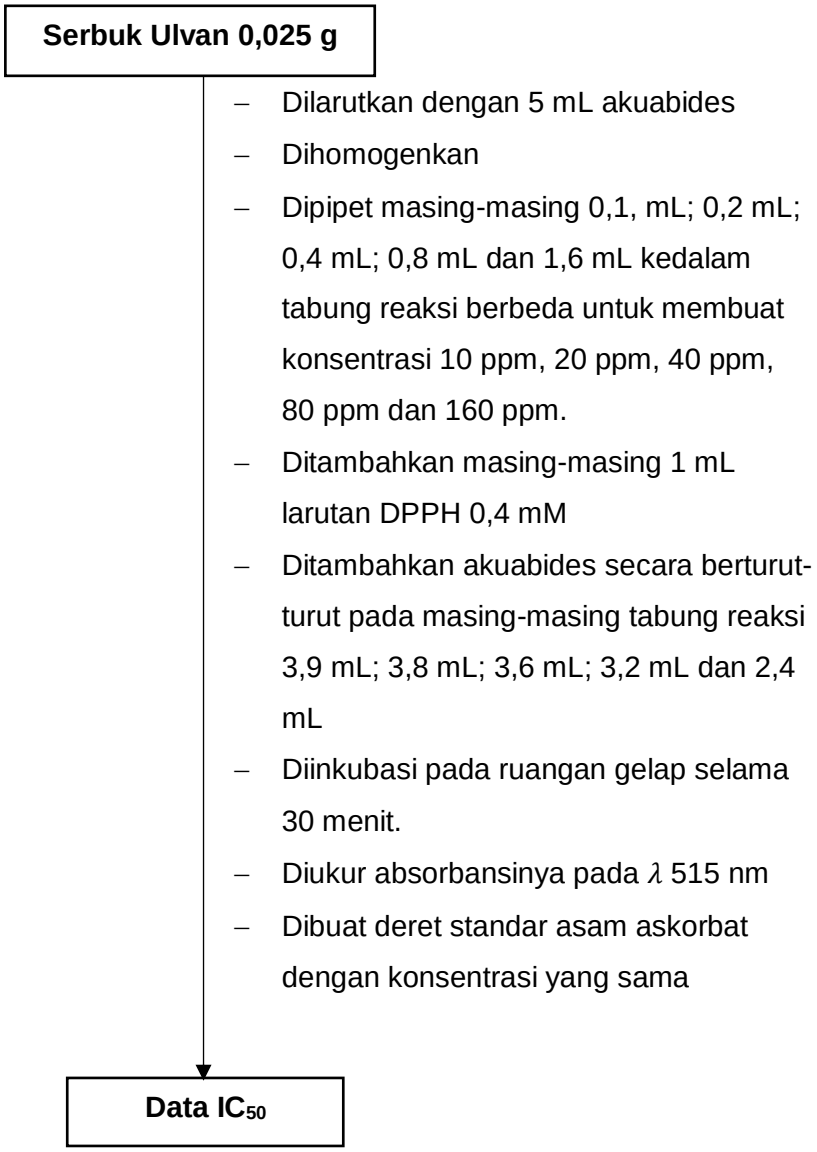
Lampiran 5. Analisis Kandungan Gula Total



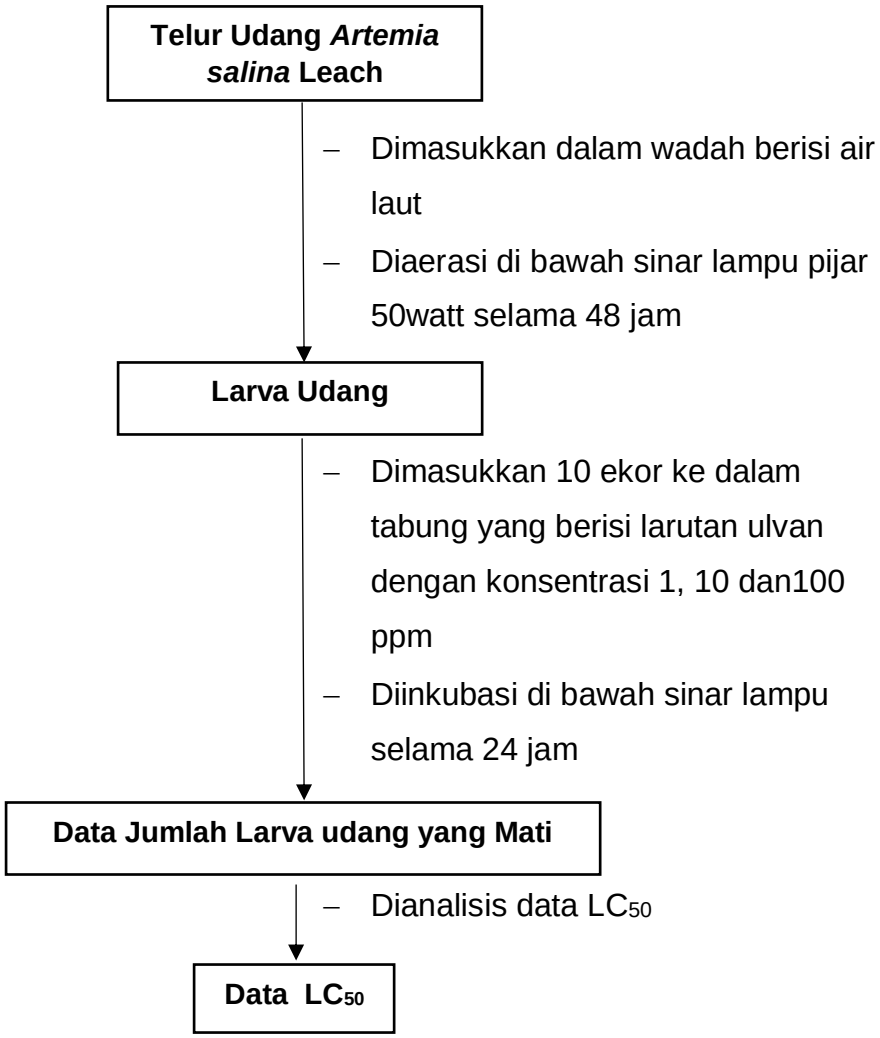
Lampiran 6. Analisis Kadar Sulfat



Lampiran 7. Uji Aktivitas Antioksidan



Lampiran 8. Skema Uji Toksisitas Ulvan Metode BSLT



Lampiran 9. Hasil Uji Identifikasi Spesies Alga Hijau *Ulva lactuca*

LABORATORIUM PRODUKTIVITAS & KUALITAS PERAIRAN
FAKULTAS ILMU KELAUTAN DAN PERIKANAN
UNIVERSITAS HASANUDDIN
Jl. Perintis Kemerdekaan, KM 10 Tamalanrea, Makassar, Indonesia 90245
Telp./Fax. +62.0411-586025, e-mail : fikp@unhas.ac.id, website :http://fikp.unhas.ac.id

Nomor : 01.UM/Lab.Air/X/2021
Pemilik Sampel : Mira Khaerunnisa (Kimia UH)
Tanggal Terima Sampel : 1 Oktober 2021
Tanggal Sampling : 27 September 2021
Jumlah Sampel : 1
Jenis Sampel : Ganggang laut
Asal Sampel : Pulau Barrang Lompo
Kegiatan : Penelitian S2

DATA HASIL IDENTIFIKASI

Kalsifikasi	Kode Sampel
	Sampel Uji
Kingdom	Plantae
Divisio	Chlorophyta
Class s	Ulvophyceae
Ordo	Ulvales
Familia	Ulvaceae
Genus	*Ulva*
Species	*Ulva lactuca Linnaeus 1753*

Sumber pustaka :
World Register Of Marine Species

Makassar, 1 November 2021
Pranata Lab. Pendidikan (PLP)

Fitriyahi, S.Si
Nip 19771012 200112 2 001

Lampiran 10. Analisis Komponen Kimia *Ulva lactuca* (Analisis Proksimat)

Kadar Air

Diketahui : Berat Cawan Kosong (A) : 24,4629 g

Berat Sampel (B) : 1,0430 g

Berat Setelah Oven (C) : 25,3320

Ditanyakan : Kadar Air (%)

Penyelesaian

$$\text{Kadar Air } (\%) = \frac{\text{A+B−C}}{\text{B}} \times 100$$

$$= \frac{24,4629+1,0430-25,3320}{1,0430} \times 100$$

= 16,67 %

Kadar Protein

Diketahui : Berat Sampel : 0,8980 g

Volume Titrasi : 2,15 mL

N HCl : 0,0103 N

Berat Atom N : 14

Faktor Protein : 6,25

Faktor Pengenceran : 50

Ditanyakan : Kadar Protein (%)

$$\text{Kadar Protein } (\%) = \frac{\text{P×V×N×14×6,25}}{\text{Berat Sampel}} \times 100$$

$$= \frac{50\times2,15\times0,0103\times14\times6,25}{0,8980} \times 100$$

= 10,79 %

Kadar Lemak

Diketahui : Berat Sampel (A) : 1.0400 g
Berat Cawan Kosong (B) : 26,2523 g
Berat Setelah Oven (C) : 26,2545 g
Ditanyakan : Kadar Lemak (%)

$$\text{Kadar Lemak } (\%) = \frac{\text{P}\times(\text{C}-\text{B})}{\text{A}} \times 100$$

$$= \frac{2\times(26{,}2524-26{,}2523)}{1{,}0400} \times 100$$

= 0,42 %

Kadar Serat Kasar

Diketahui : Berat Sampel (A) : 0,3070 g
Berat Cawan setelah oven (B) : 52,9359 g
Berat Cawan Setelah Tanur (C) : 52,9230 g
Ditanyakan : Kadar Serat Kasar(%)

$$\text{Kadar Serat Kasar } (\%) = \frac{\text{B}-\text{C}}{\text{A}} \times 100$$

$$= \frac{(52{,}9359-52{,}9230)}{0{,}3070} \times 100$$

= 4,20 %

Kadar Abu

Diketahui : Berat Sampel (A) : 1,0434 g
Berat Cawan Kosong (B) : 24,4629 g
Berat Cawan Setelah Tanur (C) : 24,6993 g
Ditanyakan : Kadar Abu (%)

$$\text{Kadar Abu } (\%) = \frac{\text{C}-\text{B}}{\text{A}} \times 100$$

$$= \frac{24,6993-24,4629}{1,0434} \times 100$$

= 22,66 %

Kadar Karbohidrat

Kadar Karbohidrat (%) = 100 –(Kadar Air + Kadar Protein + Kadar Lemak + Kadar Serat Kasar + Kadar Abu)

= 100 – (16,67 + 10,79 + 0,42 + 4,20 + 22,66

= 45,26 %

Lampiran 11. Analisis RSM suhu, waktu dan Konsentrasi HCl Optimum Ulvan

Suhu (℃)	Konsentrasi HCl (M)	Waktu Pemanasan (Jam)	Massa ulvan (%b/b)	Run order
60	1,00	3	4,76	4
	0,55	1	18,64	5
	0,10	3	20,15	8
	0,55	5	21,21	11
70	0,55	3	23,17	2
	0,10	5	21,05	3
	0,55	3	23,17	10
	1,00	5	3,54	12
	0,10	1	21,01	13
	0,55	3	23,17	14
	1,00	1	4,89	15
80	0,55	1	16,00	1
	0,10	3	22,24	6
	0,55	5	23,34	7
	1,00	3	4,31	9

Perhitungan Massa ulvan dalam proses Optimasi

a. Running 1

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0016 g

Bobot hasil ekstraksi : 0,6403 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}6403\ \text{g}}{4{,}0016\ \text{g}} \times 100$$

$$= 16\ \%$$

b. Running 2, 10 dan 14

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0013 g

Bobot hasil ekstraksi : 0,9272 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}9272\ \text{g}}{4{,}0013\ \text{g}} \times 100$$

$$= 23{,}17\ \%$$

c. Running 3

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0020 g

Bobot hasil ekstraksi : 0,8427 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}8427\ \text{g}}{4{,}0020\ \text{g}} \times 100$$

$$= 21{,}05\ \%$$

d. Run 4

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0017 g

Bobot hasil ekstraksi : 0,1905 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}1905\ \text{g}}{4{,}0017\ \text{g}} \times 100$$

$$= 4{,}76\ \%$$

e. Run 5

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0014 g

Bobot hasil ekstraksi : 0,7462 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}7462\ \text{g}}{4{,}0014\ \text{g}} \times 100$$

$$= 18{,}64\ \%$$

f. Run 6

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0020 g

Bobot hasil ekstraksi : 0,8903 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}8903\ \text{g}}{4{,}0020\ \text{g}} \times 100$$

$$= 22{,}24\ \%$$

g. Run 7

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0015 g

Bobot hasil ekstraksi : 0,9342g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}9342\ \text{g}}{4{,}0015\ \text{g}} \times 100$$

$$= 23{,}34\ \%$$

h. Running 8

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0026 g

Bobot hasil ekstraksi : 0,8067 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}8067\ \text{g}}{4{,}0026\ \text{g}} \times 100$$

$$= 20{,}15\ \%$$

i. Running 9

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0020 g

Bobot hasil ekstraksi : 0,1728 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}1728\ \text{g}}{4{,}0020\ \text{g}} \times 100$$

$$= 4{,}31\ \%$$

j. Running 11

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0007g

Bobot hasil ekstraksi : 0,8488 g

Ditanyakan : % rendemen ulvan

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}8488\ \text{g}}{4{,}0007\ \text{g}} \times 100$$

$$= 21{,}21\ \%$$

k. Running 12

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0021 g

Bobot hasil ekstraksi : 0,1417 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}1417\ \text{g}}{4{,}0021\ \text{g}} \times 100$$

$$= 3{,}54\ \%$$

l. Running 13

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0000 g

Bobot hasil ekstraksi : 0,8406 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}8406\ \text{g}}{4{,}0000\ \text{g}} \times 100$$

$$= 21{,}01\ \%$$

m. Running 15

Diketahui : Bobot serbuk kering *Ulva lactuca* : 4,0019 g

Bobot hasil ekstraksi : 0,1958 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{0{,}1958\ \text{g}}{4{,}0019\ \text{g}} \times 100$$

$$= 4{,}89\ \%$$

Setelah diperoleh kondisi optimum yaitu pada Konsentrasi HCl 0,3 M pada suhu 73^0C selama 4 jam, maka dilakukan produksi ulvan dengan total rendemen yang diperoleh sebesar 25,07%.

Perhitungan rendemen ulvan hasil produksi

Diketahui : Bobot serbuk kering *Ulva lactuca* : 25,0083 g

Bobot hasil ekstraksi : 6,2702 g

Ditanyakan : % rendemen ulvan

Penyelesaian

$$\%\ \text{rendemen} = \frac{\text{berat rendemen hasil ekstraksi (g)}}{\text{berat biomassa kering (g)}} \times 100$$

$$\%\ \text{rendemen} = \frac{6{,}2702\ \text{g}}{25{,}0083\ \text{g}} \times 100$$

$$= 25{,}0724\ \%$$

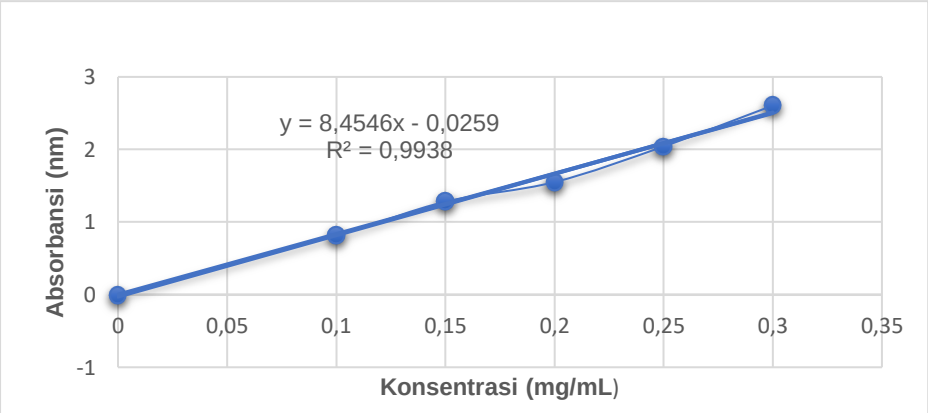
Lampiran 12. Analisis Kadar Gula Total dari Ulvan yang Diisolasi dari *Ulva lactuca* dengan menggunakan metode Fenol-Asam Sulfat

Pembuatan Kurva Standar

Penambahan	Volume (mL)					
Tabung ke-	**Blanko (1)**	**2**	**3**	**4**	**5**	**6**
Aquabidest	0,5	0,4	0,35	0,3	0,25	0,2
Standar Glukosa (1mg/mL)		0,1	0.15	0,2	0,25	0,3
Larutan Fenol 5%	0,5	0,5	0,5	0,5	0,5	0,5
H_2SO_4 Pekat	2,5	2,5	2,5	2,5	2,5	0,5

Data Kurva Standar Fenol-Asam Sulfat

Konsentrasi (mg/mL)	Absorbansi (A) 481 nm
Glukosa 0,1	0,820
Glukosa 0,15	1,281
Glukosa 0,2	1,551
Glukosa 0,25	2,042
Glukosa 0,3	2,605



Perhitungan Kadar Gula:

y = ax + b

y = 8,4546x + 0,0259

x = $\frac{y-b}{a}$

x = $\frac{y-0,0259}{8,4546}$

Hasil Perhitungan kadar Gula total Sampel Ulvan

Kadar gula total sampel ulvan diukur dengan konsentrasi 0,2 mg/mL pada panjang gelombang 481 nm sehingga menghasilkan absorbansi sebesar 1,627 dan 1,413, hasil yang diperoleh kemudian dimasukkan kedalam persamaan y = ax + b dengan y = absorbansi sampel yang diperoleh dan x = kandungan gula total dalam sampel, berikut adalah perhitungan kadar gula total ulvan:

$$x\ (simplo) = \frac{1,627 - 0,0259}{8,4546}$$

$$x = \frac{1,6011}{8,4546}$$

$$x = 0,1893\ mg/mL$$

$$x\ (duplo) = \frac{1,413 - 0,0259}{8,4546}$$

$$x = \frac{1,6011}{8,4546}$$

$$x = 0,1641 mg/mL$$

Perhitungan dilakukan secara duplo sehingga diperoleh rata-rata kadar gula total sebesar 0,1767 mg/mL.

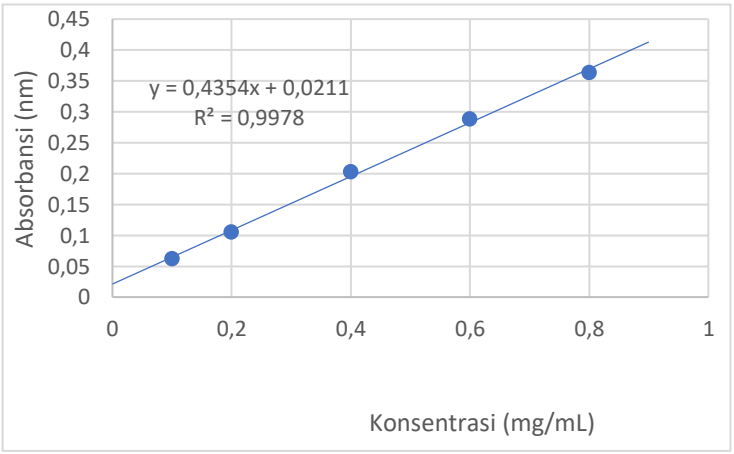
Lampiran 13. Analisis Kadar Sulfat dari Ulvan yang Diisolasi dari *Ulva lactuca* dengan menggunakan metode turbidimetri

Pembuatan Kurva Standar

Penambahan	Volume (mL)					
Tabung ke-	**Blanko (1)**	**2**	**3**	**4**	**5**	**6**
Aquabidest	1	0,9	0,8	0,6	0,4	0,2
Standar SO_4^{2-} (1mg/mL)		0,1	0.2	0,4	0,6	0,8
TCA 4%	1,4	1,4	1,4	1,4	1,4	1,4
Reagen $BaCl_2$-Gelatin	1	1	1	1	1	

Data Kurva Standar

Konsentrasi SO_4^{2-} (mg/mL)	Absorbansi (A) 397 nm
0,1	0,062
0,2	0,105
0,4	0,202
0,6	0,288
0,8	0,363



Perhitungan Kadar Sulfat:

y = ax + b

y = 0,4353x + 0,0211

x = $\frac{y-b}{a}$

x = $\frac{y-0,0259}{8,4546}$

Hasil Perhitungan kadar sulfat Ulvan

Kadar sulfat sampel ulvan diukur dengan konsentrasi 0,2 mg/mL pada panjang gelombang 397 nm sehingga menghasilkan absorbansi sebesar 0,201 hasil yang diperoleh kemudian dimasukkan kedalam persamaan y = ax + b dengan y = absorbansi sampel yang diperoleh dan x = kandungan sulfat dalam sampel, berikut adalah perhitungan kadar sulfat:

$$x = \frac{0,201 - 0,0211}{0,4354}$$

$$x = \frac{0,1799}{0,4354}$$

$$x = 0,4131\ mg/mL$$

Berdasarkan perhitungan, maka diperoleh kadar sulfat 0,4131 mg/mL.

Lampiran 14. Hasil Analisis FTIR

14.1 Sampel Ulvan Hasil Ekstraksi

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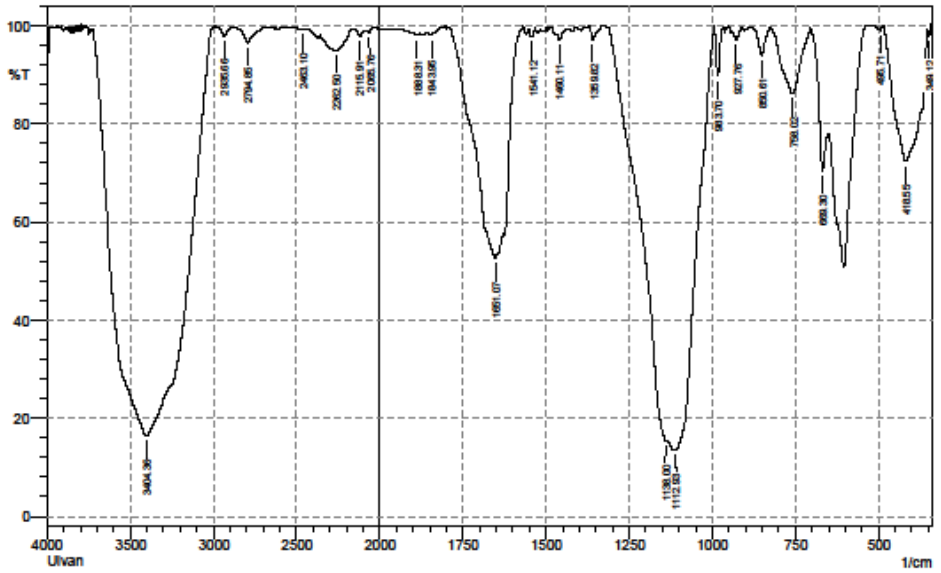


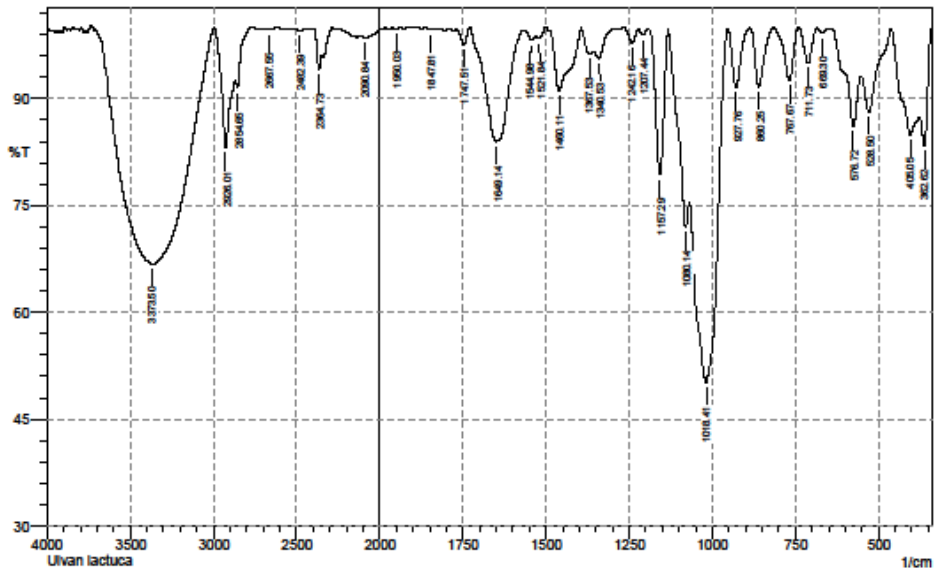
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	349.12	97.97	1.675	352.97	341.4	0.07	0.059
2	418.55	72.429	27.21	484.13	352.97	11.599	11.393
3	495.71	99.066	0.901	520.78	484.13	0.059	0.06
4	669.3	70.331	14.856	704.02	651.94	4.064	1.202
5	758.02	86.149	13.385	825.53	704.02	4.015	3.771
6	850.61	93.933	5.7	881.47	825.53	0.652	0.564
7	927.76	97.232	1.97	941.26	910.4	0.226	0.126
8	983.7	89.74	10.057	995.27	966.34	0.604	0.574
9	1112.93	13.537	14.758	1134.14	995.27	63.875	10.654
10	1138	15.366	0.852	1330.88	1136.07	49.735	-29.402
11	1359.82	97.104	2.838	1369.46	1330.88	0.225	0.227
12	1460.11	97.025	1.572	1467.83	1446.61	0.206	0.086
13	1541.12	97.746	0.295	1543.05	1531.48	0.075	0.005
14	1651.07	52.709	2.94	1791.87	1645.28	19.427	-0.407
15	1843.95	97.996	0.649	1859.38	1834.3	0.186	0.035
16	1888.31	98.025	0.525	1932.67	1878.67	0.335	0.061
17	2065.76	98.616	0.584	2086.98	2031.04	0.23	0.056
18	2115.91	97.928	1.166	2164.13	2086.98	0.442	0.156
19	2262.5	94.902	0.086	2264.43	2164.13	1.427	0.152
20	2463.1	99.176	0.018	2497.82	2461.17	0.107	0
21	2794.85	96.488	3.233	2870.08	2677.2	1.209	0.957
22	2935.66	97.886	1.785	2968.45	2891.3	0.376	0.264
23	3404.36	16.385	83.144	3726.47	2993.52	305.477	304.088

Comment;
Ulvan

Date/Time; 4/1/2022 10:38:41 AM
No. of Scans;
Resolution;
Apodization;

14.2 Sampel Standar Polisakarida

SHIMADZU



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	362.62	83.44	8.901	376.12	343.33	1.698	0.751
2	405.05	84.896	6.504	460.99	378.05	4.037	1.511
3	528.5	88.068	6.757	551.64	462.92	2.568	1.166
4	576.72	86.046	7.318	601.79	553.57	2.203	0.765
5	669.3	99.166	0.735	686.66	638.44	0.091	0.068
6	711.73	94.972	5.039	740.67	686.66	0.604	0.608
7	767.67	92.489	7.522	815.89	742.59	1.026	1.022
8	860.25	91.577	8.311	887.26	817.82	1.142	1.11
9	927.76	91.513	8.319	952.84	889.18	1.106	1.063
10	1018.41	50.217	35.523	1066.64	954.76	20.987	14.097
11	1080.14	71.893	7.933	1132.21	1068.56	5.059	0.989
12	1157.29	79.301	20.454	1192.01	1134.14	2.661	2.601
13	1207.44	98.939	0.829	1222.87	1193.94	0.085	0.055
14	1242.16	97.789	2.032	1267.23	1222.87	0.222	0.191
15	1340.53	95.633	1.703	1357.89	1292.31	0.64	0.09
16	1367.53	96.224	1.15	1394.53	1357.89	0.431	0.137
17	1460.11	91.023	8.598	1489.05	1394.53	2.164	2.04
18	1521.84	98.432	0.716	1531.48	1502.55	0.136	0.054
19	1544.98	98.185	0.875	1566.2	1531.48	0.185	0.057
20	1649.14	83.977	15.84	1728.22	1566.2	5.9	5.764
21	1747.51	97.559	2.297	1766.8	1728.22	0.218	0.194
22	1847.81	99.64	0.202	1865.17	1840.09	0.024	0.011
23	1950.03	99.792	0.111	1963.53	1938.46	0.017	0.006
24	2090.84	98.597	0.252	2112.05	1984.75	0.555	0.144
25	2364.73	94.004	3.227	2397.52	2349.3	0.716	0.273
26	2482.39	99.61	0.154	2522.89	2414.88	0.149	0.043
27	2667.55	99.682	0.141	2696.48	2615.47	0.082	0.028
28	2854.65	91.458	2.02	2868.15	2767.85	1.316	0.136
29	2926.01	83.051	12.79	2993.52	2870.08	5.102	2.948
30	3373.5	66.776	1.011	3672.47	3363.86	35.853	7.388

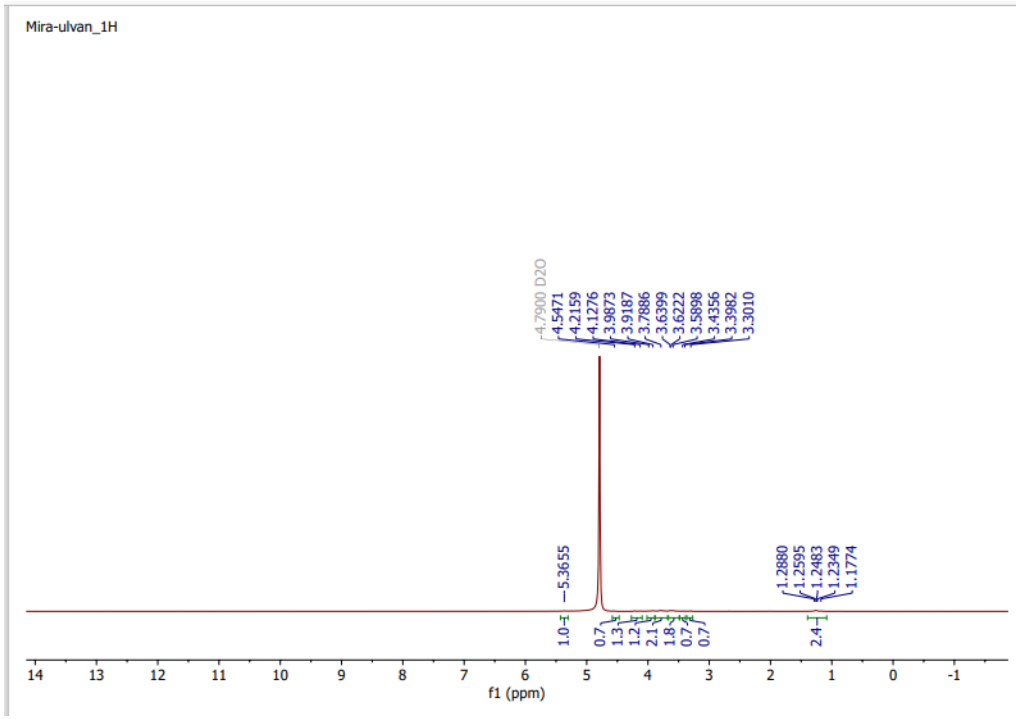
Comment;
Ulvan lactuca

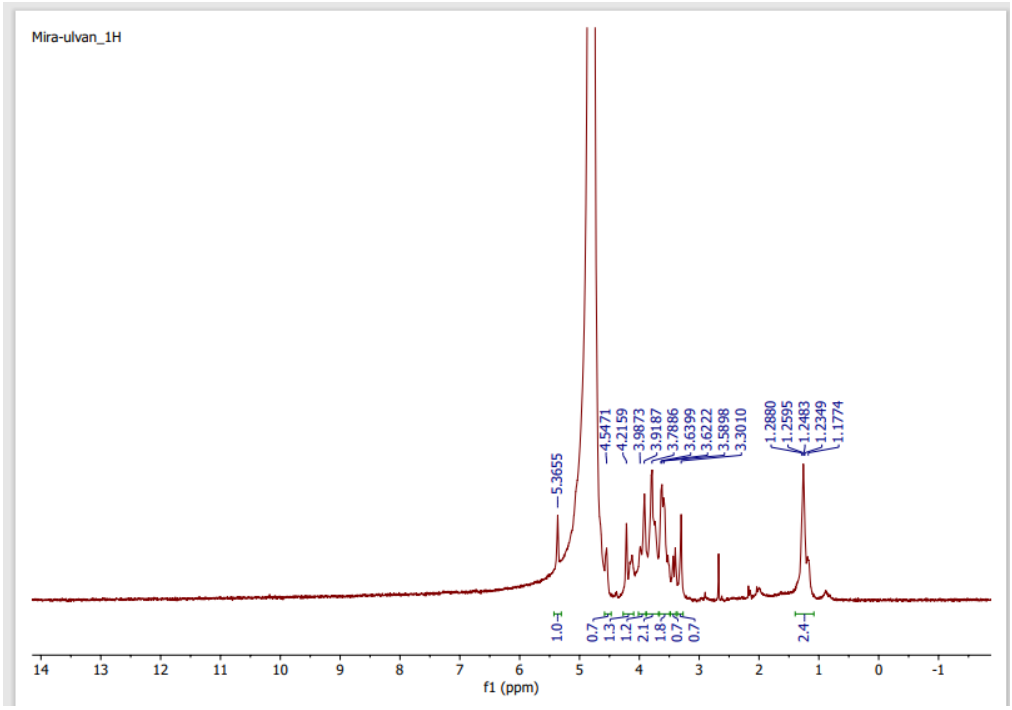
Date/Time; 7/7/2022 10:50:58 AM
No. of Scans;
Resolution;
Apodization;

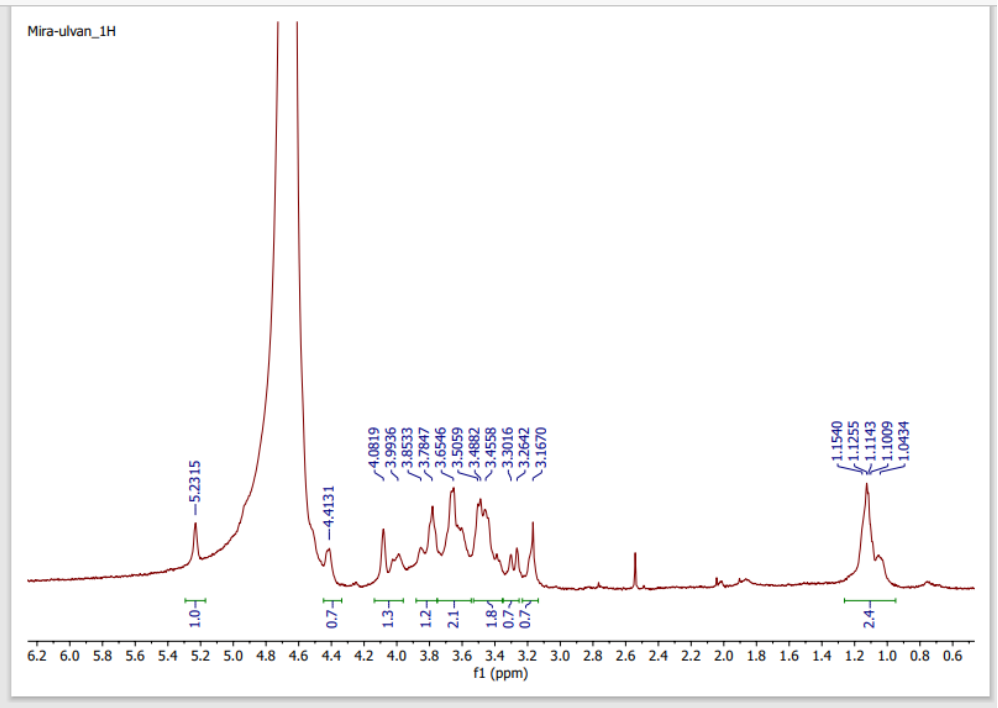
Tabel data spektrum FTIR ulvan

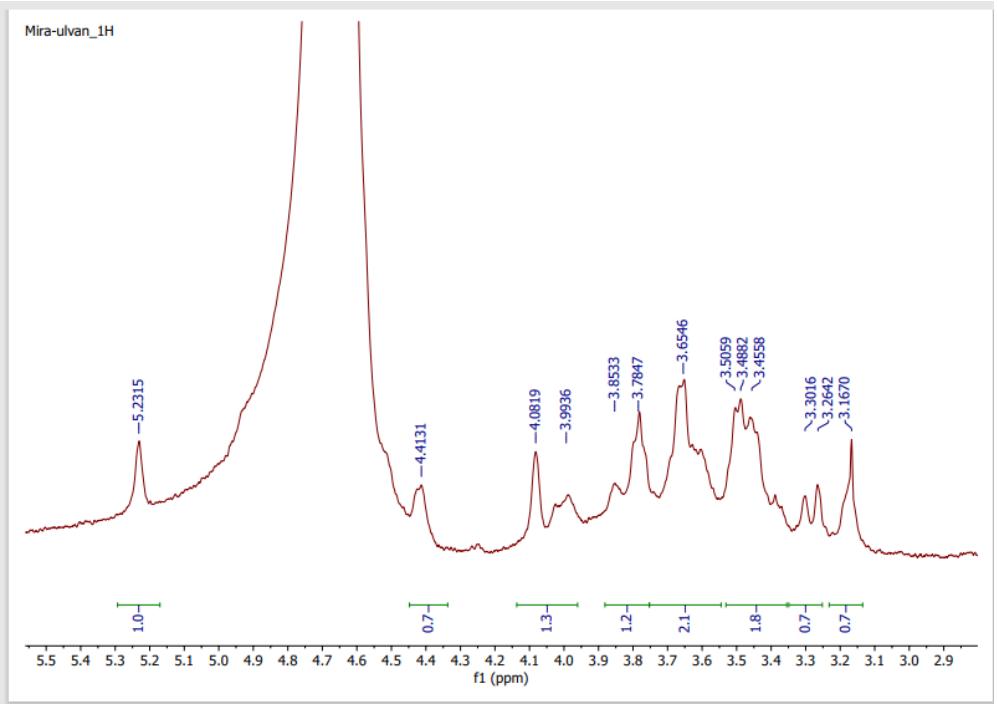
No.	Bilangan gelombang ulvan (cm^{-1})	Bilangan gelombang polisakarida standar (cm^{-1})	Dugaan Gugus fungsi
1.	3404,36	3373,50	Peregangan O-H dari gugus hidroksil (lebar dan kuat)
2.	1651,07	1649,14	Peregangan C=O sesuai dengan gugus karboksilat pada bagian asam uronat
3.	1460,11	1460,11	Gugus C=O sesuai dengan peregangan asimetris ikatan O-C-O pada gugus karboksilat
4.	1112,93	1018,41	Puncak serapan kuat adalah karakteristik penyerapan yang kuat dari fukosa dan indikasi peregangan gugus S=O. puncak ini merupakan karakteristik utama dari polisakarida sulfat
5.	983,70 dan 850,6	850,25 dan 576,72	Sesuai dengan peregangan ikatan C-O-S, biasanya ditemukan di ulvan karena adalanya gugus sulfat

Lampiran 15. Hasil Analisis ^{1}H-NMR






Mira-ulvan_1H
5.2315
4.4131
4.0819
3.9936
3.8533
3.7847
3.6546
3.5059
3.4882
3.4558
3.3016
3.2642
3.1670
1.1540
1.1255
1.1143
1.1009
1.0434
1.0
0.7
1.3
1.2
2.1
1.8
0.7
0.7
2.4
f1 (ppm)


Mira-ulvan_1H
5.2315
4.4131
4.0819
3.9936
3.8533
3.7847
3.6546
3.5059
3.4882
3.4558
3.3016
3.2642
3.1670
1.0
0.7
1.3
1.2
2.1
1.8
0.7
0.7
f1 (ppm)

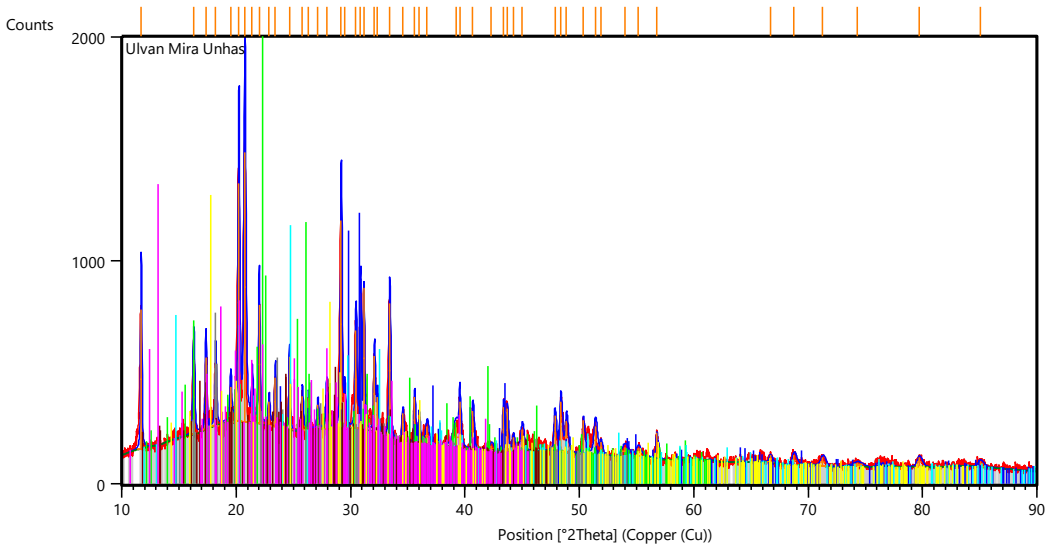
Lampiran 16. Hasil Analisis XRD

16.1 Hasil XRD Sampel Ulvan

This is the simple example template containing only headers for each report item and the bookmarks.
The invisible bookmarks are indicated by text between brackets.
Modify it according to your own needs and standards.

Measurement Conditions: (Bookmark 1)

Dataset Name	Ulvan Mira Unhas
File name	E:\Ulvan Mira Unhas.raw
Raw Data Origin	Rigaku-binary (.RAW)
Scan Axis	Gonio
Start Position [°2Th.]	10.0000
End Position [°2Th.]	90.0000
Step Size [°2Th.]	0.0200
Scan Step Time [s]	1.0000
Scan Type	Pre-set time
Offset [°2Th.]	0.0000
Divergence Slit Type	Fixed
Divergence Slit Size [°]	1.0000
Specimen Length [mm]	10.00
Receiving Slit Size [mm]	0.1000
Measurement Temperature [°C]	25.00
Anode Material	Cu
K-Alpha1 [Å]	1.54060
K-Alpha2 [Å]	1.54443
K-Beta [Å]	1.39225
K-A2 / K-A1 Ratio	0.50000
Generator Settings	0 mA, 0 kV
Diffractometer Number	0
Goniometer Radius [mm]	240.00
Dist. Focus-Diverg. Slit [mm]	91.00
Incident Beam Monochromator	No
Spinning	No



Peak List: (Bookmark 3)

Pos. [°2Th.]	Height [cts]	FWHM Left [°2Th.]	d-spacing [Å]	Rel. Int. [%]
11.7121	622.62	0.1181	7.55601	51.63
16.3022	335.96	0.1771	5.43741	27.86
17.3609	322.43	0.1378	5.10812	26.74
18.2141	269.96	0.1574	4.87072	22.39
19.5244	157.80	0.1574	4.54671	13.09
20.2385	1065.98	0.1574	4.38787	88.40
20.7634	1205.93	0.1968	4.27811	100.00
21.4031	167.67	0.1574	4.15167	13.90
22.0155	530.41	0.1378	4.03755	43.98
22.8813	104.85	0.1574	3.88669	8.69
23.4328	216.70	0.1574	3.79645	17.97
24.6565	327.55	0.0984	3.61074	27.16
25.7847	150.55	0.1574	3.45526	12.48
26.3274	139.94	0.1181	3.38526	11.60
27.1405	106.87	0.1574	3.28565	8.86
27.9277	169.55	0.1968	3.19480	14.06
29.1766	929.41	0.1574	3.06083	77.07
29.4947	151.97	0.1181	3.02854	12.60
30.4714	438.33	0.1574	2.93365	36.35
30.8722	607.63	0.1181	2.89648	50.39
31.1695	634.52	0.0787	2.86953	52.62
32.0909	338.33	0.1378	2.78921	28.06
32.3621	159.79	0.1378	2.76645	13.25
33.4198	602.13	0.1378	2.68128	49.93
34.5617	132.30	0.1574	2.59526	10.97
35.6054	206.02	0.1378	2.52154	17.08
36.0021	128.06	0.1181	2.49466	10.62
36.6937	80.56	0.3149	2.44921	6.68
39.2284	87.85	0.6298	2.29661	7.29
39.5494	207.70	0.1181	2.27871	17.22
40.6860	177.26	0.1968	2.21763	14.70
42.3109	28.99	0.4723	2.13615	2.40
43.3700	202.71	0.1574	2.08641	16.81
43.7107	195.28	0.1181	2.07094	16.19
44.2361	63.65	0.1968	2.04755	5.28
45.0023	95.98	0.3149	2.01446	7.96
47.8626	156.51	0.1968	1.90054	12.98
48.3750	221.75	0.1968	1.88160	18.39
48.8710	140.97	0.2362	1.86366	11.69
50.3620	148.97	0.1574	1.81193	12.35
51.3925	125.27	0.3149	1.77799	10.39
51.9053	60.51	0.1574	1.76162	5.02
53.9546	37.34	0.6298	1.69946	3.10
55.1300	33.82	0.4723	1.66597	2.80
56.7713	116.69	0.1574	1.62165	9.68
66.6881	30.53	0.2362	1.40256	2.53
68.7412	46.03	0.3936	1.36559	3.82
71.2566	37.10	0.4723	1.32344	3.08
74.2741	14.64	0.9446	1.27697	1.21
79.6819	39.90	0.3936	1.20335	3.31

Pattern List: (Bookmark 4)

Visible	Ref. Code	Score	Compound Name	Displacement [°2Th.]	Scale Factor	Chemical Formula
*	01-072-0354	15	Potassium Sulfate	0.000	0.482	K_2SO_4
*	96-210-6925	4	$K_2S_5O_{16}$	0.000	1.548	O_{64}.00 S_{20}.00 K_8.00
*	96-900-4774	9	Melanterite	0.000	0.252	Fe4.00 S4.00 O44.00
*	96-153-1346	8	$Fe_2(SO_4)2O(H_2O)_7$	0.000	2.091	O32.00 S4.00 Fe4.00
*	01-073-0573	6	Iron Sulfate	0.000	0.457	$Fe_2(SO_4)_3$
*	96-900-0314	7	Kornelite	0.000	0.582	Fe8.00 S12.00 O77.00
*	96-900-0226	6	Butlerite	0.000	0.519	Fe2.00 S2.00 O14.00

Document History: (Bookmark 5)

Insert Measurement:
- File name = Ulvan Mira Unhas.raw
- Modification time = "10/1/2022 12:33:52 PM"
- Modification editor = "LabMikrostruktur"

Search & Match:
- Allow pattern shift = "No"
- Auto residue = "Yes"
- Data source = "Profile and peak list"
- Demote unmatched strong = "Yes"
- Multi phase = "No"
- Restriction set = "Untitled"
- Restriction = "Restriction set"
- Subset name = ""
- Match intensity = "Yes"
- Two theta shift = "0"
- Identify = "No"
- Max. no. of accepted patterns = "5"
- Minimum score = "50"
- Min. new lines / total lines = "60"
- Search depth = "10"
- Minimum new lines = "5"
- Minimum scale factor = "0.1"
- Intensity threshold = "0"
- Use line clustering = "Yes"
- Line cluster range = "1.5"
- Search sensitivity = "1.8"
- Use adaptive smoothing = "Yes"
- Smoothing range = "1.5"
- Threshold factor = "3"
- Modification time = "10/1/2022 12:50:38 PM"
- Modification editor = "LabMikrostruktur"

16.2 Hasil XRD polisakarida standar

Match! Phase Analysis Report

Sample: Ulva Lactuca

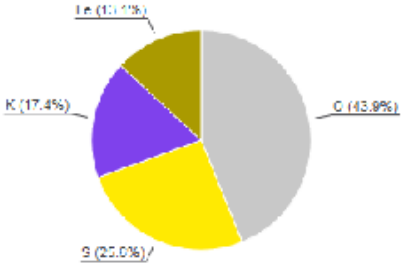
Sample Data

File name	Ulva Lactuca.rd
File path	E:/
Data collected	Agu 1, 2022 04:37:27
Data range	10.000° - 90.000°
Original data range	10.000° - 90.000°
Number of points	4001
Step size	0.020
Rietveld refinement converged	No
Alpha2 subtracted	No
Background subtr.	Yes
Data smoothed	Yes
Radiation	X-rays
Wavelength	1.540598 Å

Analysis Results

Phase composition

Elemental composition



Index	*Amount (%)*	*Name*	*Formula sum*
A	53.0	Potassium dithionate	K2 O6 S2
B	47.0	Fe2 (S O4)3	Fe2 O12 S3
	32.9	*Unidentified peak area*	

Amounts calculated by RIR (Reference Intensity Ratio) method

Element	*Amount (weight %)*
O	43.9%(*)
S	25.6%
K	17.4%
Fe	13.1%
**LE (sum)*	*43.9%*

Details of identified phases

A: Potassium dithionate (53.0 %)*

Formula sum	K2 O6 S2
Entry number	96-101-0614
Figure-of-Merit (FoM)	0.622323*
Total number of peaks	271
Peaks in range	271
Peaks matched	11
Intensity scale factor	0.10*
Space group	P 3 2 1
Crystal system	trigonal (hexagonal axes)
Unit cell	a= 9.8200 Å c= 6.3600 Å
I/Ic	1.63
Calc. density	2.235 g/cm³
Reference	Helwig G V, "The structure of potassium dithionate K~2~ S~2~ O~6~ and themeasurement of the integrated reflection from a smallcrystal", Zeitschrift fuer Kristallographie, Kristallgeometrie, Kristallphysik,Kristallchemie (-144,1977) **83**, 485-492 (1932)

B: Fe2 (S O4)3 (47.0 %)*

Formula sum	Fe2 O12 S3
Entry number	96-434-3675
Figure-of-Merit (FoM)	0.551001*
Total number of peaks	500
Peaks in range	500
Peaks matched	40
Intensity scale factor	0.04*
Space group	P 1 21/n 1
Crystal system	monoclinic
Unit cell	a= 11.5730 Å b= 8.2500 Å c= 8.2620 Å β= 90.810 °
I/Ic	0.70
Calc. density	3.367 g/cm³
Reference	Long G.J., Thundathil R.V., Battle P., Longworth G., Cheetham A.K., Beveridge D., "A study of anhydrous iron(III) sulfate by magnetic susceptibility,Moessbauer, and neutron diffraction technics", Inorganic Chemistry **18**, 624-632 (1979)

*2theta values have been shifted internally for the calculation of the amounts, the intensity scaling factors as well as the figure-of-merit (FoM), due to the active search-match option 'Automatic zero point adaption'.

Search-Match

Settings

Reference database used	COD-Inorg 2022.06.29
Automatic zeropoint adaptation	Yes
Downgrade entries with low scaling factors	Yes
Minimum figure-of-merit (FoM)	0.50
2theta window for peak corr.	0.30 deg.
Minimum rel. int. for peak corr.	0
Parameter/influence 2theta	0.50
Parameter/influence intensities	0.50
Parameter multiple/single phase(s)	0.50

Selection Criteria

Elements:

Elements that must be present:	O, S
Elements that may be present:	All elements not mentioned above

Peak List

No.	*2theta [°]*	*d [Å]*	*I/I0 (peak height)*	*Counts (peak area)*	*FWHM*	*Matched*
1	15.20	5.8243	170.53	435.60	1.4729	B
2	17.18	5.1572	104.36	188.67	1.0424	A,B
3	18.14	4.8864	360.41	1600.08	2.5600	A
4	21.54	4.1222	157.09	925.65	3.3978	B
5	23.08	3.8505	309.07	1357.72	2.5331	A,B
6	25.36	3.5092	702.51	404.01	0.3316	A,B
7	30.40	2.9380	1000.00	624.32	0.3600	B
8	37.00	2.4276	664.61	414.93	0.3600	
9	37.88	2.3732	285.61	89.16	0.1800	A,B
10	48.10	1.8901	129.61	145.98	0.5090	A,B
11	53.96	1.6979	87.18	75.24	0.4946	A,B
12	55.14	1.6643	87.61	56.36	0.3637	A,B
13	62.78	1.4789	50.97	64.49	0.7295	A,B

Integrated Profile Areas

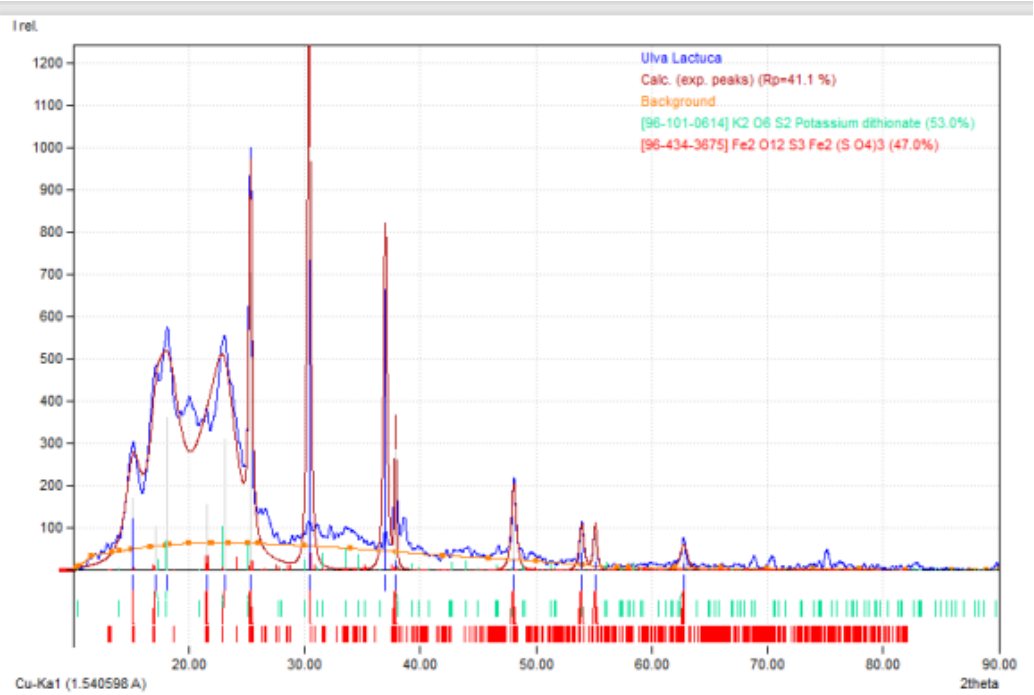
Based on calculated profile

Profile area	***Counts***	***Amount***
Overall diffraction profile	370659	100.00%
Background radiation	116027	31.30%
Diffraction peaks	254632	68.70%
Peak area belonging to selected phases	132544	35.76%
Peak area of phase A (Potassium dithionate)	*67409*	*18.19%*
Peak area of phase B (Fe2 (S O4)3)	*65135*	*17.57%*
Unidentified peak area	122088	32.94%

Peak Residuals

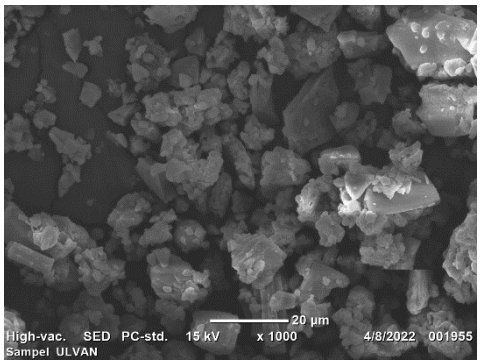
Peak data	***Counts***	***Amount***
Overall peak intensity	6382	100.00%
Peak intensity belonging to selected phases	4630	72.55%
Unidentified peak intensity	1752	27.45%

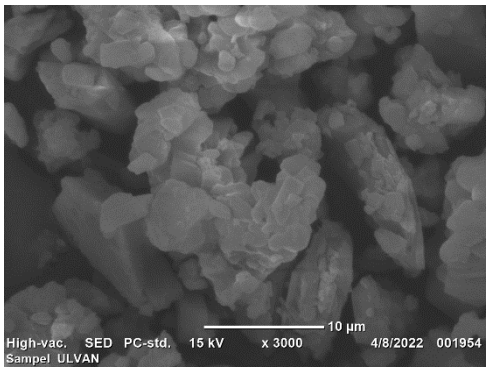
Diffraction Pattern Graphics

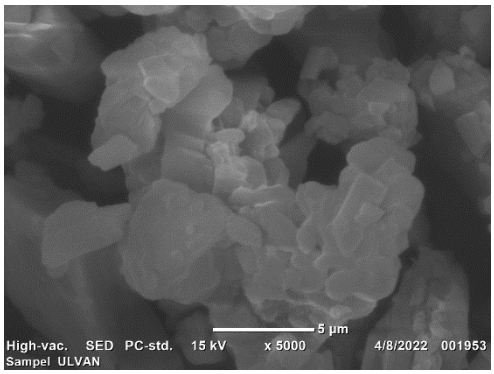


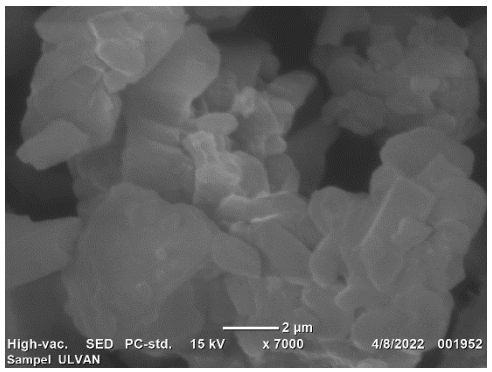
Lampiran 17. Hasil analisis SEM

17.1 Hasil Analisis SEM sampel Ulvan

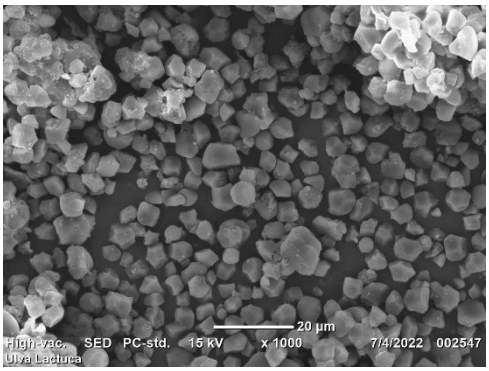


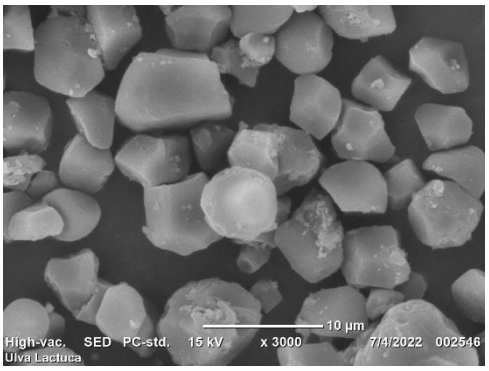


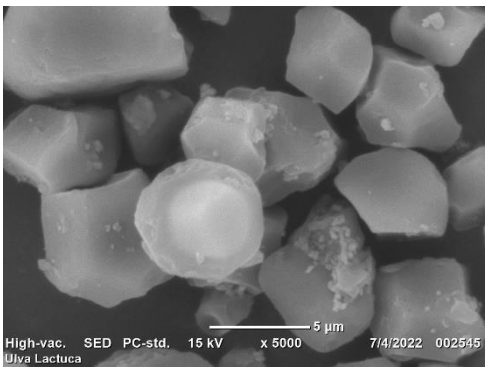


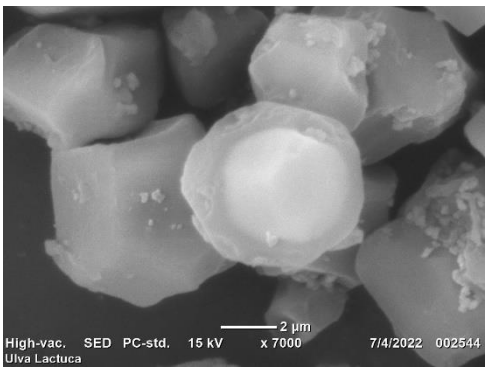


17.2 Hasil SEM Polisakarida Standar



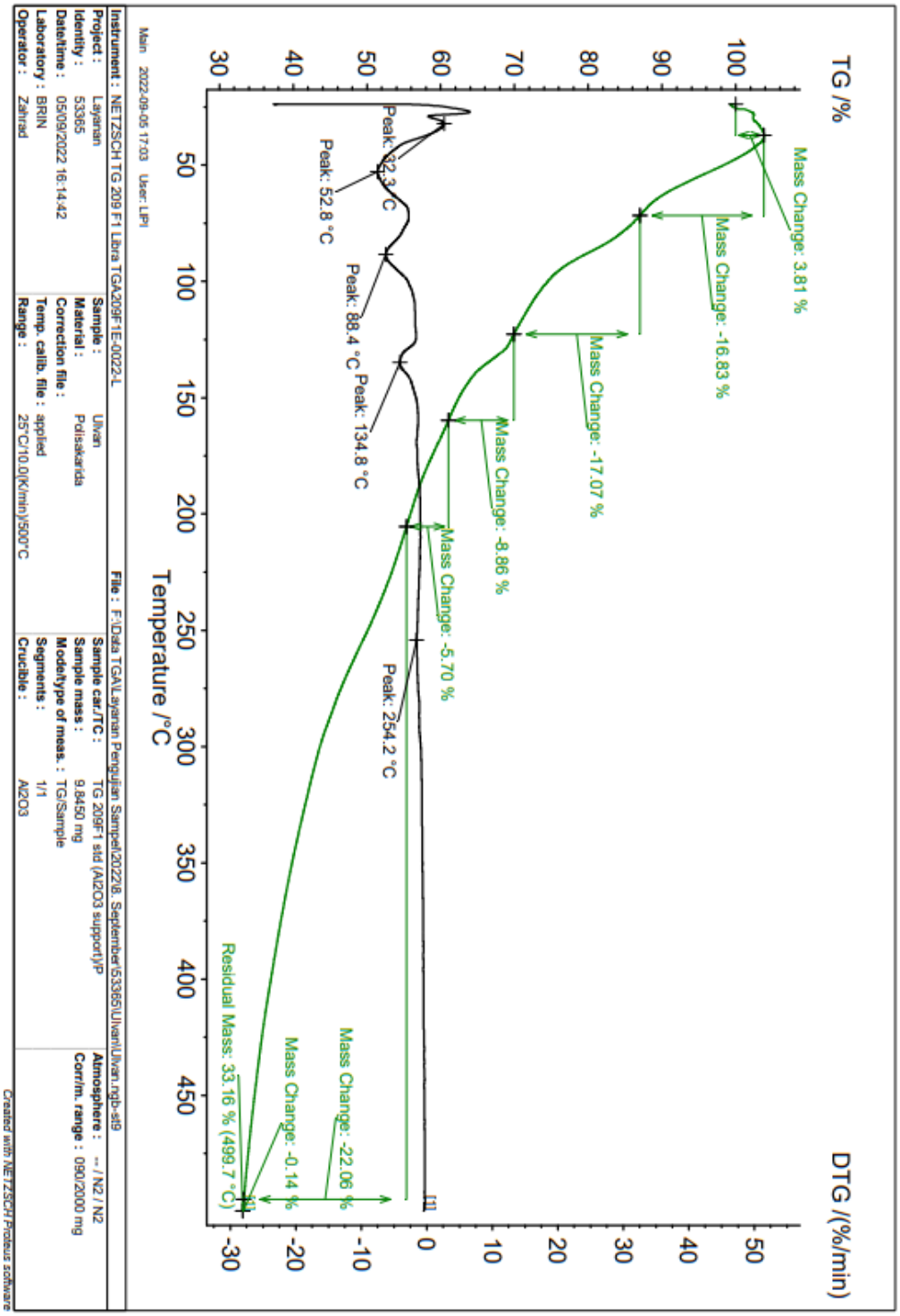






Lampiran 18. Hasil Analisis TGA

18.1 Hasil TGA Ulvan



Instrument:	NETZSCH TG 209 F1 Libra TGA209F1E-002	**Sample name:**	Ulvan
Project:	Layinsan	**Sample Mass:**	9.8450 mg
Filename:	Ulvan.ngb-st9	**Crucible:**	Al2O3
Method used:	new measurement	**Crucible Mass:**	0 mg
Date/Time:	05/09/2022 16:14:42 (UTC+7)	**Material:**	Polisakarida
End Date/Time:	05/09/2022 17:02:13 (UTC+7)	**Sample determination m**	Manual
Laboratory:	BRIN	**Residuum measurement**	Not possible
Operator:	Zahrad	**Atmosphere:**	– / N2 / N2
Measurement Type:	Sample	**Segments:**	1/1
Temp.Calib.:	<0 °C... 1100 °C>, Crucible: Al2O3, Gas: NITI	**Range:**	25°C/10.0(K/min)/500°C
Crucible:	Al2O3	**Conf/m. range:**	090/2000
Sample identity:	53365		

Remark:

Temperature °C	Time min	TG %	Temperature °C	Time min	TG %
23.8	0.0	100.00	81.8	5.7	83.33
24.8	0.1	99.40	82.8	5.8	82.84
25.8	0.2	101.35	83.8	5.9	82.34
26.8	0.2	102.01	84.8	6.0	81.76
27.8	0.3	102.43	85.8	6.1	81.17
28.8	0.5	102.38	86.8	6.2	80.58
29.8	0.7	102.31	87.8	6.3	79.94
30.8	0.8	102.46	88.8	6.4	79.33
31.8	0.9	102.84	89.8	6.5	78.72
32.8	1.0	103.15	90.8	6.6	78.16
33.8	1.1	103.35	91.8	6.7	77.60
34.8	1.2	103.56	92.8	6.8	77.09
35.8	1.3	103.72	93.8	6.9	76.63
36.8	1.3	103.81	94.8	7.0	76.21
37.8	1.4	103.80	95.8	7.1	75.81
38.8	1.5	103.71	96.8	7.2	75.44
39.8	1.6	103.50	97.8	7.3	75.11
40.8	1.7	103.09	98.8	7.4	74.86
41.8	1.8	102.74	99.8	7.4	74.53
42.8	1.9	102.36	100.8	7.5	74.31
43.8	2.0	101.90	101.8	7.6	73.94
44.8	2.1	101.41	102.8	7.7	73.75
45.8	2.2	100.87	103.8	7.8	73.53
46.8	2.3	100.31	104.8	8.0	73.29
47.8	2.4	99.72	105.8	8.1	73.06
48.8	2.4	99.11	106.8	8.2	72.84
49.8	2.5	98.49	107.8	8.3	72.63
50.8	2.6	97.85	108.8	8.4	72.43
51.8	2.7	97.13	109.8	8.5	72.23
52.8	2.8	96.44	110.8	8.6	72.04
53.8	2.9	95.74	111.8	8.7	71.85
54.8	3.0	95.05	112.8	8.8	71.66
55.8	3.1	94.38	113.8	8.9	71.48
56.8	3.2	93.72	114.8	9.0	71.30
57.8	3.3	93.08	115.8	9.1	71.11
58.8	3.4	92.43	116.8	9.2	70.93
59.8	3.5	91.79	117.8	9.3	70.75
60.8	3.6	91.20	118.8	9.4	70.58
61.8	3.7	90.64	119.8	9.5	70.40
62.8	3.8	90.10	120.8	9.6	70.23
63.8	3.9	89.62	121.8	9.7	70.06
64.8	4.0	89.18	122.8	9.8	69.90
65.8	4.1	88.78	123.8	9.9	69.75
66.8	4.2	88.41	124.8	10.0	69.59
67.8	4.3	88.08	125.8	10.1	69.43
68.8	4.4	87.85	126.8	10.2	69.26
69.8	4.5	87.49	127.8	10.3	69.07
70.8	4.6	87.26	128.8	10.4	68.84
71.8	4.7	86.89	129.8	10.5	68.48
72.8	4.8	86.68	130.8	10.6	68.07
73.8	4.9	86.33	131.8	10.7	67.67
74.8	5.0	86.09	132.8	10.8	67.26
75.8	5.1	85.72	133.8	10.9	66.85
76.8	5.2	85.36	134.8	11.0	66.41
77.8	5.3	84.99	135.8	11.1	66.00
78.8	5.4	84.60	136.8	11.2	65.60
79.8	5.5	84.21	137.8	11.3	65.23
80.8	5.6	83.79	138.8	11.4	64.88

Created with NETZSCH Proteus software

Instrument: NETZSCH TG 209 F1 Libra TGA209F1E-002 **Sample name:** Ulvan

Temperature °C	Time min	TG %	Temperature °C	Time min	TG %
139.8	11.5	64.60	212.8	18.8	54.64
140.8	11.6	64.32	213.8	18.9	54.53
141.8	11.7	64.09	214.8	19.0	54.43
142.8	11.8	63.88	215.8	19.1	54.33
143.8	11.9	63.65	216.8	19.2	54.22
144.8	12.0	63.43	217.8	19.3	54.12
145.8	12.1	63.23	218.8	19.4	54.02
146.8	12.2	63.03	219.8	19.5	53.92
147.8	12.3	62.84	220.8	19.6	53.81
148.8	12.4	62.66	221.8	19.7	53.70
149.8	12.5	62.48	222.8	19.8	53.59
150.8	12.6	62.32	223.8	19.9	53.49
151.8	12.7	62.16	224.8	20.0	53.38
152.8	12.8	62.01	225.8	20.1	53.26
153.8	12.9	61.86	226.8	20.2	53.15
154.8	13.0	61.72	227.8	20.3	53.04
155.8	13.1	61.58	228.8	20.4	52.91
156.8	13.2	61.43	229.8	20.5	52.78
157.8	13.3	61.30	230.8	20.6	52.67
158.8	13.4	61.17	231.8	20.7	52.55
159.8	13.5	61.03	232.8	20.8	52.43
160.8	13.6	60.90	233.8	20.9	52.30
161.8	13.7	60.77	234.8	21.0	52.18
162.8	13.8	60.63	235.8	21.1	52.05
163.8	13.9	60.48	236.8	21.2	51.92
164.8	14.0	60.34	237.8	21.3	51.79
165.8	14.1	60.20	238.8	21.4	51.65
166.8	14.2	60.05	239.8	21.5	51.52
167.8	14.3	59.91	240.8	21.6	51.39
168.8	14.4	59.75	241.8	21.7	51.25
169.8	14.5	59.59	242.8	21.8	51.12
170.8	14.6	59.42	243.8	21.9	50.98
171.8	14.7	59.29	244.8	22.0	50.84
172.8	14.8	59.14	245.8	22.1	50.70
173.8	14.9	59.00	246.8	22.2	50.57
174.8	15.0	58.86	247.8	22.3	50.42
175.8	15.1	58.72	248.8	22.4	50.27
176.8	15.2	58.57	249.8	22.5	50.13
177.8	15.3	58.42	250.8	22.6	49.98
178.8	15.4	58.28	251.8	22.7	49.83
179.8	15.5	58.15	252.8	22.8	49.69
180.8	15.6	58.01	253.8	22.9	49.53
181.8	15.7	57.87	254.8	23.0	49.37
182.8	15.8	57.73	255.8	23.1	49.21
183.8	15.9	57.62	256.8	23.2	49.07
184.8	16.0	57.49	257.8	23.3	48.92
185.8	16.1	57.37	258.8	23.4	48.77
186.8	16.2	57.25	259.8	23.5	48.62
187.8	16.3	57.14	260.8	23.6	48.47
188.8	16.4	57.02	261.8	23.7	48.32
189.8	16.5	56.92	262.8	23.8	48.17
190.8	16.6	56.81	263.8	23.9	48.03
191.8	16.7	56.71	264.8	24.0	47.89
192.8	16.8	56.61	265.8	24.1	47.74
193.8	16.9	56.50	266.8	24.2	47.59
194.8	17.0	56.40	267.8	24.3	47.45
195.8	17.1	56.30	268.8	24.4	47.30
196.8	17.2	56.21	269.8	24.5	47.16
197.8	17.3	56.11	270.8	24.6	47.03
198.8	17.4	56.00	271.8	24.7	46.90
199.8	17.5	55.90	272.8	24.8	46.75
200.8	17.6	55.81	273.8	24.9	46.62
201.8	17.7	55.71	274.8	25.0	46.49
202.8	17.8	55.61	275.8	25.1	46.36
203.8	17.9	55.51	276.8	25.2	46.23
204.8	18.0	55.41	277.8	25.3	46.10
205.8	18.1	55.32	278.8	25.4	45.98
206.8	18.2	55.22	279.8	25.5	45.86
207.8	18.3	55.13	280.8	25.6	45.75
208.8	18.4	55.03	281.8	25.7	45.63
209.8	18.5	54.93	282.8	25.8	45.52
210.8	18.6	54.84	283.8	25.9	45.41
211.8	18.7	54.74	284.8	26.0	45.29

Created with NETZSCH Proteus software

80.8	5.6	83.79	138.8	11.4	64.88

Temperature °C	Time min	TG %	Temperature °C	Time min	TG %
285.8	26.1	45.18	358.8	33.4	39.28
286.8	26.2	45.06	359.8	33.5	39.22
287.8	26.3	44.93	360.8	33.6	39.16
288.8	26.4	44.82	361.8	33.7	39.10
289.8	26.5	44.71	362.8	33.8	39.03
290.8	26.6	44.60	363.8	33.9	38.97
291.8	26.7	44.48	364.8	34.0	38.91
292.8	26.8	44.36	365.8	34.1	38.85
293.8	26.9	44.24	366.8	34.2	38.79
294.8	27.0	44.14	367.8	34.3	38.74
295.8	27.1	44.03	368.8	34.4	38.68
296.8	27.2	43.93	369.8	34.5	38.63
297.8	27.3	43.83	370.8	34.6	38.57
298.8	27.4	43.74	371.8	34.7	38.51
299.8	27.5	43.64	372.8	34.8	38.45
300.8	27.6	43.54	373.8	34.9	38.39
301.8	27.7	43.45	374.8	35.0	38.33
302.8	27.8	43.38	375.8	35.1	38.28
303.8	27.9	43.29	376.8	35.2	38.22
304.8	28.0	43.20	377.8	35.3	38.17
305.8	28.1	43.12	378.8	35.4	38.11
306.8	28.2	43.03	379.8	35.5	38.05
307.8	28.3	42.95	380.8	35.6	38.00
308.8	28.4	42.88	381.8	35.7	37.94
309.8	28.5	42.79	382.8	35.8	37.89
310.8	28.6	42.72	383.8	35.9	37.83
311.8	28.7	42.63	384.8	36.0	37.78
312.8	28.8	42.55	385.8	36.1	37.73
313.8	28.9	42.47	386.8	36.2	37.67
314.8	29.0	42.40	387.8	36.3	37.62
315.8	29.1	42.31	388.8	36.4	37.58
316.8	29.2	42.24	389.8	36.5	37.52
317.8	29.3	42.16	390.8	36.6	37.45
318.8	29.4	42.09	391.8	36.7	37.40
319.8	29.5	42.02	392.8	36.8	37.36
320.8	29.6	41.94	393.8	36.9	37.31
321.8	29.7	41.87	394.8	37.0	37.25
322.8	29.8	41.79	395.8	37.1	37.20
323.8	29.9	41.71	396.8	37.2	37.15
324.8	30.0	41.64	397.8	37.3	37.09
325.8	30.1	41.56	398.8	37.4	37.04
326.8	30.2	41.49	399.8	37.5	36.99
327.8	30.3	41.41	400.8	37.6	36.94
328.8	30.4	41.34	401.8	37.7	36.88
329.8	30.5	41.27	402.8	37.8	36.83
330.8	30.6	41.19	403.8	37.9	36.78
331.8	30.7	41.12	404.8	38.0	36.73
332.8	30.8	41.05	405.8	38.1	36.67
333.8	30.9	40.97	406.8	38.2	36.62
334.8	31.0	40.90	407.8	38.3	36.57
335.8	31.1	40.83	408.8	38.4	36.52
336.8	31.2	40.76	409.8	38.5	36.47
337.8	31.3	40.69	410.8	38.6	36.42
338.8	31.4	40.62	411.8	38.7	36.37
339.8	31.5	40.55	412.8	38.8	36.32
340.8	31.6	40.48	413.8	38.9	36.27
341.8	31.7	40.40	414.8	39.0	36.21
342.8	31.8	40.34	415.8	39.1	36.17
343.8	31.9	40.27	416.8	39.2	36.12
344.8	32.0	40.19	417.8	39.3	36.08
345.8	32.1	40.13	418.8	39.4	36.03
346.8	32.2	40.06	419.8	39.5	35.98
347.8	32.3	40.00	420.8	39.6	35.94
348.8	32.4	39.93	421.8	39.7	35.89
349.8	32.5	39.86	422.8	39.8	35.84
350.8	32.6	39.80	423.8	39.9	35.80
351.8	32.7	39.73	424.8	40.0	35.76
352.8	32.8	39.67	425.8	40.1	35.71
353.8	32.9	39.60	426.8	40.2	35.68
354.8	33.0	39.53	427.8	40.3	35.63
355.8	33.1	39.47	428.8	40.4	35.58
356.8	33.2	39.41	429.8	40.5	35.55
357.8	33.3	39.34	430.8	40.6	35.51

Created wi

Temperature	Time	TG	Temperature	Time	TG
°C	min	%	°C	min	%
431.8	40.7	35.47	465.8	44.1	34.19
432.8	40.8	35.42	466.8	44.2	34.16
433.8	40.9	35.38	467.8	44.3	34.13
434.8	41.0	35.34	468.8	44.4	34.10
435.8	41.1	35.30	469.8	44.5	34.06
436.8	41.2	35.27	470.8	44.6	34.02
437.8	41.3	35.22	471.8	44.7	34.00
438.8	41.4	35.18	472.8	44.8	33.97
439.8	41.5	35.14	473.8	44.9	33.94
440.8	41.6	35.10	474.8	45.0	33.91
441.8	41.7	35.07	475.8	45.1	33.87
442.8	41.8	35.02	476.8	45.2	33.84
443.8	41.9	35.00	477.8	45.3	33.81
444.8	42.0	34.97	478.8	45.4	33.78
445.8	42.1	34.92	479.8	45.5	33.75
446.8	42.2	34.87	480.8	45.6	33.70
447.8	42.3	34.84	481.8	45.7	33.68
448.8	42.4	34.80	482.8	45.8	33.65
449.8	42.5	34.77	483.8	45.9	33.63
450.8	42.6	34.73	484.8	46.0	33.60
451.8	42.7	34.68	485.8	46.1	33.57
452.8	42.8	34.65	486.8	46.2	33.53
453.8	42.9	34.61	487.8	46.3	33.51
454.8	43.0	34.58	488.8	46.4	33.48
455.8	43.1	34.54	489.8	46.5	33.45
456.8	43.2	34.50	490.8	46.6	33.43
457.8	43.3	34.46	491.8	46.7	33.39
458.8	43.4	34.43	492.8	46.8	33.35
459.8	43.5	34.39	493.8	46.9	33.31
460.8	43.6	34.36	494.8	47.0	33.30
461.8	43.7	34.33	495.8	47.1	33.28
462.8	43.8	34.29	496.8	47.2	33.25
463.8	43.9	34.25	497.8	47.3	33.22
464.8	44.0	34.21	498.8	47.4	33.19

Instrument:	NETZSCH TG 209F1 Libra TGA209F1E-002(	**Crucible:**	Al2O3
Project:	Layanan	**Sample identity:**	53365
Filename:	Ulvan.ngb-st9	**Sample name:**	Ulvan
Method used:	new measurement	**Sample Mass:**	9.8450 mg
Date/Time:	05/09/2022 16:14:42 (UTC+7)	**Crucible:**	Al2O3
End Date/Time:	05/09/2022 17:02:13 (UTC+7)	**Crucible Mass:**	0 mg
Laboratory:	BRIN	**Material:**	Polisakarida
Operator:	Zahrad	**Sample determination m**	Manual
Measurement Type:	Sample	**Residuum measurement**	Not possible
Temp.Calib.:	<0 °C... 1100 °C>, Crucible: Al2O3, Gas: NITI		

Remark:

Furnace:	Ceramic TG 209F1	**Furnace TC:**	S
Sample carrier:	TG 209F1 std (Al2O3 support)	**Sample TC:**	P
Measurement End:	Normal end		

Purge 1 MFC:	OXYGEN	**Flow range:**	252.5 ml/min	**predefined**
Purge 2 MFC:	NITROGEN	**Flow range:**	250.0 ml/min	**predefined**
Protective MFC:	NITROGEN	**Flow range:**	250.0 ml/min	**predefined**

Start criteria

Temperature threshold:	5.0 K
Activate stability criteria:	No
Stabilization delay:	00:30 mm:ss
Preheating rate:	30.00 K/min
Maximum equilibrium time after preheating:	00:20 hh:mm
Precooling rate:	50.00 K/min
Maximum equilibrium time after precooling:	00:30 hh:mm

List of temperature steps:

Num	Mode	Temp. °C	HR K/min	Acq.Rate pts/min	Duration hh:mm	STC	P1:–	P2:N2	PG:N2
—	Start	25.0				1	0.0	10.0	20.0
1	Dynamic	500.0	10.000	200.00	00:48	1	0.0	10.0	20.0
—	Emergency	510.0					0.0	0.0	20.0

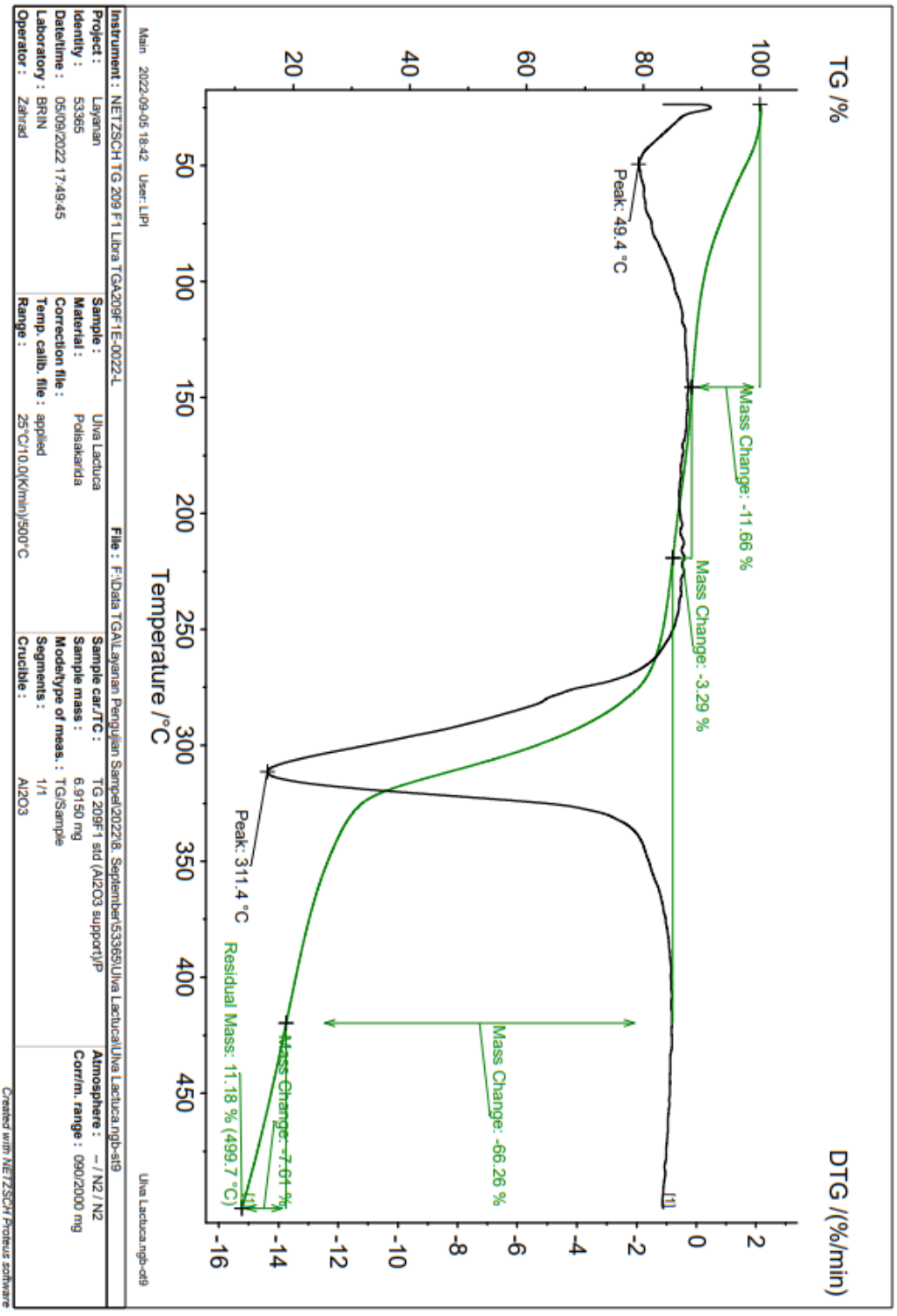
Instrument:	NETZSCH TG 209 F1 Libra TGA209F1E-002	**Crucible:**	Al2O3
Project:	Layanan	**Sample Identity:**	53365
Filename:	Ulvan.ngb-st9	**Sample name:**	Ulvan
Method used:	new measurement	**Sample Mass:**	9.8450 mg
Date/Time:	05/09/2022 16:14:42 (UTC+7)	**Crucible:**	Al2O3
End Date/Time:	05/09/2022 17:02:13 (UTC+7)	**Crucible Mass:**	0 mg
Laboratory:	BRIN	**Material:**	Polisakarida
Operator:	Zahrad	**Sample determination m**	Manual
Measurement Type:	Sample	**Residuum measuremen**	Not possible
Temp.Calib.:	<0 °C... 1100 °C>, Crucible: Al2O3, Gas: NITR	**Atmosphere:**	– / N2 / N2

Remark:

Segments: 1/1 : 25°C/10.0(K/min)/500°C

Parameters	Result	Range (min)	Range (max)
Mass Change (TG)	3.81 %	23.8 °C	37.1 °C
Residual Mass (TG)	33.16 %	499.7 °C/47.5 min	
Mass Change (TG)	-16.83 %	37.1 °C	71.5 °C
Mass Change (TG)	-17.07 %	71.5 °C	122.7 °C
Mass Change (TG)	-8.86 %	122.7 °C	159.6 °C
Mass Change (TG)	-5.70 %	159.6 °C	205.4 °C
Mass Change (TG)	-22.06 %	205.4 °C	494.6 °C
Mass Change (TG)	-0.14 %	494.6 °C	499.7 °C
Peak (DTG)	32.3 °C	32.0 °C	37.1 °C
Peak (DTG)	52.8 °C	37.1 °C	71.3 °C
Peak (DTG)	88.4 °C	71.5 °C	122.7 °C
Peak (DTG)	134.8 °C	122.7 °C	159.6 °C
Peak (DTG)	254.2 °C	205.4 °C	494.6 °C

18.2 Hasil TGA Polisakarida Standar



Instrument:	NETZSCH TG 209 F1 Libra TGA209F1E-002	**Sample name:**	Ulva Lactuca
Project:	Layanan	**Sample Mass:**	6.9150 mg
Filename:	Ulva Lactuca.ngb-st9	**Crucible:**	Al2O3
Method used:	new measurement	**Crucible Mass:**	0 mg
Date/Time:	05/09/2022 17:49:45 (UTC+7)	**Material:**	Polisakarida
End Date/Time:	05/09/2022 18:37:17 (UTC+7)	**Sample determination m**	Manual
Laboratory:	BRIN	**Residuum measurement**	Not possible
Operator:	Zahrad	**Atmosphere:**	-- / N2 / N2
Measurement Type:	Sample	**Segments:**	1/1
Temp.Calib.:	<0 °C... 1100 °C>, Crucible: Al2O3, Gas: NITF	**Range:**	25°C/10.0(K/min)/500°C
Crucible:	Al2O3	**Corr/m. range:**	090/2000
Sample identity:	53365		

Remark:

Temperature	Time	TG	Temperature	Time	TG
°C	min	%	°C	min	%
23.7	0.0	100.01	81.7	5.7	92.18
24.7	0.2	100.07	82.7	5.8	92.05
25.7	0.3	100.20	83.7	5.9	91.92
26.7	0.4	100.20	84.7	6.0	91.79
27.7	0.5	100.17	85.7	6.1	91.67
28.7	0.6	100.12	86.7	6.2	91.55
29.7	0.7	100.07	87.7	6.3	91.44
30.7	0.8	100.01	88.7	6.4	91.32
31.7	0.9	99.97	89.7	6.5	91.21
32.7	0.9	99.90	90.7	6.6	91.11
33.7	1.0	99.83	91.7	6.7	91.02
34.7	1.1	99.75	92.7	6.8	90.92
35.7	1.2	99.67	93.7	6.9	90.82
36.7	1.3	99.58	94.7	7.0	90.73
37.7	1.4	99.49	95.7	7.1	90.64
38.7	1.4	99.38	96.7	7.2	90.56
39.7	1.5	99.27	97.7	7.3	90.48
40.7	1.6	99.14	98.7	7.4	90.40
41.7	1.7	99.02	99.7	7.5	90.32
42.7	1.8	98.87	100.7	7.6	90.25
43.7	1.9	98.72	101.7	7.7	90.18
44.7	2.0	98.54	102.7	7.8	90.10
45.7	2.1	98.38	103.7	7.9	90.03
46.7	2.2	98.20	104.7	8.0	89.96
47.7	2.3	98.01	105.7	8.1	89.89
48.7	2.4	97.81	106.7	8.2	89.83
49.7	2.5	97.61	107.7	8.3	89.77
50.7	2.6	97.41	108.7	8.4	89.71
51.7	2.7	97.21	109.7	8.5	89.66
52.7	2.8	97.01	110.7	8.6	89.60
53.7	2.9	96.82	111.7	8.7	89.55
54.7	3.0	96.62	112.7	8.8	89.51
55.7	3.1	96.43	113.7	8.9	89.45
56.7	3.2	96.24	114.7	9.0	89.41
57.7	3.3	96.06	115.7	9.1	89.37
58.7	3.4	95.88	116.7	9.2	89.32
59.7	3.5	95.70	117.7	9.3	89.27
60.7	3.6	95.53	118.7	9.4	89.22
61.7	3.7	95.36	119.7	9.5	89.18
62.7	3.8	95.18	120.7	9.6	89.15
63.7	3.9	94.99	121.7	9.7	89.11
64.7	4.0	94.82	122.7	9.8	89.08
65.7	4.1	94.65	123.7	9.9	89.03
66.7	4.2	94.49	124.7	10.0	89.00
67.7	4.3	94.32	125.7	10.1	88.96
68.7	4.4	94.15	126.7	10.2	88.92
69.7	4.5	93.98	127.7	10.3	88.89
70.7	4.6	93.82	128.7	10.4	88.85
71.7	4.7	93.65	129.7	10.5	88.81
72.7	4.8	93.50	130.7	10.6	88.78
73.7	4.9	93.35	131.7	10.7	88.75
74.7	5.0	93.20	132.7	10.8	88.72
75.7	5.1	93.05	133.7	10.9	88.68
76.7	5.2	92.90	134.7	11.0	88.65
77.7	5.3	92.75	135.7	11.1	88.62
78.7	5.4	92.60	136.7	11.2	88.59
79.7	5.5	92.46	137.7	11.3	88.56
80.7	5.6	92.32	138.7	11.4	88.53

Temperature °C	Time min	TG %	Temperature °C	Time min	TG %
139.7	11.5	88.50	212.7	18.8	85.34
140.7	11.6	88.47	213.7	18.9	85.30
141.7	11.7	88.44	214.7	19.0	85.26
142.7	11.8	88.41	215.7	19.1	85.21
143.7	11.9	88.38	216.7	19.2	85.15
144.7	12.0	88.35	217.7	19.3	85.10
145.7	12.1	88.33	218.7	19.4	85.07
146.7	12.2	88.30	219.7	19.5	85.03
147.7	12.3	88.28	220.7	19.6	84.99
148.7	12.4	88.25	221.7	19.7	84.94
149.7	12.5	88.22	222.7	19.8	84.89
150.7	12.6	88.19	223.7	19.9	84.84
151.7	12.7	88.16	224.7	20.0	84.80
152.7	12.8	88.13	225.7	20.1	84.76
153.7	12.9	88.10	226.7	20.2	84.72
154.7	13.0	88.07	227.7	20.3	84.68
155.7	13.1	88.04	228.7	20.4	84.62
156.7	13.2	88.01	229.7	20.5	84.57
157.7	13.3	87.98	230.7	20.6	84.52
158.7	13.4	87.95	231.7	20.7	84.48
159.7	13.5	87.91	232.7	20.8	84.42
160.7	13.6	87.88	233.7	20.9	84.36
161.7	13.7	87.84	234.7	21.0	84.32
162.7	13.8	87.81	235.7	21.1	84.27
163.7	13.9	87.78	236.7	21.2	84.22
164.7	14.0	87.75	237.7	21.3	84.15
165.7	14.1	87.71	238.7	21.4	84.10
166.7	14.2	87.67	239.7	21.5	84.04
167.7	14.3	87.64	240.7	21.6	83.98
168.7	14.4	87.60	241.7	21.7	83.93
169.7	14.5	87.56	242.7	21.8	83.86
170.7	14.6	87.51	243.7	21.9	83.81
171.7	14.7	87.45	244.7	22.0	83.74
172.7	14.8	87.41	245.7	22.1	83.68
173.7	14.9	87.38	246.7	22.2	83.61
174.7	15.0	87.33	247.7	22.3	83.53
175.7	15.1	87.28	248.7	22.4	83.46
176.7	15.2	87.23	249.7	22.5	83.39
177.7	15.3	87.18	250.7	22.6	83.31
178.7	15.4	87.14	251.7	22.7	83.23
179.7	15.5	87.08	252.7	22.8	83.14
180.7	15.6	87.03	253.7	22.9	83.06
181.7	15.7	86.98	254.7	23.0	82.98
182.7	15.8	86.93	255.7	23.1	82.86
183.7	15.9	86.88	256.7	23.2	82.75
184.7	16.0	86.83	257.7	23.3	82.65
185.7	16.1	86.78	258.7	23.4	82.54
186.7	16.2	86.72	259.7	23.5	82.42
187.7	16.3	86.66	260.7	23.6	82.29
188.7	16.4	86.61	261.7	23.7	82.16
189.7	16.5	86.56	262.7	23.8	82.03
190.7	16.6	86.50	263.7	23.9	81.89
191.7	16.7	86.44	264.7	24.0	81.73
192.7	16.8	86.38	265.7	24.1	81.56
193.7	16.9	86.32	266.7	24.2	81.39
194.7	17.0	86.27	267.7	24.3	81.20
195.7	17.1	86.21	268.7	24.4	81.00
196.7	17.2	86.16	269.7	24.5	80.78
197.7	17.3	86.10	270.7	24.6	80.55
198.7	17.4	86.04	271.7	24.7	80.29
199.7	17.5	85.99	272.7	24.8	80.01
200.7	17.6	85.93	273.7	24.9	79.69
201.7	17.7	85.88	274.7	25.0	79.36
202.7	17.8	85.83	275.7	25.1	79.00
203.7	17.9	85.78	276.7	25.2	78.47
204.7	18.0	85.73	277.7	25.3	78.14
205.7	18.1	85.69	278.7	25.4	77.65
206.7	18.2	85.64	279.7	25.5	77.09
207.7	18.3	85.58	280.7	25.6	76.59
208.7	18.4	85.53	281.7	25.7	76.10
209.7	18.5	85.47	282.7	25.8	75.57
210.7	18.6	85.42	283.7	25.9	75.02
211.7	18.7	85.38	284.7	26.0	74.44

Temperature °C	Time min	TG %	Temperature °C	Time min	TG %
285.7	26.1	73.82	358.7	33.4	24.63
286.7	26.2	73.18	359.7	33.5	24.50
287.7	26.3	72.51	360.7	33.6	24.36
288.7	26.4	71.82	361.7	33.7	24.24
289.7	26.5	71.11	362.7	33.8	24.11
290.7	26.6	70.36	363.7	33.9	23.99
291.7	26.7	69.57	364.7	34.0	23.86
292.7	26.8	68.77	365.7	34.1	23.75
293.7	26.9	67.92	366.7	34.2	23.63
294.7	27.0	67.04	367.7	34.3	23.51
295.7	27.1	66.12	368.7	34.4	23.40
296.7	27.2	65.15	369.7	34.5	23.29
297.7	27.3	64.18	370.7	34.6	23.18
298.7	27.4	63.15	371.7	34.7	23.07
299.7	27.5	62.08	372.7	34.8	22.95
300.7	27.6	60.94	373.7	34.9	22.85
301.7	27.7	59.79	374.7	35.0	22.75
302.7	27.8	58.62	375.7	35.1	22.65
303.7	27.9	57.37	376.7	35.2	22.55
304.7	28.0	56.10	377.7	35.3	22.44
305.7	28.1	54.80	378.7	35.4	22.34
306.7	28.2	53.48	379.7	35.5	22.24
307.7	28.3	52.07	380.7	35.6	22.15
308.7	28.4	50.69	381.7	35.7	22.06
309.7	28.5	49.27	382.7	35.8	21.96
310.7	28.6	47.82	383.7	35.9	21.86
311.7	28.7	46.38	384.7	36.0	21.77
312.7	28.8	44.96	385.7	36.1	21.68
313.7	28.9	43.49	386.7	36.2	21.60
314.7	29.0	42.09	387.7	36.3	21.50
315.7	29.1	40.72	388.7	36.4	21.41
316.7	29.2	39.43	389.7	36.5	21.32
317.7	29.3	38.15	390.7	36.6	21.23
318.7	29.4	36.97	391.7	36.7	21.14
319.7	29.5	35.86	392.7	36.8	21.06
320.7	29.6	34.86	393.7	36.9	20.97
321.7	29.7	33.99	394.7	37.0	20.88
322.7	29.8	33.20	395.7	37.1	20.80
323.7	29.9	32.54	396.7	37.2	20.72
324.7	30.0	31.96	397.7	37.3	20.63
325.7	30.1	31.45	398.7	37.4	20.55
326.7	30.2	31.13	399.7	37.5	20.46
327.7	30.3	30.60	400.7	37.6	20.38
328.7	30.4	30.35	401.7	37.7	20.29
329.7	30.5	30.06	402.7	37.8	20.21
330.7	30.6	29.76	403.7	37.9	20.13
331.7	30.7	29.48	404.7	38.0	20.04
332.7	30.8	29.22	405.7	38.1	19.95
333.7	30.9	28.97	406.7	38.2	19.87
334.7	31.0	28.74	407.7	38.3	19.80
335.7	31.1	28.52	408.7	38.4	19.71
336.7	31.2	28.30	409.7	38.5	19.63
337.7	31.3	28.10	410.7	38.6	19.54
338.7	31.4	27.90	411.7	38.7	19.46
339.7	31.5	27.71	412.7	38.8	19.37
340.7	31.6	27.52	413.7	38.9	19.29
341.7	31.7	27.33	414.7	39.0	19.21
342.7	31.8	27.16	415.7	39.1	19.13
343.7	31.9	26.98	416.7	39.2	19.05
344.7	32.0	26.81	417.7	39.3	18.96
345.7	32.1	26.63	418.7	39.4	18.88
346.7	32.2	26.47	419.7	39.5	18.80
347.7	32.3	26.29	420.7	39.6	18.72
348.7	32.4	26.13	421.7	39.7	18.64
349.7	32.5	25.97	422.7	39.8	18.55
350.7	32.6	25.81	423.7	39.9	18.47
351.7	32.7	25.66	424.7	40.0	18.39
352.7	32.8	25.50	425.7	40.1	18.30
353.7	32.9	25.35	426.7	40.2	18.22
354.7	33.0	25.20	427.7	40.3	18.14
355.7	33.1	25.05	428.7	40.4	18.06
356.7	33.2	24.91	429.7	40.5	17.98
357.7	33.3	24.77	430.7	40.6	17.89

Temperature °C	Time min	TG %	Temperature °C	Time min	TG %
431.7	40.7	17.81	466.7	44.2	14.66
432.7	40.8	17.73	467.7	44.3	14.56
433.7	40.9	17.64	468.7	44.4	14.47
434.7	41.0	17.55	469.7	44.5	14.37
435.7	41.1	17.46	470.7	44.6	14.27
436.7	41.2	17.38	471.7	44.7	14.18
437.7	41.3	17.29	472.7	44.8	14.08
438.7	41.4	17.21	473.7	44.9	13.97
439.7	41.5	17.12	474.7	45.0	13.87
440.7	41.6	17.03	475.7	45.1	13.77
441.7	41.7	16.94	476.7	45.2	13.67
442.7	41.8	16.86	477.7	45.3	13.57
443.7	41.9	16.77	478.7	45.4	13.47
444.7	42.0	16.68	479.7	45.5	13.37
445.7	42.1	16.59	480.7	45.6	13.26
446.7	42.2	16.50	481.7	45.7	13.16
447.7	42.3	16.41	482.7	45.8	13.04
448.7	42.4	16.32	483.7	45.9	12.94
449.7	42.5	16.23	484.7	46.0	12.84
450.7	42.6	16.15	485.7	46.1	12.74
451.7	42.7	16.06	486.7	46.2	12.63
452.7	42.8	15.97	487.7	46.3	12.52
453.7	42.9	15.88	488.7	46.4	12.42
454.7	43.0	15.79	489.7	46.5	12.31
455.7	43.1	15.70	490.7	46.6	12.20
456.7	43.2	15.61	491.7	46.7	12.09
457.7	43.3	15.51	492.7	46.8	11.98
458.7	43.4	15.42	493.7	46.9	11.86
459.7	43.5	15.33	494.7	47.0	11.75
460.7	43.6	15.23	495.7	47.1	11.64
461.7	43.7	15.13	496.7	47.2	11.52
462.7	43.8	15.04	497.7	47.3	11.41
463.7	43.9	14.95	498.7	47.4	11.30
464.7	44.0	14.85	499.7	47.5	11.18
465.7	44.1	14.75			

Instrument:	NETZSCH TG 209F1 Libra TGA209F1E-002	**Crucible:**	Al2O3
Project:	Layanan	**Sample identity:**	53365
Filename:	Ulva Lactuca.ngb-st9	**Sample name:**	Ulva Lactuca
Method used:	new measurement	**Sample Mass:**	6.9150 mg
Date/Time:	05/09/2022 17:49:45 (UTC+7)	**Crucible:**	Al2O3
End Date/Time:	05/09/2022 18:37:17 (UTC+7)	**Crucible Mass:**	0 mg
Laboratory:	BRIN	**Material:**	Polisakarida
Operator:	Zahrad	**Sample determination m**	Manual
Measurement Type:	Sample	**Residuum measurement**	Not possible
Temp.Calib.:	<0 °C... 1100 °C>, Crucible: Al2O3, Gas: NITI		

Remark:

Furnace:	Ceramic TG 209F1	**Furnace TC:**	S
Sample carrier:	TG 209F1 std (Al2O3 support)	**Sample TC:**	P
Measurement End:	Normal end		

Purge 1 MFC:	OXYGEN	**Flow range:**	252.5 ml/min	**predefined**
Purge 2 MFC:	NITROGEN	**Flow range:**	250.0 ml/min	**predefined**
Protective MFC:	NITROGEN	**Flow range:**	250.0 ml/min	**predefined**

Start criteria

Temperature threshold:	5.0 K
Activate stability criteria:	No
Stabilization delay:	00:30 mm:ss
Preheating rate:	30.00 K/min
Maximum equilibrium time after preheating:	00:20 hh:mm
Precooling rate:	50.00 K/min
Maximum equilibrium time after precooling:	00:30 hh:mm

List of temperature steps:

Num	Mode	Temp. °C	HR K/min	Acq.Rate pts/min	Duration hh:mm	STC	P1:–	P2:N2	PG:N2
—	Start	25.0				1	0.0	10.0	20.0
1	Dynamic	500.0	10.000	200.00	00:48	1	0.0	10.0	20.0
—	Emergency	510.0					0.0	0.0	20.0

Lampiran 19. Hasil Uji Aktivitas Antioksidan Ulvan Hasil Ekstraksi dan Standar Polisakarida Sulfat dengan Metode DPPH

1. Asam Askorbat

Perhitungan aktivitas antioksidan:

% Aktivitas Antioksidan = $\frac{\{(\boldsymbol{Abs.\ blanko})-(\boldsymbol{Abs.\ sampel})\}}{(\boldsymbol{Abs.\ blanko})} \times \mathbf{100}$

1.1 Konsentrasi 0,2 ppm

% Aktivitas Antioksidan = $\frac{\{(0{,}9470)-(0{,}9125)\}}{(0{,}9470)} \times 100$ = 3,643 %

1.2 Konsentrasi 0,4 ppm

% Aktivitas Antioksidan = $\frac{\{(0{,}9470)-(0{,}8825)\}}{(0{,}9470)} \times 100$ = 6,811 %

1.3 Konsentrasi 0,8 ppm

% Aktivitas Antioksidan = $\frac{\{(0{,}9470)-(0{,}8250)\}}{(0{,}9470)} \times 100$ = 12,883 %

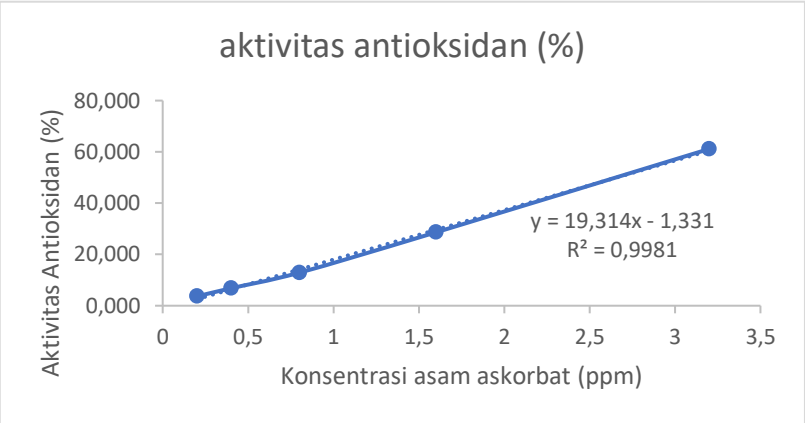
1.4 Konsentrasi 1,6 ppm

% Aktivitas Antioksidan = $\frac{\{(0{,}9470)-(0{,}6760)\}}{(0{,}9470)} \times 100$ = 28,617 %

1.5 Konsentrasi 3,2 ppm

% Aktivitas Antioksidan = $\frac{\{(0{,}9470)-(0{,}368)\}}{(0{,}9470)} \times 100$ = 61,140 %

Konsentrasi (ppm)	Aktivitas Antioksidan (%)
0,2	3,643
0,4	6,811
0,8	12,883
1,6	28,617
3,2	61,140



Perhitungan Nilai IC_{50}

$y = ax + b$

$y = 19{,}314x - 1{,}331$

$IC_{50} = \frac{(y+1{,}331)}{19{,}314} = \frac{(50+1{,}331)}{19{,}314} = 2{,}658\ ppm$

2. Ulvan Hasil Ekstraksi

Perhitungan aktivitas antioksidan:

$$\textbf{\% Aktivitas Antioksidan} = \frac{\{(\boldsymbol{Abs.\ blanko}) - (\boldsymbol{Abs.\ sampel})\}}{(\boldsymbol{Abs.\ blanko})} \times \mathbf{100}$$

2.1 Konsentrasi 10 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}711)\}}{(0{,}806)} \times 100 \quad = 11{,}79\ \%$$

2.2 Konsentrasi 20 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}692)\}}{(0{,}806)} \times 100 \quad = 14{,}14\ \%$$

2.3 Konsentrasi 40 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}660)\}}{(0{,}806)} \times 100 = 18{,}11\ \%$$

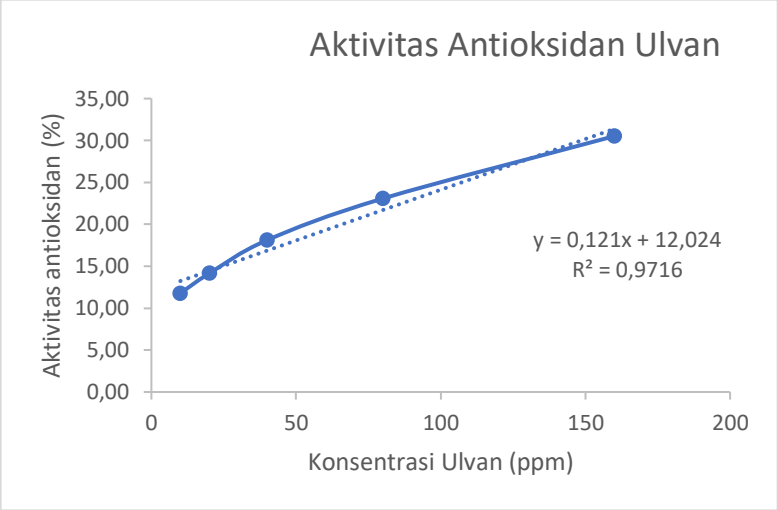
2.4 Konsentrasi 80 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}620)\}}{(0{,}806)} \times 100 \quad = 23{,}08\ \%$$

2.5 Konsentrasi 160 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}560)\}}{(0{,}806)} \times 100 \quad = 30{,}52\ \%$$

Konsentrasi (ppm)	Aktivitas Antioksidan (%)
10	11,79
20	14,14
40	18,11
80	23,08
160	30,52



Perhitungan Nilai IC_{50}

$y = ax + b$

$y = 0{,}121x + 12{,}024$

$IC_{50} = \frac{(y-0{,}121)}{12{,}024} = \frac{(50-0{,}121)}{12{,}0121} = 313{,}851\ ppm$

3. Standar Polisakarida Sulfat

Perhitungan aktivitas antioksidan:

$$\textbf{\% Aktivitas Antioksidan} = \frac{\{(\boldsymbol{Abs.\ blanko}) - (\boldsymbol{Abs.\ sampel})\}}{(\boldsymbol{Abs.\ blanko})} \times \mathbf{100}$$

3.1 Konsentrasi 10 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}733)\}}{(0{,}806)} \times 100 \quad = 9{,}06\ \%$$

3.2 Konsentrasi 20 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}715)\}}{(0{,}806)} \times 100 \quad = 11{,}29\ \%$$

3.3 Konsentrasi 40 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}692)\}}{(0{,}806)} \times 100 = 14{,}14\ \%$$

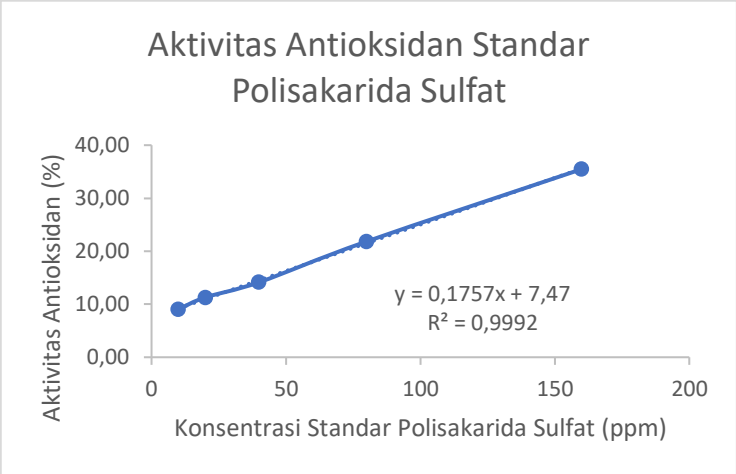
3.4 Konsentrasi 80 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}630)\}}{(0{,}806)} \times 100 \quad = 21{,}84\ \%$$

3.5 Konsentrasi 160 ppm

$$\text{\% Aktivitas Antioksidan} = \frac{\{(0{,}806) - (0{,}520)\}}{(0{,}806)} \times 100 \quad = 35{,}48\ \%$$

Konsentrasi (ppm)	Aktivitas Antioksidan (%)
10	9,06
20	11,29
40	14,14
80	21,84
160	35,48



Perhitungan Nilai IC_{50}

$y = ax + b$

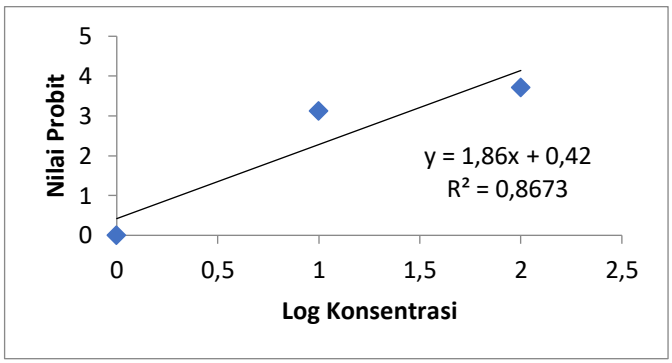
$y = 0{,}1757x + 7{,}47$

$IC_{50} = \frac{(y-0{,}1757)}{7{,}47} = \frac{(50-0{,}1757)}{7{,}47} = 242{,}060\ ppm$

Lampiran 20. Hasil Uji Toksisitas Ulvan Hasil Ekstraksi dan Standar Polisakarida Sulfat

Perhitungan LC_{50} Ulvan hasil ekstraksi

Log Konsentrasi (X)	% Kematian	Nilai Probit (Y)
0	0	0
1	3	3,12
2	10	3,72



Untuk LC_{50}, nilai probit adalah 5, dimasukkan ke persamaan regresi Y = 1,86x + 0,420

Y = 1,86x + 0,420

5 = 1,86x + 0,420

X = 2,462366

Jadi, log X = 2,462366

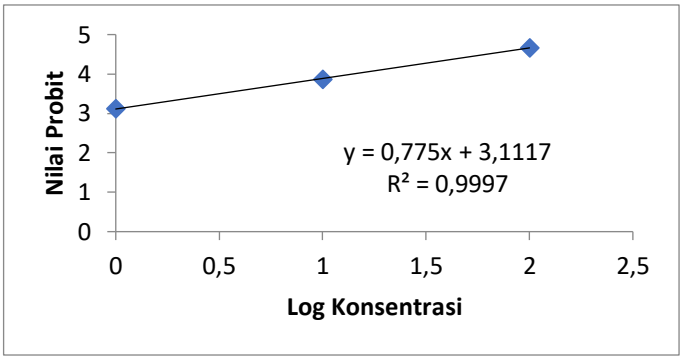
X = antilog 2,462366

= 289,978 ppm

LC_{50} Ulvan hasil ekstraksi adalah = 289,978 ppm

Perhitungan LC_{50} Standar Polisakarida Sulfat

Log Konsentrasi (X)	% Kematian	Nilai Probit (Y)
0	3	3.12
1	13	3.87
2	37	4,67



Untuk LC_{50}, nilai probit adalah 5, dimasukkan ke persamaan regresi Y = 0,775x + 3.1117

Y = 0,775x + 3.1117

5 = 0,775x + 3.1117

X = 2,436516

Jadi, log X = 2,436516

X = antilog 2,436516

= 273,222 ppm

LC_{50} Standar Polisakarida Sulfat adalah = 273,222 ppm

Tabel nilai probit

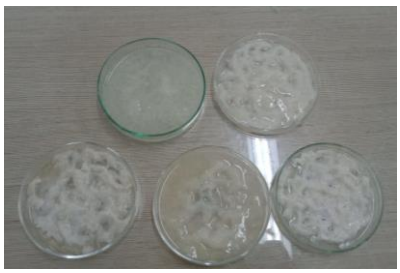
Persentase	Probit									
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0	-	2,67	2,95	3,12	3,25	3,36	3,45	3,52	3,59	3,66
10	3,72	3,77	3,82	3,87	3,93	3,95	4,01	4,05	4,08	4,12
20	4,17	4,19	4,23	4,26	4,29	4,33	4,36	4,39	4,42	4,45
30	4,48	4,50	4,53	4,56	4,59	4,61	4,64	4,67	4,69	4,72
40	4,75	4,77	4,80	4,82	4,85	4,87	4,90	4,92	4,95	4,97
50	5,00	5,03	5,05	5,08	5,10	5,13	5,15	5,18	5,20	5,23
60	5,25	5,28	5,31	5,33	5,36	5,39	5,41	5,44	5,47	5,50
70	5,52	5,55	5,58	5,61	5,64	5,67	5,71	5,74	5,77	5,81
80	5,84	5,88	5,92	5,95	5,99	6,04	6,08	6,13	6,18	6,23
90	6,28	6,34	6,41	6,48	6,55	6,64	6,75	6,88	7,05	7,33
-	**0,0**	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**
99	7,33	7,37	7,41	7,46	7,51	7,55	7,66	7,75	7,88	8,09

Lampiran 21. Dokumentasi

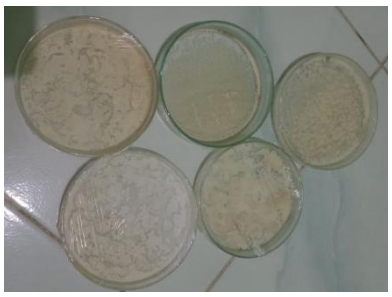
Gambar	Keterangan
	Pengumpulan Sampel Rumput Laut
	Proses pengeringan sampel setelah pencucian
	Pengeringan sampel dengan oven suhu 60^{o}C
	Sampel yang telah siap diekstraksi dan diuji kadar proksimat
	Proses optimasi dalam ekstraksi sampel

Pemisahan filtrat dengan endapan menggunakan sentrifuse tahap pertama

Proses pengendapan dengan etanol 96%



Endapan hasil sentrifuse tahap 2 sebelum dikeringkan



Endapan yang sudah kering

Proses penggerusan polisakarida hasil ekstraksi

Material polisakarida setelah digerus

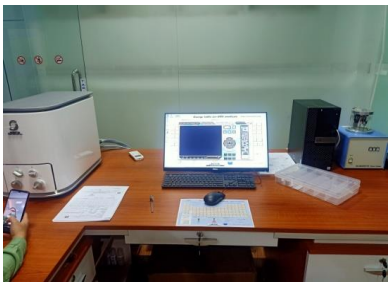
Analisis kadar gula total

Analisis kadar sulfat

Uji toksisitas ulvan menggunakan metode BSLT

Uji aktivitas antioksidan ulvan

Karakterisasi ulvan dengan FTIR



Karakterisasi ulvan dengan SEM

Karakterisasi ulvan dengan XRD

Karakterisasi ulvan dengan TGA