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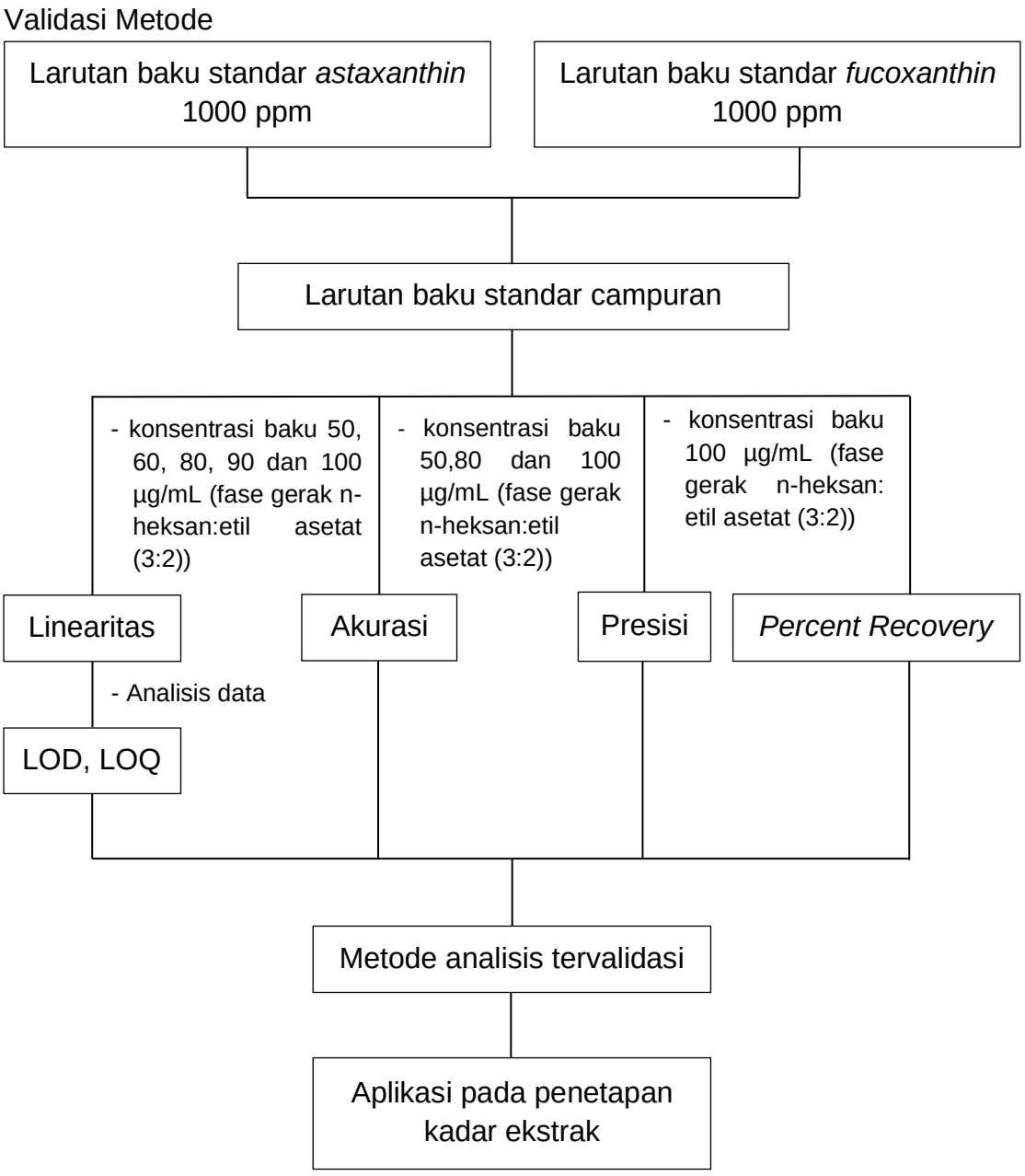
LAMPIRAN

Lampiran 1. Skema Kerja Penelitian

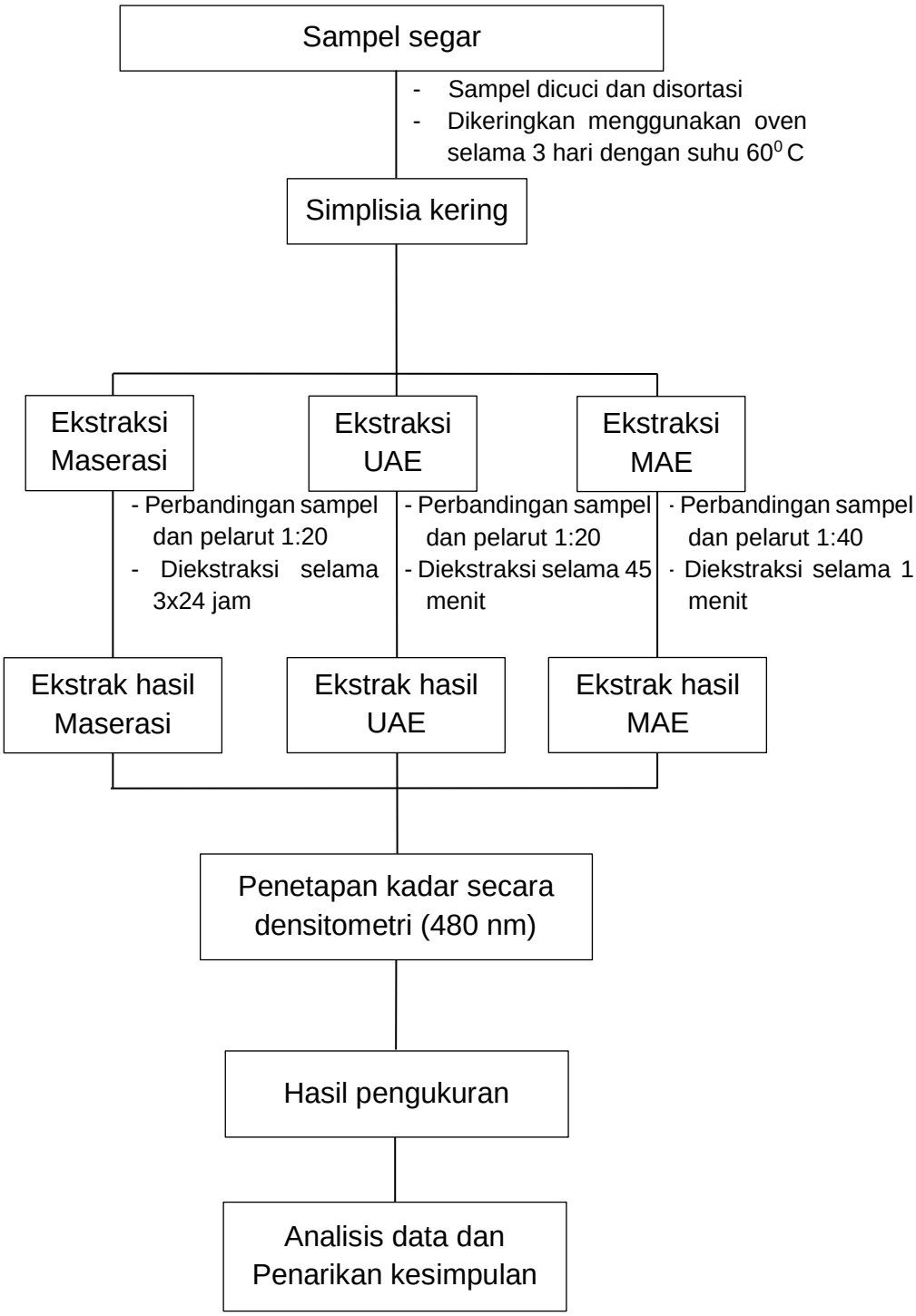


Daftar singkatan

LOD : *Limit of Detection*

LOQ : *Limit of Quantification*

Ekstraksi *Padina australis*



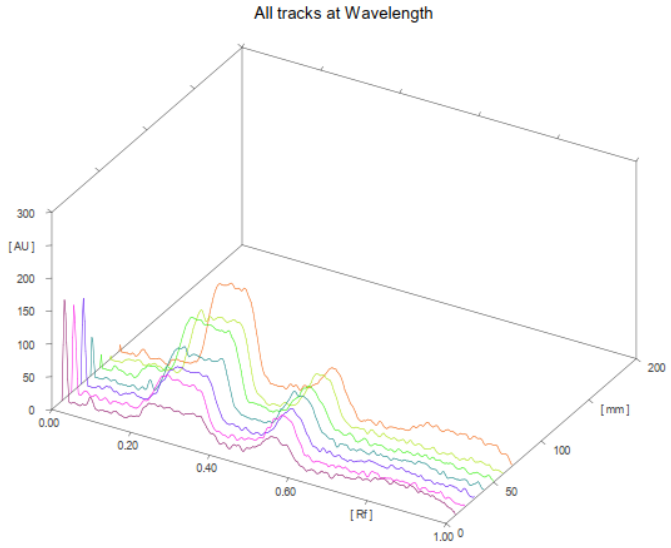
Daftar singkatan

UAE : *Ultrasonic Assisted Extraction*

MAE : *Microwave Assisted Extraction*

Lampiran 2. Perhitungan

1. Linearitas

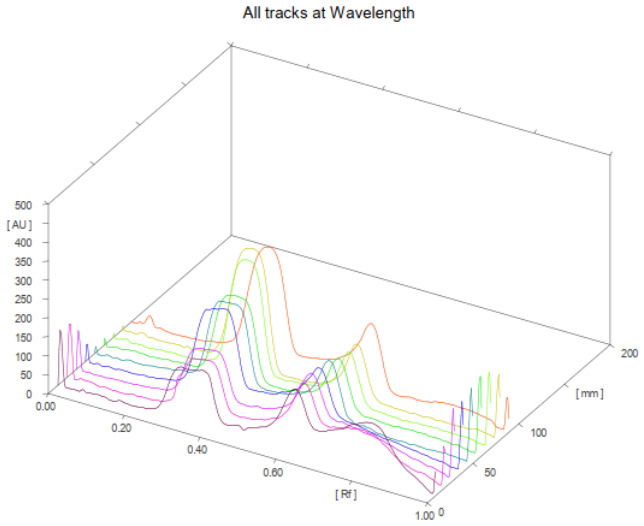


Gambar 14. Densitogram linearitas

Baku *astaxanthin* dan *fucoxanthin* dibuat dalam konsentrasi 1000 µg/mL dengan menimbang masing-masing 1,0 mg baku dalam 1 mL *methanol*, lalu diencerkan menjadi konsentrasi 50,60,80,90 dan 100 µg/mL.

Konsentrasi baku *Astaxathin* (µg/mL)	**AUC**
50	1951,7
60	2455,3
80	3456,8
90	3744
100	4283,5
Konsentrasi baku *Fucoxathin* (µg/mL)	**AUC**
50	3619,3
60	4489,3
80	6344
90	7724,7
100	8652,6

2. Akurasi



Gambar 15. Densitogram Akurasi

Konsentrasi Baku	AUC	Konsentrasi Terdeteksi	% *Recovery*	Rata-Rata
50 µg/mL	2127,70	53,13	106,26	102,19
	2085,40	52,21	104,42	
	1889,70	47,95	95,90	
80 µg/mL	3495,00	82,89	103,61	102,47
	3319,20	79,07	98,83	
	3544,80	83,98	104,97	
100 µg/mL	5956,60	136,48	136,47	127,19
	5211,20	120,25	120,25	
	5423,00	124,86	124,86	

Konsentrasi Baku	AUC	Konsentrasi Terdeteksi	% *Recovery*	Rata-Rata
50 µg/mL	3040,70	45,33	90,65	94,94
	3262,10	47,50	95,00	
	3474,80	49,59	99,17	
	6753,00	81,76	102,20	104,26

80 µg/mL	6600,10	80,26	100,32	
	7410,80	88,22	110,27	
100 µg/mL	8322,20	97,16	97,16	105,55
	9436,70	108,10	108,10	
	9773,00	111,40	111,40	

A. Sampel *astaxanthin*

Y = 45,941x – 313,24

Perhitungan konsentrasi terdeteksi baku 50 µg/mL

X1 = $\frac{2127,7+313,24}{45,941}$ = 53,13

X2 = $\frac{2085,4+313,24}{45,941}$ = 52,21

X3 =$\frac{1889,7+313,24}{45,941}$ = 47,95

Perhitungan konsentrasi terdeteksi baku 80 µg/mL

X1 = $\frac{3495+313,24}{45,941}$ = 82,89

X2 = $\frac{3319,2+313,24}{45,941}$ = 79,06

X3 = $\frac{3544,8+313,24}{45,941}$ = 83,97

Perhitungan konsentrasi terdeteksi baku 100 µg/mL

X1 = $\frac{5956,6 +313,24}{45,941}$ = 136,47

X2 = $\frac{5211,2+313,24}{45,941}$ = 120,25

X3 = $\frac{5423+313,24}{45,941}$ = 124,86

Perhitungan *percent recovery*

$percent\ recovery = \frac{Cf}{C*a}\ x\ 100\%$

Perhitungan *percent recovery* baku 50 µg/mL

$percent\ recovery$ X1= $\frac{53,13206069}{50}\ x\ 100\%$ = 106,26%

$percent\ recovery$ X2= $\frac{52,21131451}{50}\ x\ 100\%$ = 104,42%

$percent\ recovery$ X3= $\frac{47,95150301}{50}\ x\ 100\%$ = 95,90%

Perhitungan *percent recovery* baku 80 µg/mL

$percent\ recovery$ X1= $\frac{82,89414684}{80}\ x\ 100\%$ = 103,61%

$percent\ recovery$ X2= $\frac{79,06749962}{80}\ x\ 100\%$ = 98,83%

$percent\ recovery$ X3= $\frac{83,97814588}{80}\ x\ 100\%$ = 104,97%

Perhitungan *percent recovery* baku 100 µg/mL

$percent\ recovery$ X1= $\frac{136,4759148}{100}\ x\ 100\%$ = 136,47%

$percent\ recovery$ X2= $\frac{120,2507564}{100}\ x\ 100\%$ = 120,25%

$percent\ recovery$ X3= $\frac{124,8610174}{100}\ x\ 100\%$ = 124,86%

B. Sampel *fucoxanthin*

Y = 101,89x – 1577,8

Perhitungan konsentrasi terdeteksi baku 50 µg/mL

X1 = $\frac{3040,7+1577,8}{101,89}$ = 45,32

X2 = $\frac{3262,1+1577,8}{101,89}$ = 47,50

X3 = $\frac{3474,8+1577,8}{101,89}$ = 49,58

Perhitungan konsentrasi terdeteksi baku 80 µg/mL

X1 = $\frac{6753+1577,8}{101,89}$ = 81,76

X2 = $\frac{6600,1+1577,8}{101,89}$ = 80,26

X3 = $\frac{7410,8+1577,8}{101,89}$ = 88,21

Perhitungan konsentrasi terdeteksi baku 100 µg/mL

X1 = $\frac{8322,2+1577,8}{101,89}$ = 97,16

X2 = $\frac{9436,7+1577,8}{101,89}$ = 108,10

X3 = $\frac{9773+1577,8}{101,89}$ = 111,40

Perhitungan *percent recovery*

$percent\ recovery = \frac{\mathrm{Cf}}{\mathrm{C*a}}\ x\ 100\%$

Perhitungan *percent recovery* baku 50 µg/mL

$percent\ recovery$ X1= $\frac{45,32829522}{50}\ x\ 100\%$ = 90,65%

$percent\ recovery$ X2= $\frac{47,50122681}{50}\ x\ 100\%$ = 95,00%

$percent\ recovery$ X3= $\frac{49,58877221}{50}\ x\ 100\%$ = 99,17%

Perhitungan *percent recovery* baku 80 µg/mL

$percent\ recovery$ X1= $\frac{81,76268525}{80}\ x\ 100\%$ = 102,20%

$percent\ recovery$ X2= $\frac{80,26204731}{80}\ x\ 100\%$ = 100,32%

$percent\ recovery$ X3= $\frac{88,21866719}{80}\ x\ 100\%$ = 110,27%

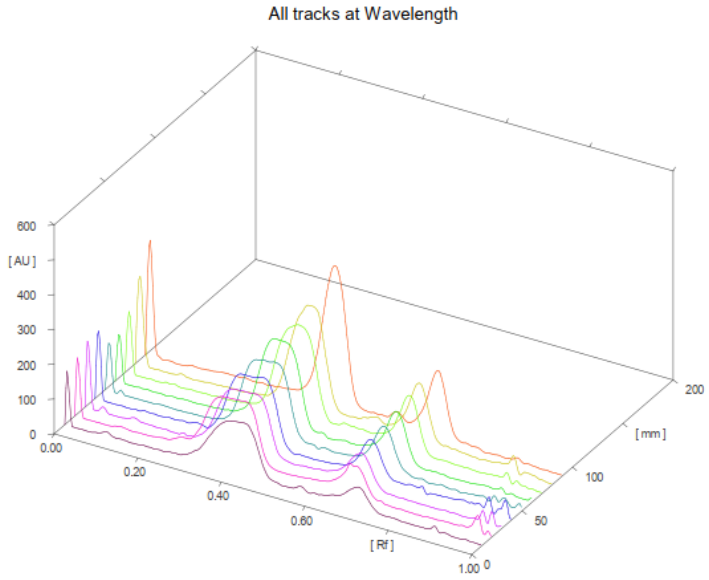
Perhitungan *percent recovery* baku 100 µg/mL

$percent\ recovery$ X1= $\frac{97,16360781}{100}\ x\ 100\%$ = 97,16%

$percent\ recovery$ X2= $\frac{108,1018746}{100}\ x\ 100\%$ = 108,10%

$percent\ recovery$ X3= $\frac{111,4024929}{100}\ x\ 100\%$ = 111,40%

3. Presisi



Gambar 16. Densitogram Presisi

Konsentrasi	Replikasi	AUC (X)	(X-Xi)	$(X-Xi)^2$
100 µg/mL	1	4453,40	216,70	46958,89
	2	4360,40	123,70	15301,69
	3	4012,60	-224,10	50220,81
	4	3621,50	-615,20	378471,04
	5	3976,40	-260,30	67756,09
	6	4561,80	325,10	105690,01
Rata-rata (Xi)	4164.35		**Jumlah $(X-Xi)^2$**	664398,53
	SD		364,53	
	RSD		8,75	

Konsentrasi	Replikasi	AUC (X)	(X-Xi)	$(X-Xi)^2$
100 µg/mL	1	8628,60	17,40	302,76
	2	8453,50	-157,70	24869,29

	3	8672,20	61,00	3721,00
	4	9455,80	844,60	713349,16
	5	9624,60	1013,40	1026979,56
	6	8402,30	-208,90	43639,21
Rata-rata (Xi)		8872.83	**Jumlah (X-Xi)^2**	1812860,98
		SD	602,14	
		RSD	6,79	

Analit pada matriks sampel 100 µg/mL

10 µg/mL (untuk 0,001%) = 0,00001

RSD > $2^{(1-0.5 \log c)}$ x 0,67

RSD > $2^{(1-0.5 \log 0,00001)}$ x 0,67

RSD > $2^{(1-0.5(-3.5))}$ x 0,67

RSD > $2^{3.5}$ x 0,67

RSD >7,58

Maka, untuk konsentrasi 100 µg/mL simpangan baku relatif yang diperbolehkan tidak boleh melebihi dari 7,58%.

Perhitungan simpangan baku (SD) *astaxanthin*

SD = = $\sum$Xi − x̄ 2$\boldsymbol{n} - \mathbf{1}$ SD = $\sqrt{\frac{\sum(\mathrm{Xi}-\bar{\mathrm{x}})^2}{\boldsymbol{n-1}}}$

SD = $\sqrt{\frac{664398.53}{\mathbf{6-1}}}$

SD = 364,52

Perhitungan Simpangan Baku Relatif (RSD) *astaxanthin*

RSD = $\frac{SD}{x}$ x 100%

RSD = $\frac{364,52}{4164,35}$ x 100%

RSD = 8,75%

Perhitungan simpangan baku (SD) *fucoxanthin*

SD = = $\sum$Xi − x 2$\boldsymbol{n}$ − **1** SD = $\sqrt{\frac{\sum(Xi-\bar{x})^2}{\boldsymbol{n-1}}}$

SD = $\sqrt{\frac{1812860.98}{\mathbf{6-1}}}$

SD = 602,13

Perhitungan Simpangan Baku Relatif (RSD) *astaxanthin*

RSD = $\frac{SD}{x}$ x 100%

RSD = $\frac{602,13}{8872,83}$ x 100%

RSD = 6,79%

4. LOD dan LOQ

Konsentrasi	AUC (Y)	Yi	(Yi-Y)	$(Yi-Y)^2$
50	1951,7	1983,81	32,11	1031,052
60	2455,3	2443,22	-12,08	145,9264
80	3456,8	3362,04	-94,76	8979,458
90	3744	3821,45	77,45	5998,502
100	4283,5	4280,86	-2,64	6,9696
		Jumlah $(Y-Yi)^2$		16161,91

Konsentrasi	AUC (Y)	Yi	(Yi-Y)	$(Yi-Y)^2$
50	3619,30	3516,70	-102,60	10526,76
60	4489,30	4535,60	46,30	2143,69
80	6344,00	6573,40	229,40	52624,36
90	7724,70	7592,30	-132,40	17529,76

100	8652,60	8611,20	-41,40	1713,96
		Jumlah $(Y-Yi)^2$		84538,53

Persamaan Garis	Koefisien Determinasi	Simpangan Baku Residual	Batas Deteksi (µg/ml)	Batas Kuantitasi (µg/ml)
y = 45,941x – 313,24	0,9956	73,40	4,79	15,98

Persamaan Garis	Koefisien Determiasi	Simpangan Baku Residual	Batas Deteksi (µg/ml)	Batas Kuantitasi (µg/ml)
y = 101,89x – 1577,8	0,9953	167,87	4,94	16,48

Simpangan Baku Residual *astaxanthin*

$$Sy/x = \sqrt{\frac{\sum(Yi-Y)^2}{n-2}}$$

$$Sy/x = \sqrt{\frac{16161,9082}{5-2}}$$

$$Sy/x = 73,39$$

$$LOD = \frac{3 \text{ x } Sy/x}{Slope}$$

$$LOD = \frac{3 \text{ x } 73,39}{45,94}$$

LOD = 4,79 µg/mL

$$LOQ = \frac{10 \text{ x } Sy/x}{Slope}$$

$$LOQ = \frac{10 \text{ x } 58,97}{45,941}$$

LOQ = 15,97 µg/mL

Simpangan Baku Residual *fucoxanthin*

$$Sy/x = \sqrt{\frac{\sum(Yi-Y)^2}{n-2}}$$

Sy/x = $\sqrt{\frac{84538,53}{\mathbf{5-2}}}$

Sy/x = 167,86

LOD = $\frac{3 \text{ x Sy/x}}{\text{Slope}}$

LOD = $\frac{3 \text{ x } 167,86}{101,89}$

LOD = 4,94 µg/mL

LOQ = $\frac{10 \text{ x Sy/x}}{\text{Slope}}$

LOQ = $\frac{10 \text{ x } 167,86}{101,89}$

LOQ = 16,47 µg/mL

5. Rendemen ekstrak

Nama Sampel	Bobot Simplisia (g)	Bobot Ekstrak (g)	Rendemen (%)
Maserasi	10,01	0,69	6,89
UAE	10,03	1,14	11,36
MAE	10,03	0,46	4,59

Ket:

UAE : *Ultrasonic Assisted Extraction*

MAE : *Microwave Assisted Extraction*

Rendemen (%) hasil maserasi = $\frac{Bobot\ akhir\ ekstrak\ (g)}{Bobot\ awal\ simplisia}\ x\ 100\%$

= $\frac{0,69\ gram}{10,01}\ x\ 100\%$

= 6,89%

Rendemen (%) hasil UAE = $\frac{Bobot\ akhir\ ekstrak\ (g)}{Bobot\ awal\ simplisia}\ x\ 100\%$

= $\frac{1,14\ gram}{10,03}\ x\ 100\%$

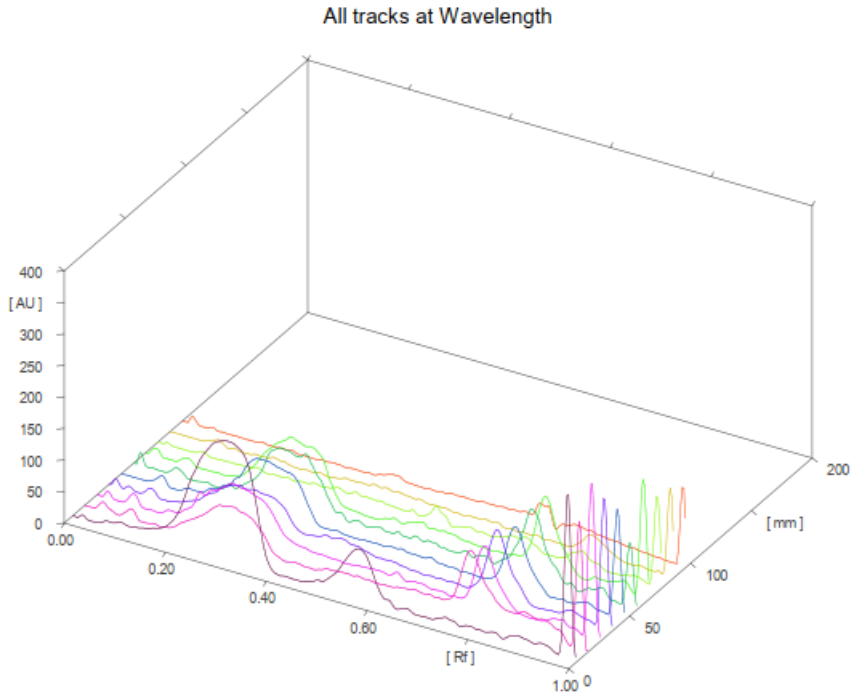
$= 11{,}36\%$

Rendemen (%) hasil MAE $= \frac{Bobot\ akhir\ ekstrak\ (g)}{Bobot\ awal\ simplisia}\ x\ 100\%$

$= \frac{0{,}46\ gram}{10{,}03}\ x\ 100\%$

$= 4{,}59\%$

6. Hasil Perhitungan Penetapan Kadar



Gambar 17. Densitogram kadar *astaxanthin* dan *fucoxanthin*

Metode Ekstraksi	Persen rendemen (%)	AUC	Kadar *astaxanthin* (mg/g)	Rata-rata ± SD
Maserasi	6,89	-	-	-
		-	-	-
		-	-	-
UAE	11,36	-	-	-
		-	-	-
		-	-	-
		-	-	-

MAE	4,59	-	-	-
		-	-	-

Metode Ekstraksi	Persen rendamen (%)	AUC	Kadar *fucoxanthin* (mg/g)	Rata-rata ± SD
Maserasi	6,89	2726,8	0,0654	0,63 ± 0,01
		2538,2	0,0625	
		2512,1	0,0621	
UAE	11,36	4069,8	0,0859	0,87 ± 0,009
		4222,1	0,0882	
		4183,6	0,087	
MAE	4,59	2790,7	0,0645	0,66 ± 0,017
		2950,2	0,0664	
		2665,5	0,0688	

Perhitungan kadar *astaxanthin*

Persamaan linearitas y = 45,941x – 313,24

Konsentrasi sampel = 10 mg/mL

Perhitungan kadar *fucoxanthin*

Persamaan linearitas y = 101,89x – 1557,8

Konsentrasi sampel = 10 mg/mL

% Kadar $= \frac{Konsentrasi\ fucoxanthin\ (\mu g/mL)}{Konsentrasi\ sampel\ (\mu g/mL)}\ x\ 100\%$

Ekstrak hasil maserasi replikasi 1

Konsentrasi *fucoxanthin* $= \frac{2726{,}8+1557{,}8}{101{,}89} = 65{,}43\ \mu g/mL$

% Kadar $= \frac{65{,}43\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0{,}65\%$

$= 0{,}0654\ mg/g$

Ekstrak hasil maserasi replikasi 2

Konsentrasi *fucoxanthin* $= \frac{2538,2+1557,8}{101,89} = 62,55\ \mu g/mL$

% Kadar $= \frac{62,55\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0,625\%$

$= 0,0625\ mg/g$

Ekstrak hasil maserasi replikasi 3

Konsentrasi *fucoxanthin* $= \frac{2512,1+1557,8}{101,89} = 62,16\ \mu g/mL$

% Kadar $= \frac{62,16\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0,621\%$

$= 0,0621\ mg/g$

Ekstrak hasil maserasi UAE 1

Konsentrasi *fucoxanthin* $= \frac{4069,8+1557,8}{101,89} = 85,95\ \mu g/mL$

% Kadar $= \frac{85,95\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0,859\%$

$= 0,0859\ mg/g$

Ekstrak hasil maserasi UAE 2

Konsentrasi *fucoxanthin* $= \frac{4222,1+1557,8}{101,89} = 88,27\ \mu g/mL$

% Kadar $= \frac{88,27\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0,882\%$

$= 0,0882\ mg/g$

Ekstrak hasil maserasi UAE 3

Konsentrasi *fucoxanthin* $= \frac{4183,6+1557,8}{101,89} = 87,68\ \mu g/mL$

% Kadar $= \frac{87,68\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0,876\%$

$= 0,0876\ mg/g$

Ekstrak hasil maserasi MAE 1

Konsentrasi *fucoxanthin* $= \frac{2665,5+1557,8}{101,89} = 64,50\ \mu g/mL$

% Kadar $= \frac{64,50\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0,645\%$

$= 0,0645\ mg/g$

Ekstrak hasil maserasi MAE 2

Konsentrasi *fucoxanthin* $= \frac{2790,7+1557,8}{101,89} = 66,41\ \mu g/mL$

% Kadar $= \frac{66,41\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0,664\%$

$= 0,0664\ mg/g$

Ekstrak hasil maserasi MAE 3

Konsentrasi *fucoxanthin* $= \frac{2950,2+1557,8}{101,89} = 68,85\ \mu g/mL$

% Kadar $= \frac{82,27\ \mu g/mL}{10.000\ \mu g/mL}\ x\ 100\%$

$= 0,688\%$

$= 0,0688\ mg/g$

Lampiran 3. Dokumentasi Penelitian

Gambar 18. Sampel *Padina australis*

Gambar 19. Proses pengeringan *Padina australis*

Gambar 20. Proses maserasi

Gambar 21. Proses UAE

Gambar 22. Proses MAE

Gambar 23. *Chamber* CAMAG

Gambar 24. Proses penyaringan ekstrak

Gambar 25. Proses penguapan pelarut

Gambar 26. Proses penotolan ekstrak

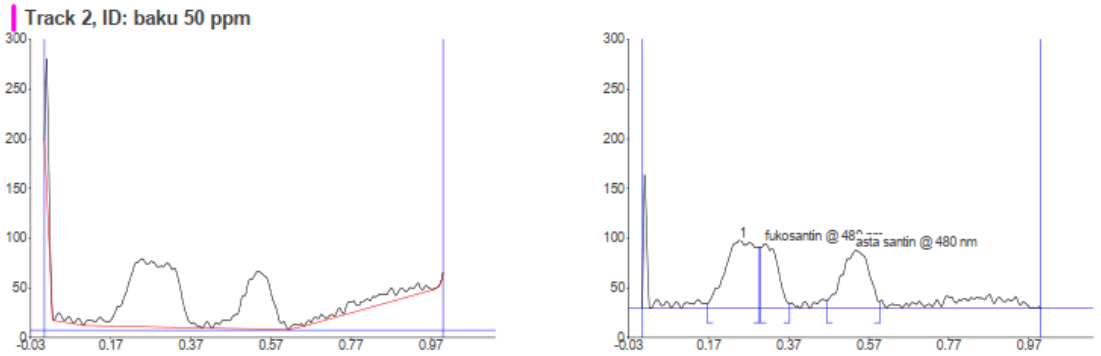
Gambar 27. Proses elusi sampel

Gambar 28. Pengukuran luas area dengan KLT Densitometri

Lampiran 4. Hasil Kromatogram Validasi Metode Analisis

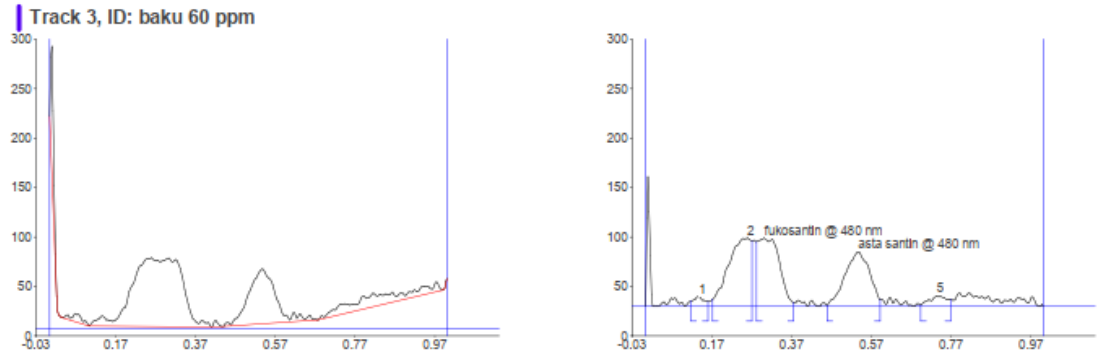
A. Linearitas

- Konsentrasi 50 µg/mL



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.16	4.1	0.24	68.1	35.71	0.29	61.4	2131.9	44.48	unknown *
2	0.30	61.0	0.31	64.7	33.92	0.37	4.2	3619.3	22.63	fukosantin
3	0.46	8.0	0.53	57.9	30.38	0.60	6.5	1951.7	32.89	asta santin

- Konsentrasi 60 µg/mL



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SN 1410W024, V1.4.3
Page 3 of 7

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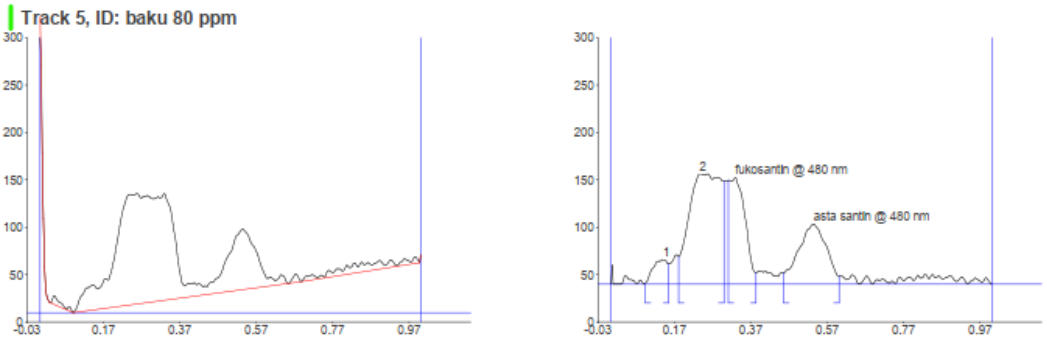
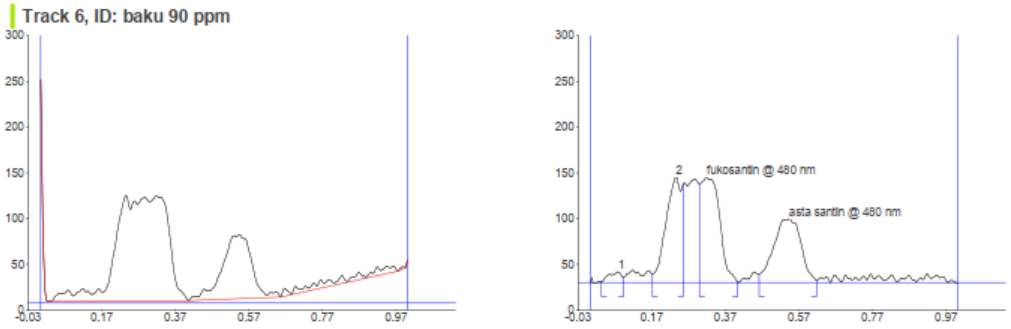
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.11	5.9	0.13	10.2	4.74	0.16	5.0	114.4	2.37	unknown *
2	0.17	7.4	0.26	69.6	32.31	0.27	66.4	1593.9	33.09	unknown *
3	0.28	65.6	0.30	69.3	32.17	0.37	4.1	4489.3	31.90	fukosantin
4	0.46	1.2	0.53	55.4	25.73	0.59	7.0	2455.3	28.57	asta santin
5	0.69	1.6	0.73	10.9	5.05	0.77	7.3	195.8	4.07	unknown *

- Konsentrasi 80 µg/mL



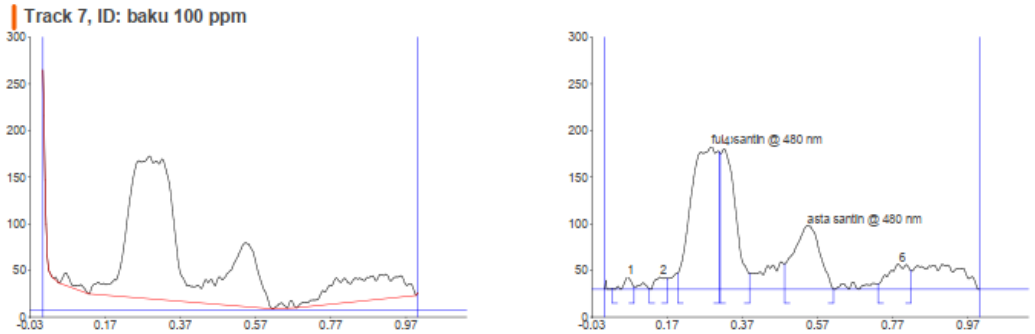
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.09	1.1	0.14	26.2	8.22	0.15	21.6	406.0	4.96	unknown *
2	0.18	29.4	0.23	116.8	36.57	0.30	108.7	3965.7	48.48	unknown *
3	0.31	109.9	0.33	112.8	35.32	0.38	12.2	6344	23.69	fukosantin
4	0.45	12.0	0.53	63.5	19.88	0.60	8.2	3456.8	22.86	asta santin

- Konsentrasi 90 µg/mL



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.03	0.8	0.08	11.8	3.77	0.09	6.2	167.1	2.47	unknown *
2	0.17	9.2	0.23	115.8	37.10	0.25	108.5	2065.8	30.57	unknown *
3	0.30	108.1	0.32	114.8	36.77	0.40	1.0	7724.7	36.09	fukosantin
4	0.46	9.6	0.54	69.8	22.37	0.62	2.5	3744	30.86	asta santin

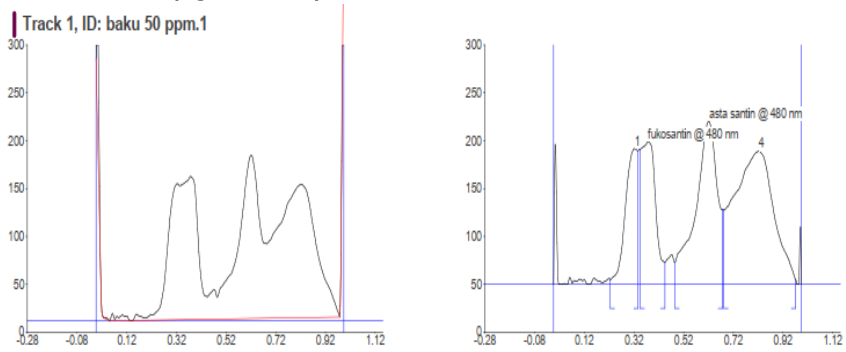
- Konsentrasi 100 µg/mL



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.02	1.0	0.06	13.5	3.17	0.08	2.6	101.2	1.06	unknown *
2	0.12	0.9	0.15	13.2	3.09	0.17	11.7	153.5	1.61	unknown *
3	0.19	17.2	0.28	152.9	35.95	0.31	147.6	8652.6	45.58	fukosantin
4	0.31	146.0	0.32	150.7	35.42	0.39	16.9	2439.7	25.64	unknown *
5	0.48	27.0	0.54	68.1	16.00	0.61	0.2	4283.5	19.86	asta santin
6	0.73	6.2	0.78	27.1	6.37	0.82	20.6	593.5	6.24	unknown *

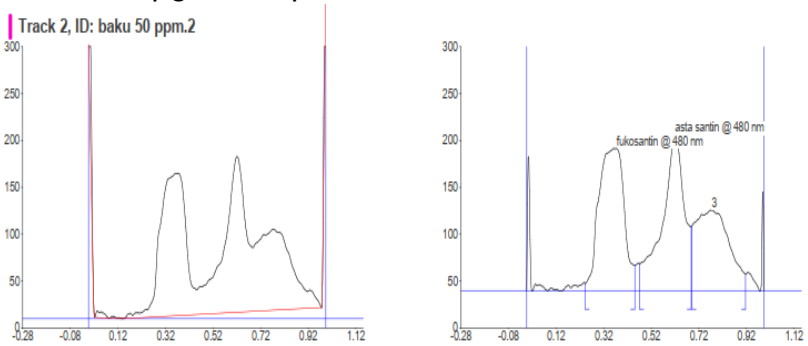
B. Akurasi

- Konsentrasi 50 µg/mL Replikasi 1



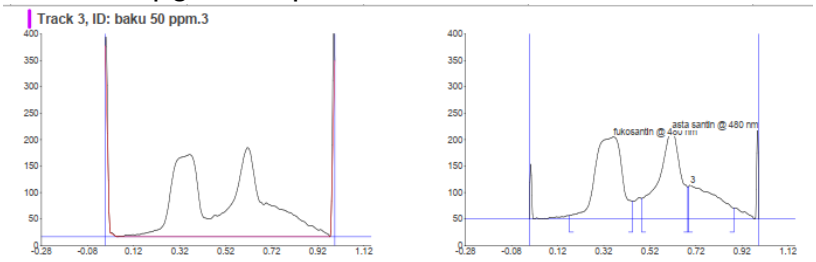
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.23	5.5	0.33	142.2	23.64	0.34	139.9	2869.7	13.35	unknown *
2	0.35	141.7	0.38	149.5	24.85	0.45	23.6	3040.7	16.84	fukosantin
3	0.49	23.0	0.63	170.4	28.33	0.68	78.4	2127.7	28.11	asta santin
4	0.69	77.8	0.83	139.4	23.18	0.98	5.6	8964.9	41.70	unknown *

- Konsentrasi 50 µg/mL Replikasi 2



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.25	7.9	0.38	151.9	37.62	0.46	26.8	3262.1	37.01	fukosantin
2	0.48	29.1	0.62	165.9	41.09	0.69	68.2	2085.4	34.99	asta santin
3	0.70	68.9	0.78	86.0	21.29	0.92	17.8	4993.7	28.00	unknown *

- Konsentrasi 50 µg/mL Replikasi 3



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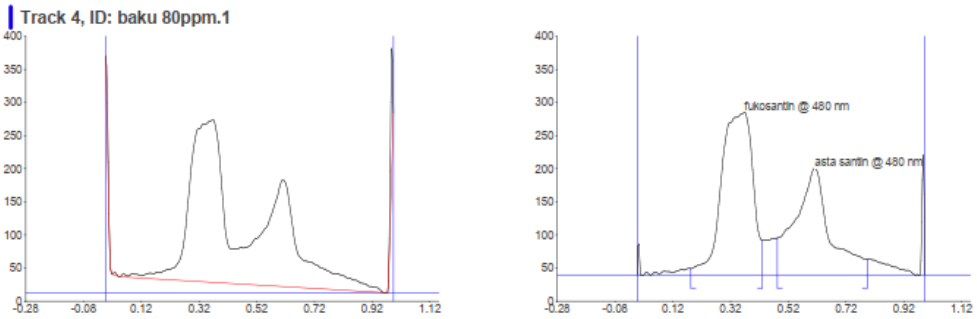
Report ID : 07D501010703101C

SN 1410W024, V1.4.3
Page 3 of 7

winCATS Planar Chromatography Manager

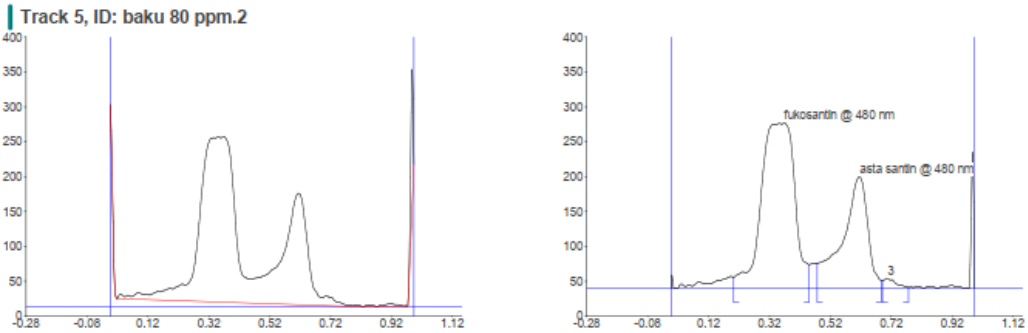
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.17	6.7	0.37	155.5	40.04	0.45	33.8	3474.8	43.52	fukosantin
2	0.49	39.3	0.62	168.6	43.43	0.69	60.9	1889.7	37.75	asta santin
3	0.69	61.5	0.70	64.2	16.53	0.89	21.1	3189.3	18.73	unknown *

- Konsentrasi 80 µg/mL Replikasi 1



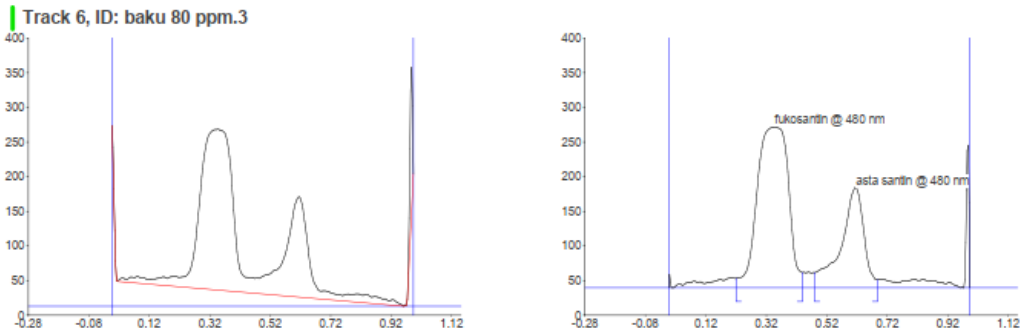
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.19	9.5	0.37	245.1	60.37	0.44	51.9	6753	57.88	fukosantin
2	0.49	55.9	0.62	160.9	39.63	0.80	23.5	3495	42.12	asta santin

- Konsentrasi 80 µg/mL Replikasi 2



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.21	16.2	0.37	237.1	57.61	0.46	34.0	6600.1	65.23	fukosantin
2	0.48	36.2	0.62	159.8	38.83	0.69	11.8	3319.2	33.23	asta santin
3	0.70	11.9	0.71	14.6	3.56	0.78	1.5	252.9	1.55	unknown *

- Konsentrasi 80 µg/mL Replikasi 3



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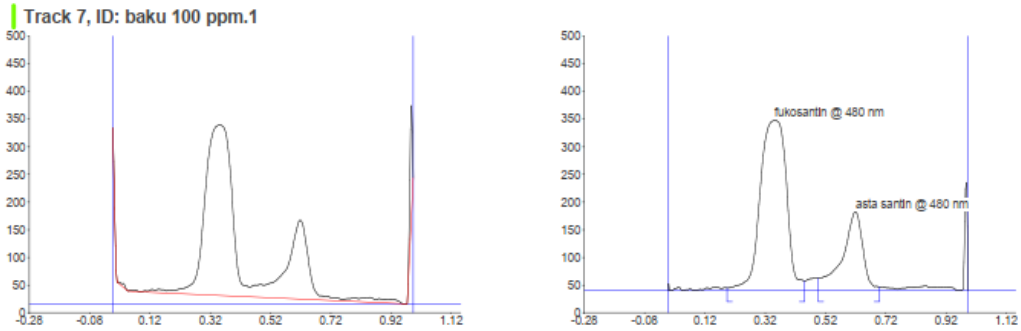
Report ID : 07D501010703101C

SN 1410W024, V1.4.3
Page 4 of 7

winCATS Planar Chromatography Manager

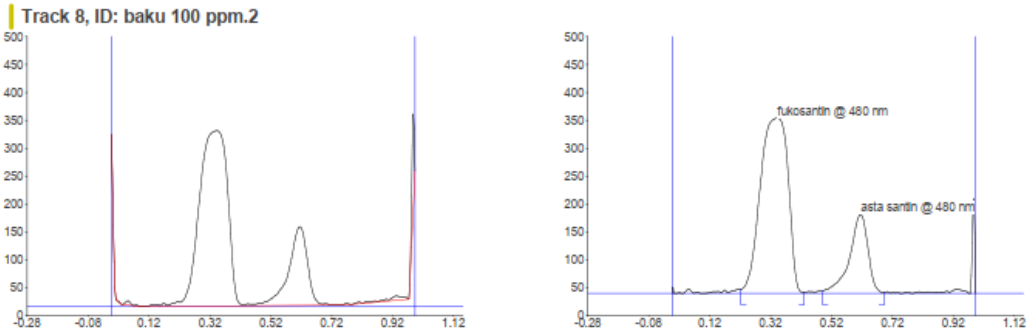
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.22	13.5	0.35	232.1	61.63	0.44	22.0	7410.8	68.70	fukosantin
2	0.48	22.0	0.62	144.5	38.37	0.69	11.4	3544.8	31.30	asta santin

- Konsentrasi 100 µg/mL Replikasi 1



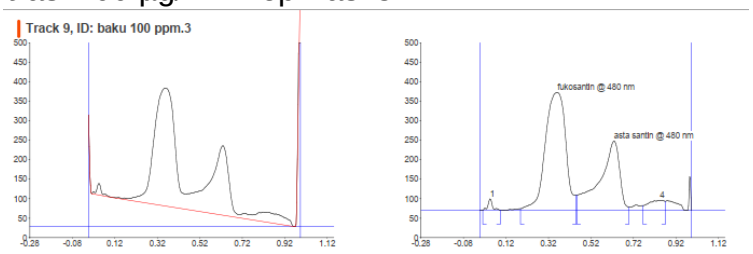
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.20	5.1	0.36	308.2	68.38	0.46	17.2	8322.2	73.39	fukosantin
2	0.50	22.3	0.62	142.5	31.62	0.70	6.5	5956.6	26.61	asta santin

- Konsentrasi 100 µg/mL Replikasi 2



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.23	6.8	0.35	314.3	69.03	0.44	2.3	9436.7	76.99	fukosantin
2	0.50	4.8	0.62	141.0	30.97	0.70	2.4	5211.2	23.01	asta santin

- Konsentrasi 100 µg/mL Replikasi 3



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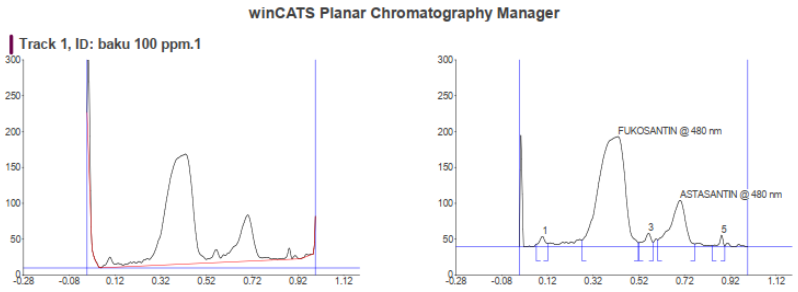
SN 1410W024, V1.4.3
Page 5 of 7

winCATS Planar Chromatography Manager

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	0.0	0.05	30.0	5.58	0.10	1.3	271.2	1.37	unknown *
2	0.19	4.8	0.37	303.1	56.37	0.46	39.2	9773	59.97	fukosantin
3	0.46	39.3	0.63	178.4	33.17	0.70	8.7	5423	34.49	asta santin
4	0.77	12.9	0.85	26.2	4.88	0.88	23.9	827.2	4.17	unknown *

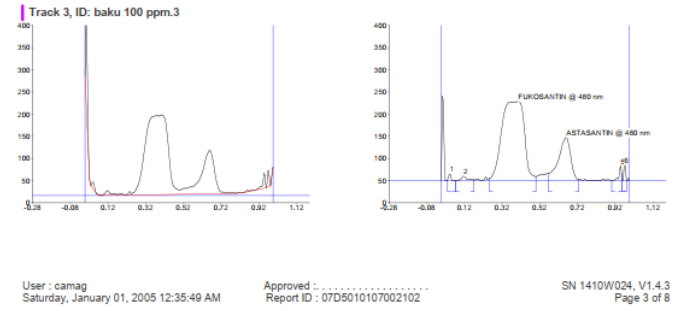
C. Presisi

- Konsentrasi 100 µg/mL Replikasi 1



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.07	3.4	0.10	14.4	5.41	0.12	3.9	138.6	1.57	unknown *
2	0.27	8.7	0.43	153.4	57.65	0.52	5.2	8628.6	76.43	FUKOSANTIN
3	0.52	5.2	0.56	18.3	6.86	0.59	6.0	221.4	2.51	unknown *
4	0.61	9.2	0.70	64.3	24.17	0.77	3.5	4453.4	18.45	ASTASANTIN
5	0.84	1.5	0.89	15.7	5.90	0.90	0.6	92.4	1.05	unknown *

- Konsentrasi 100 µg/mL Replikasi 2



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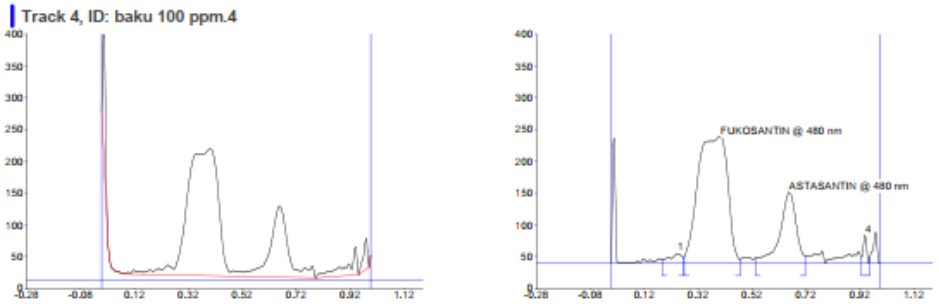
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.03	1.8	0.04	15.4	4.10	0.07	0.0	78.3	0.68	unknown *
2	0.08	0.0	0.12	10.7	2.85	0.17	1.7	129.3	1.13	unknown *
3	0.26	5.6	0.41	179.4	47.95	0.50	9.2	8453.5	73.68	FUKOSANTIN
4	0.57	15.9	0.66	98.2	26.25	0.73	3.1	4360.4	21.79	ASTASANTIN
5	0.91	0.1	0.95	33.8	9.04	0.96	16.5	166.7	1.45	unknown *
6	0.96	3.7	0.97	36.7	9.81	0.99	0.0	144.6	1.26	unknown *

- Konsentrasi 100 µg/mL Replikasi 3



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.19	5.5	0.25	15.0	4.06	0.27	9.2	274.2	2.32	unknown *
2	0.27	9.9	0.41	199.3	53.86	0.48	5.9	8672.2	73.37	FUKOSANTIN
3	0.54	7.8	0.66	111.5	30.15	0.72	11.6	4012.6	22.38	ASTASANTIN
4	0.93	9.1	0.94	44.1	11.93	0.96	10.0	227.7	1.93	unknown *

- Konsentrasi 100 µg/mL Replikasi 4

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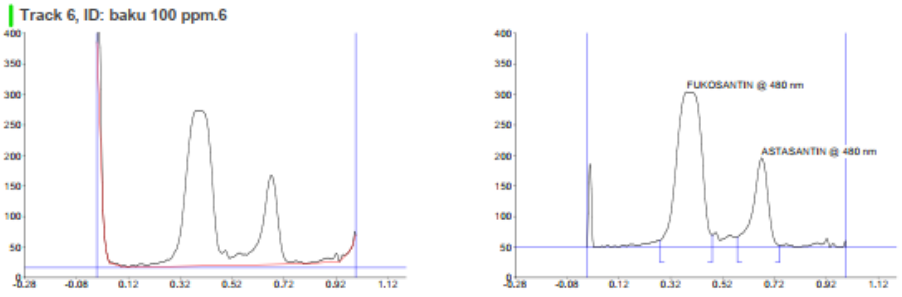
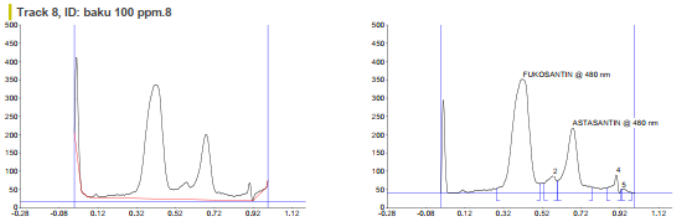


Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.28	11.1	0.39	254.2	63.51	0.48	20.1	9455.8	74.36	FUKOSANTIN
2	0.58	16.4	0.67	146.0	36.49	0.74	2.9	3621.5	25.64	ASTASANTIN

- Konsentrasi 100 µg/mL Replikasi 5



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Report ID : 07D5010107002102

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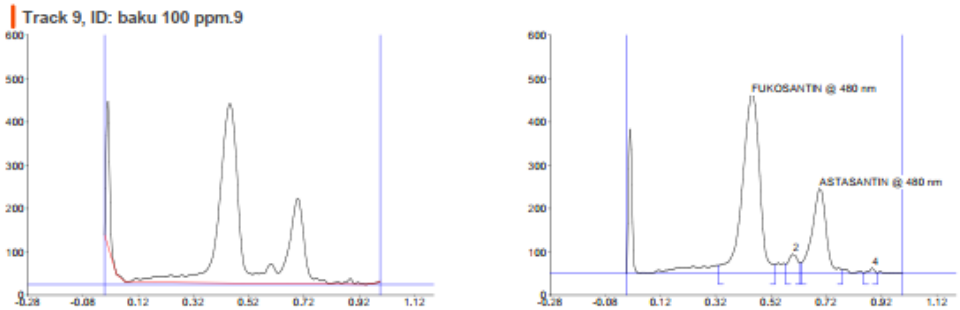
Page 5 of 8

winCATS Planar Chromatography Manager

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.29	12.1	0.42	311.7	52.05	0.51	25.4	9624.6	64.22	FUKOSANTIN
2	0.53	27.7	0.58	46.9	7.84	0.60	32.9	906.8	5.47	unknown *
3	0.60	33.3	0.68	179.0	29.89	0.78	15.5	3976.4	26.33	ASTASANTIN
4	0.86	13.9	0.91	49.5	8.27	0.93	8.8	530.7	3.20	unknown *
5	0.93	11.3	0.94	11.6	1.95	0.99	0.4	128.9	0.78	unknown *

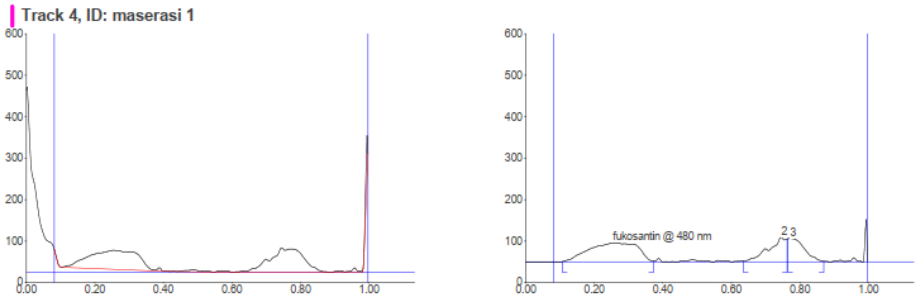
- Konsentrasi 100 µg/mL Replikasi 6



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.33	19.2	0.45	413.5	61.84	0.54	20.8	8402.3	68.27	FUKOSANTIN
2	0.58	22.8	0.60	45.0	6.74	0.63	24.1	640.5	4.27	unknown *
3	0.63	24.7	0.70	197.1	29.48	0.78	8.3	4561.8	26.74	ASTASANTIN
4	0.86	2.2	0.89	13.0	1.95	0.91	1.9	108.6	0.72	unknown *

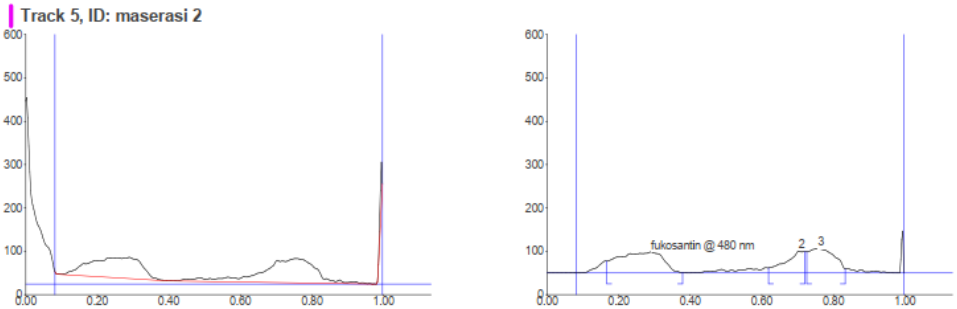
Lampiran 5. Hasil Kromatogram Ekstrak

Kromatogram *fucoxanthin* hasil maserasi 1



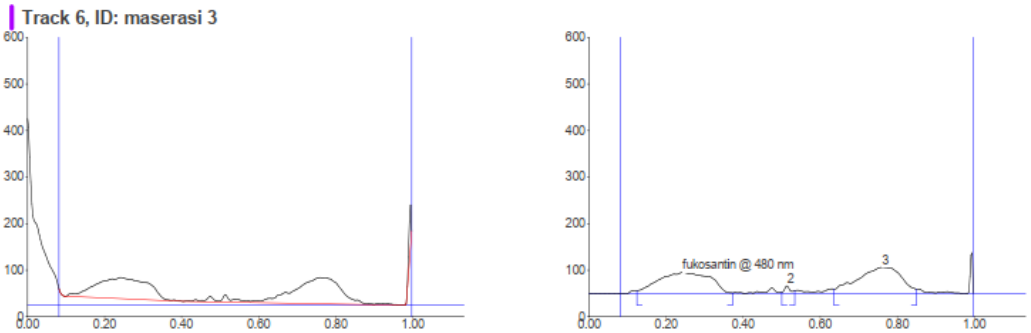
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.11	0.8	0.25	46.0	28.48	0.37	2.4	2726.8	53.28	fukosantin
2	0.64	2.7	0.75	59.1	36.59	0.76	55.1	1274.7	24.91	unknown *
3	0.77	56.1	0.77	56.4	34.93	0.87	1.4	1116.4	21.81	unknown *

Kromatogram *fucoxanthin* hasil maserasi 2



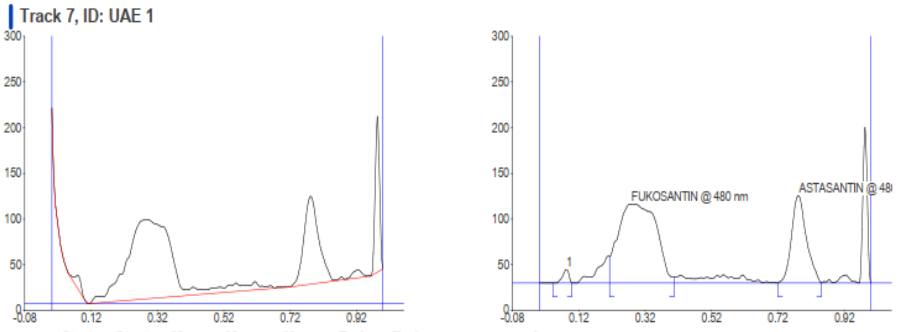
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.17	27.6	0.29	48.9	31.29	0.38	1.2	2538.2	47.36	fukosantin
2	0.62	11.8	0.71	51.2	32.77	0.72	49.6	1103.4	20.59	unknown *
3	0.73	48.9	0.76	56.2	35.94	0.84	9.7	1717.4	32.05	unknown *

Kromatogram *fucoxanthin* hasil maserasi 3



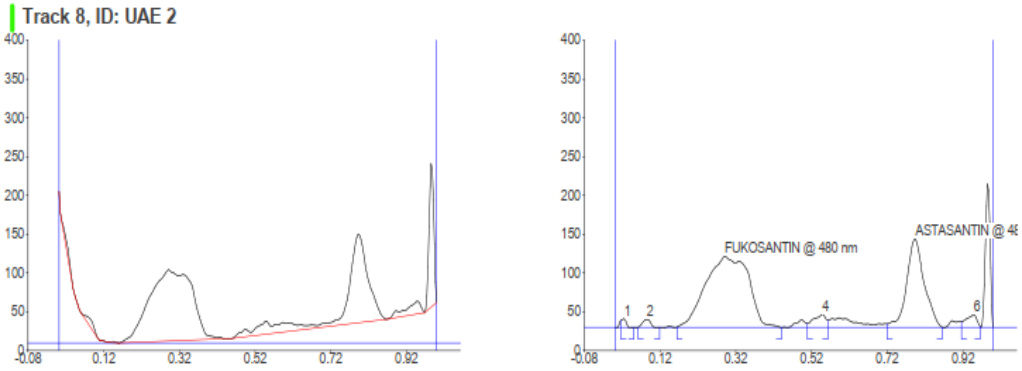
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.12	6.1	0.24	45.4	38.30	0.37	1.3	2512.1	47.85	fukosantin
2	0.50	2.9	0.52	16.6	14.02	0.54	6.0	104.3	1.99	unknown *
3	0.64	9.6	0.76	56.5	47.68	0.85	9.1	2633.1	50.16	unknown *

Kromatogram *fucoxanthin* hasil UAE 1



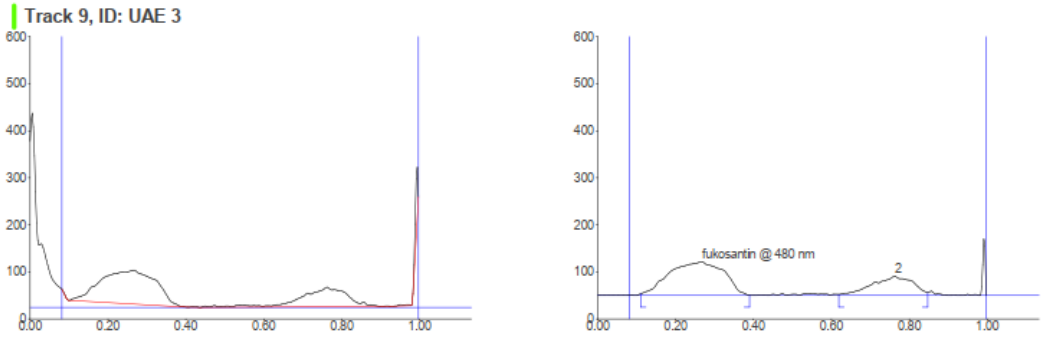
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.04	0.1	0.08	15.4	7.76	0.10	0.2	116.7	1.96	unknown *
2	0.21	29.2	0.28	86.5	43.70	0.41	6.6	4069.8	68.52	FUKOSANTIN

Kromatogram *fucoxanthin* hasil UAE 2



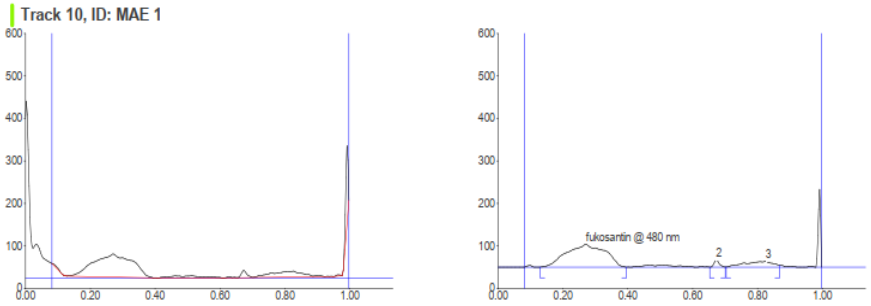
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	8.9	0.02	11.2	4.31	0.05	0.0	60.1	0.87	unknown *
2	0.06	0.2	0.08	10.3	3.96	0.12	0.1	86.5	1.25	unknown *
3	0.16	0.4	0.29	91.6	35.23	0.44	0.2	4222.1	60.84	FUKOSANTIN
4	0.51	4.9	0.55	17.0	6.53	0.56	9.1	226.8	3.27	unknown *

Kromatogram *fucoxanthin* hasil UAE 3



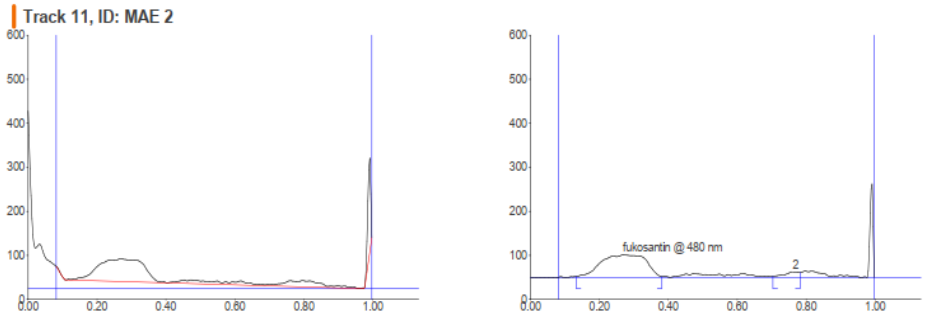
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.11	4.0	0.27	72.2	63.44	0.39	0.3	4183.6	70.20	fukosantin
2	0.62	2.4	0.76	41.6	36.56	0.85	6.1	1775.8	29.80	unknown *

Kromatogram *fucoxanthin* hasil MAE 1



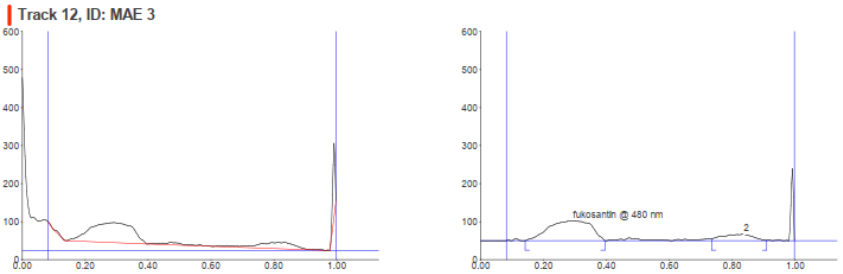
Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.13	0.2	0.27	54.2	63.88	0.40	0.2	2665.5	81.17	fukosantin
2	0.65	0.2	0.67	16.8	19.76	0.70	0.3	114.3	3.48	unknown *
3	0.71	0.5	0.83	13.9	16.35	0.87	4.9	503.9	15.34	unknown *

Kromatogram *fucoxanthin* hasil MAE 2



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.13	2.5	0.27	51.4	79.76	0.38	1.8	2790.7	92.29	fukosantin
2	0.71	2.8	0.76	13.0	20.24	0.78	11.2	233.0	7.71	unknown *

Kromatogram *fucoxanthin* hasil MAE 3



User : camag
Saturday, January 01, 2005 12:26:49 AM

Approved :. . . . . .
Report ID : 07D501010700141A

SN 1410W024, V1.4.3
Page 9 of 11

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Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.14	0.2	0.29	52.7	74.80	0.40	0.3	2950.2	80.95	fukosantin
2	0.74	5.5	0.84	17.7	25.20	0.91	1.0	694.2	19.05	unknown *

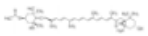
Lampiran 6. *Certificate of Analysis* Baku

Sigma-Aldrich.

3050 Spruce Street, Saint Louis, MO 63103, USA
Website: www.sigmaaldrich.com
Email USA: techserv@sial.com
Outside USA: eurtechserv@sial.com

Certificate of Analysis

Product Name:
Fucoxanthin – carotenoid antioxidant



Product Number:	**F6932**
Batch Number:	**MKCP1541**
Brand:	SIGMA
CAS Number:	3351-86-8
Formula:	C42H58O6
Formula Weight:	658.91 g/mol
Storage Temperature:	Store at -20 °C
Quality Release Date:	22 MAR 2021

Test	Specification	Result
Appearance (Color)	Red to Very Dark Red	Red
Appearance (Form)	Powder	Powder
Proton NMR Spectrum	Conforms to Structure	Conforms
13C NMR Spectrum	Conforms to Structure	Conforms
Purity (HPLC)	≥ 95 %	99 %
Solubility (Color)	Red to Very Dark Red	Dark Red
Solubility (Turbidity) 10 mg/mL, EtOH	Clear	Clear

Michael Grady, Manager
Quality Control
Milwaukee, WI US

LABORATORIUM ILMU LINGKUNGAN DAN KELAUTAN
DEPARTEMEN BIOLOGI
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS HASANUDDIN, KAMPUS TAMALANREA
JL. PERINTIS KEMERDEKAAN KM.10, MAKASSAR

No : 062/ILK.BIO/PP.13/10/2021
Hal : Identifikasi Algae
Lamp : 1 Lembar

SURAT KETERANGAN

Yang bertanda tangan dibawah ini, menerangkan bahwa setelah mengkaji karakter sampel ganggang algae dan identifikasi maka terdapat tiga spesies yaitu :

Alga Coklat (Phaeophyta)
Sampel : Terima tanggal 06/10/2022
Kondisi sampel : lembab

1. Jenis : *Sargassum polycystum* C. Agardh
   Diskripsio : Tanaman cukup besar, panjangnya antara 10-40 cm. Alga berwarna coklat, melekat pada substrat keras. Stipula silindris, kaku, dapat tegak sepanjang thallus. Cabang utama kaku mengeluarkan cabang sekunder tumbuh selang-seling dan pada cabang ini terdapat daun , thallus bercabang berbentuk lembaran seperti daun bergelombang, tepi daun bergerigi tidak beraturan, dengan permukaan licin dan agak kaku, dari nudus terdapat bulatan-bulatan banyak menyerupai buah. Tangkai vesikula oval, melekat banyak pada cabang tertier, tunggal atau bergerombol.

2. Jenis : *Sargassum sp.*
   Diskripsio : Tanaman besar, panjang antara 20-40 cm, berwarna coklat. Bentuk daun besar. oval, dengan tepi bergerigi atau berombak dan ujung agak meruncing. Permukaan licin. Thallus silindris. Tidak memiliki organ pelekat (*holdfast*).

3. Jenis : *Padina australis* Hanch, 1887
   Diskripsio : Thallus terdiri dari beberapa helaian bentuk kipas/filament berwarna coklat. Ukuran filament ini sedikit lebih besar dibandingkan jenis lain dari *Padina*. Tepi luar filament menebal dan permukaan atas filament mempunyai garis konsentris warna putih. Organ pelekat (*holdfast*) bentuk discoid.

Makassar, 10 Oktober 2022
Kepala Laboratorium ILK,

LABORATORIUM ILMU LINGKUNGAN BIOLOGI MAKASSAR

Dr. Magdalena Litaay, M.Sc
NIP.19640929 198903 2 002

Tembusan :
1. Arsip

LABORATORIUM ILMU LINGKUNGAN DAN KELAUTAN
DEPARTEMEN BIOLOGI
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS HASANUDDIN, KAMPUS TAMALANREA
JL. PERINTIS KEMERDEKAAN KM.10, MAKASSAR

Lampiran

Gambar 1. *Sargassum polycystum* C. Agardh

Gambar 2. *Sargassum sp.*

Gambar 3. *Padina australis* Hauch, 1887