

### DAFTAR PUSTAKA

- Ali, A. 2017. *Keragaman Actinobacteria di Sulawesi Selatan dan Aplikasinya dalam Bioteknologi Tanaman*. Makassar: Global-RCI.
- Ali, A., Passita, M., Rante, H., Wahyudin, E., Djide, N. J. N., Politan, R. J., Nur, E. A., Shigeno, S., Ohte S., Kobayashi, K., Hosoda, K., Tomoda, H., & Ohshiro, T. Antibiotic Production By An Endophytic Streptomyces Isolated From The Medicinal Plant *Poikilospermum Suaveolens*. *Biodiversitas*. 25(5): 2221-2229.
- Alwi, M., Suharjono, S., Ardyati, T. & Subandi, S. 2020. Eksplorasi *Actinomycetes* Sebagai Kandidat Antibakteri Patogen Yang Resisten Dari Rhizosfer Tumbuhan Leda (*Eucalyptus Deglupta* Blume.) Di Taman Nasional Lore Lindu, Indonesia. *Biocelebes*. 14(3): 253-267.
- Anggrayeni, Y.T., Wijanarkan., Kusdiyantini, E., 2019. Isolasi dan Identifikasi Morfologi serta Biokimia Khamir Hasil Isolasi dari Buah Tomat (*Lycopersicum esculentum*) yang Berpotensi menghasilkan Bioetanol. *Bioma*. 21. (1): 16-24.
- Bellandria, J. C. & Morillo, N. J. 2013. Amino Acid Profile and Pigment Content in Shrimp Waste Meal. *Zootecnia Tropical*. 31(1): 24 – 34.
- Bibb, M. J. 2003. Regulation of Secondary Metabolism in Streptomyces. *Current Opinion in Microbiologu*. 8: 208-205.
- Burhamzah, R. & Rante, H. 2020. Isolasi Dan Skrining Aktinomisetes Laut Penghasil Senyawa Antibakteri-Multi Drug Resistance Dari Sedimen Laut Pantai Galesong. *Majalah Farmasi Farmakologi Fakultas Farmasi*. 23(3): 79-81.
- Charousuva, I., Medo, J., Hleba, L., Cisarova, M. & Javorekova, S. 2019. Antimicrobial Activity Of *Actinomycetes* And Characterization Of Actinomycin-Producing Strain KRG-1 Isolated From Karoo, South Africa. *Brazilian Journal of Pharmaceutical Sciences*. 55: 1-11.
- Dharmaraj, S., Ashokkumar, B., & Dhevendaran, K. 2010. Isolation Of Marine Streptomyces And The Evaluation Of Its Bioactive Potential. *African Journal of Microbiology Research*. 4(4): 240 – 248.
- Finocchiaro, G. 2020. Actinomycin D: A New Opening For An Old Drug. *Neuro Oncol*. 22(9): 1235-1236.
- Gonzalez B. J., Fernandez, F. J., Tomasini, A., & Mejia, A. 2005. Secondary Metabolites Production by Solid-State Fermentation. *Malaysian Journal of Microbiology*. 1(1): 1-6.
- Mukhriani. 2014. Ekstraksi, Pemisahan Senyawa, dan Identifikasi Senyawa Aktif. *Jurnal Kesehatan*. 7(2):361-367.
- Mutsaqof, A. A. N., Wiharto., Suryani, E. 2015. Sistem Pakar Untuk Mendiagnosis Penyakit Infeksi Menggunakan Forward Chaining. *Jurnal Itsmart*. 4(1): 43-47.
- Hafsari, A.R., Asriana, G., Farida, W.N., Agus, M., 2021. Karakteristik pH Kultur Kombucha Teh Hitam dengan Jenis Gula Berbeda pada Fermentasi *Batch Culture*. *SEMABIO*. 6: 227-232.
- Hamida, A. A., & Nasution, N. E. 2019. Effect Of Sugar Cane Molasses And Tofu Waste On The Inhibitory Activity Of Cell Free Fermentation Broth Of Streptomyces antibioticus K-6. *Pharmaciana*. 9(2): 315-324.
- Hashary, A. R., Alhidayatullah., Nur, A. A. 2021. Potensi *Actinomycetes* Yang Diisolasi Dari Rhizosfer Pinus (*Pinus Merkusii*) Asal Desa Limapoccoe

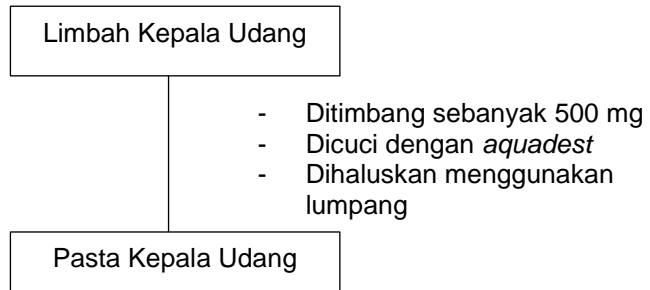
- Kecamatan Cenrana Kabupaten Maros Sebagai Penghasil Antimikroba. *Jurnal Farmasi Fakultas Kedokteran dan Ilmu Kesehatan*. 9(2): 15-19.
- Hubalek, Zdenek. 2003. Protectants Used In The Cryopreservation Of Microorganism. *Cryobiology*. 46: 205-229.
- Kementerian Perindustrian. 2016. Impor Bahan Baku Obat Picu Defisit. *Berita Industri*. (Online). (<https://kemenperin.go.id/artikel/15785/Impor-Bahan-Baku-Obat-Picu-Defisit>, diakses 1 November 2023).
- Kumala, T., Jayuska, A., & Ardiningsih, P. 2015. Uji Aktivitas Antibakteri Isolat Actinomyces 9ISP1 dari Spons. *JKK*. 4(2): 30-36
- Kumar SR, S., & Rao, K. V. B. 2012. In-Vitro Antimicrobial Activity Of Marine Actinobacteria Against Multidrug Resistance Staphylococcus Aureus. *Asian Pacific Journal Of Tropical Biomedicine*. 2(10): 787-792
- Kurniawan, S., Syarifuddin, A., Agusta, H. F., & Pradani, M. P. K. 2020. Optimasi Pertumbuhan Isolat Bakteri (Isolat Te 234) Dan Uji Aktivitas Cairan Kultur Terhadap Bakteri Escherichia Coli Dan Staphylococcus Aureus. *Jurnal Ilmiah Ibnu Sina*. 5(2): 211-219.
- Laila, A., Setiawan, F., Widyastuti, W., Fadhillah, M. R., Setiawan, A., Juliasih, N. L. G. R., Setiawan, W. A., Apriliana, E., Ahmadi, E., & Arai, M. & Hendri, J. 2023. Exploration and Biorefinery Antimicrobial Agent through Solid State Fermentation from Indonesia's Marine Actinomyces. *Fermentation*. 9: 334.
- Listiana, E., Anugrahwati, D. R., & Muthahanas, I. 2018. Isolasi dan Identifikasi Bakteri Endofitik Actinomyces dari Tanaman Padi Lokal Lombok. *Jurnal Ilmiah Budidaya*. 2(2): 138-144.
- Liu, X. F., Xiang, L., Zhou, Q., Carralot, J. P., Prunotto, M., Niederfellner, G., & Pastan, I. 2016. Actinomycin D Enhances Killing of Vancer Cells by Immunotoxin RG7787 Through Activation of The Extrinsic Pathway of Apoptosis. *PNAS Early Edition*. 113(38): 10666 – 10671.
- Soeka, Y. S. & Triana, E. 2016. Pemanfaatan Limbah Kulit Udang untuk Menghasilkan Enzim Kitinase dari Streptomyces macrosporeus InACC A454. *Jurnal Kimia Terapan Indonesia*. 18(1): 91-101.
- Umah, L., Agustini, T. W., Fahmi, A. S. 2021. Karakteristik Perisa Bubuk Ekstrak Kepala Udang Vanamei (*Litopenaeus vannamei*) Dengan Penambahan Konsentrat Tomat (*Lycopersicum esculentum*) Menggunakan Metode Foam Mat Drying. *Jurnal Ilmu dan Teknologi Perikanan*. 3(1): 50-58.
- Moelharjo, S. D. 1972. *On Flavour Compound of Cooked Trasi, A Curve Shrimp Paste Condiment of Far East*. Wageningen: Centre of Agriculture Publishing.
- Mubarak, F., Rante, H., Djide, N. 2017. Isolasi Dan Aktivitas Antimikroba Aktinomyces Dari Tanah Karst Taman Wisata Bantimurung Asal Maros Sulawesi Selatan. *As-Syifaa*. 9(1): 1-10.
- Queendy, V. & Roza, R. M. 2019. Aktivitas Antifungi Isolat Aktinomisetes Arboretum Universitas Riau Terhadap Jamur *Fusarium Oxysporum F.Sp Lycopersici* dan *Ganoderma Boninense*. *AL – KAUNIYAH*. 12(1): 73-88.
- Rante, H., Wahyono, Murti, Y. B. & Alam, G. Purifikasi Dan Karakterisasi Senyawa Antibakteri Dari Actinomyces Asosiasi Spons Terhadap Bakteri Patogen Resisten. *Majalah Farmasi Indonesia*. 21(3): 158-165.
- Savitri, A. & Megantara S. 2019. Metode Klt-Densitometri Sebagai Penetapan Kadar Bahan Aktif Sediaan Farmasi. *Farmaka*. 17(2): 455-463.

- Setiawan, A., Widyastuti, W., Irawan, A., Wijaya, O. S., Laila, A., Setiawan, W. A., Juliasih, N. L. G. R., Nonaka, K., Arai, M., & Hendri, J. Solid State Fermentation of Shrimp Shell Waste Using *Pseudonocardia carboxydivorans* 18A13O1 to Produce Bioactive Metabolites. *Fermentation*. 7: 247.
- Shikuku, B. O., Kiruki, S., Kuria, E., Mayo, D., & Ogolla, F. O. Effect of pH, Carbon and Nitrogen Sources on Antibiotic Production by Actinomycetes Isolates from River Tana and Lake Elementaita, Kenya. *Asian Journal of Research in Biochemistry*. 13(1): 42-51.
- Singh, L. S., Mazumder, S. & Bora, T. C. 2009. Optimisation Of Process Parameters For Growth And Bioactive Metabolite Produced By A Salt-Tolerant And Alkaliphilic Actinomycete, *Streptomyces Tanashiensis* Strain A2D. *Journal de Mycologie Medicale*. 19: 225-233.
- Wahyuningrum, S. A., Bahar, M., & Pramono, A. P. 2021. Uji Daya Hambat Isolat *Actinomycetes* sebagai Antibakteri terhadap Pertumbuhan *Pseudomonas aeruginosa* ATCC 27853 secara *In Vitro*. *Jurnal Kesehatan Andalas*. 10(1): 16-22.

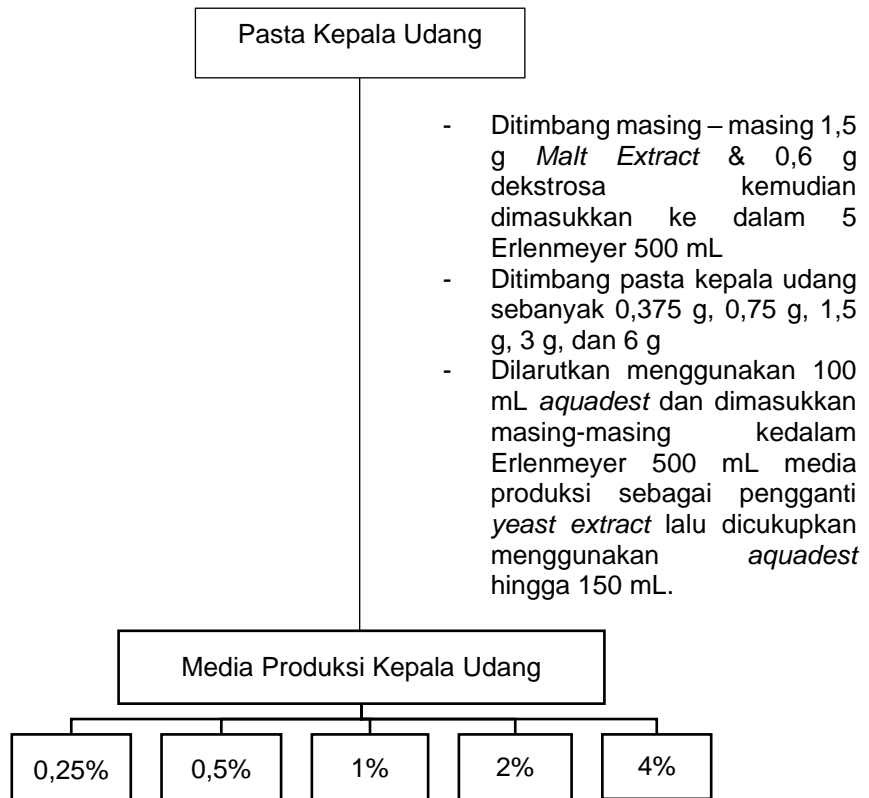
## LAMPIRAN

### Lampiran 1. Skema Kerja

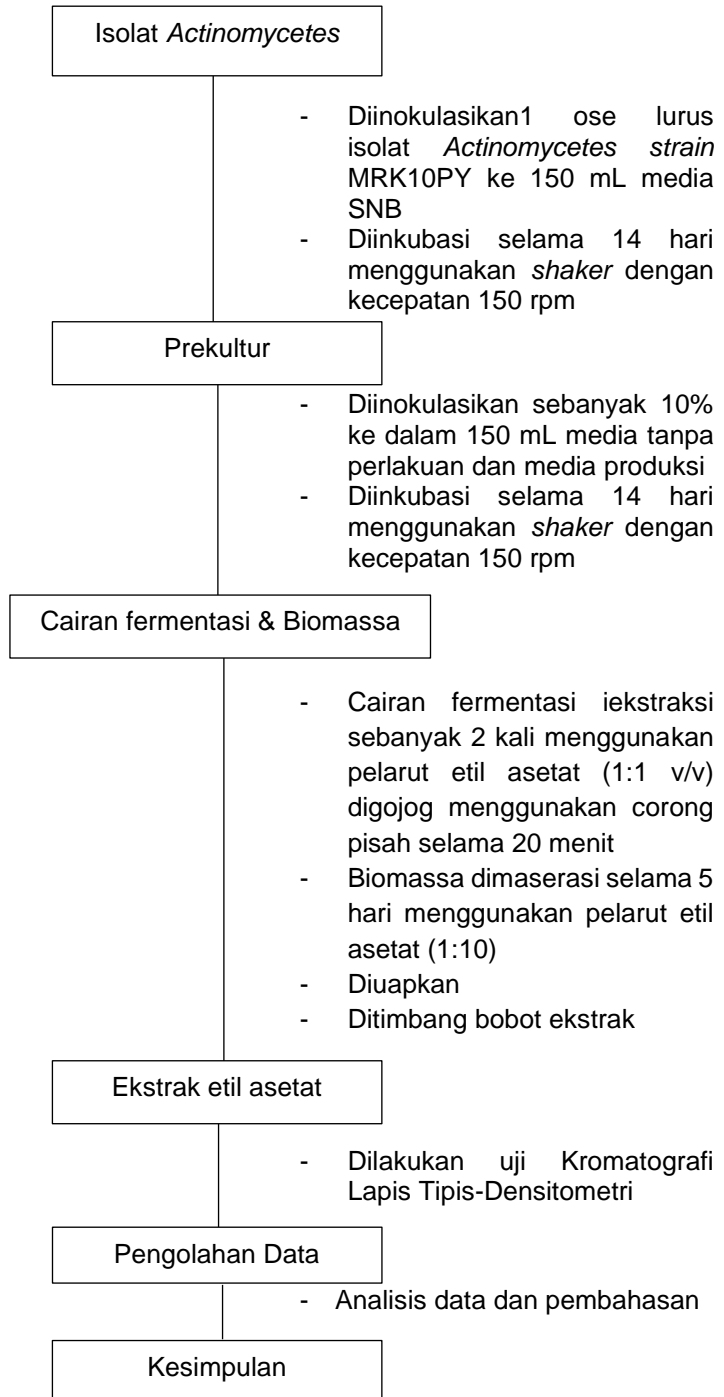
#### Lampiran 1. Preparasi Limbah Kepala Udang



#### Lampiran 1.2. Pembuatan Media Produksi



### Lampiran 1.3. Produksi *Actinomycetes*



**Lampiran 2. Perhitungan**

Lampiran 2a. Perhitungan konsentrasi larutan

Jumlah ekstrak = 50 mg

Jumlah pelarut = 0,5 mL

$$\begin{aligned} \text{Konsentrasi larutan} &= \frac{50 \text{ mg}}{0,5 \text{ mL}} \times 100\% \\ &= \frac{0,5 \text{ g}}{0,5 \text{ mL}} \times 100\% = 10\% \end{aligned}$$

Volume totalan = 5 µL

**Lampiran 3. Komposisi Media****Tabel 3.** Komposisi media Starch Nitrate Agar (SNA)

<b>Nama Bahan</b>	<b>Jumlah</b>
<i>Soluble Starch</i>	20 g
Nacl	0,5 g
Agar	15 g
KNO <sub>3</sub>	2 g
K <sub>2</sub> HPO <sub>4</sub>	1 g
MgSO <sub>4</sub> .7H <sub>2</sub> O	0,05 g
Fe <sub>2</sub> SO <sub>4</sub> .7H <sub>2</sub> O	0,01 g
<i>Distilled Water</i>	1 L

**Tabel 4.** Komposisi media Starch Nitrate Broth (SNB)

<b>Nama Bahan</b>	<b>Jumlah</b>
<i>Soluble Starch</i>	20 g
Nacl	0,5 g
KNO <sub>3</sub>	2 g
K <sub>2</sub> HPO <sub>4</sub>	1 g
MgSO <sub>4</sub> .7H <sub>2</sub> O	0,05 g
Fe <sub>2</sub> SO <sub>4</sub> .7H <sub>2</sub> O	0,01 g
<i>Distilled Water</i>	1 L

**Tabel 5.** Komposisi media International Streptomyces Project 2 (ISP 2)

<b>Nama Bahan</b>	<b>Jumlah</b>
<i>Malt extract</i>	10 g
Yeast extract	4 g
<i>Dextrose</i>	4 g
<i>Distilled water</i>	1 L

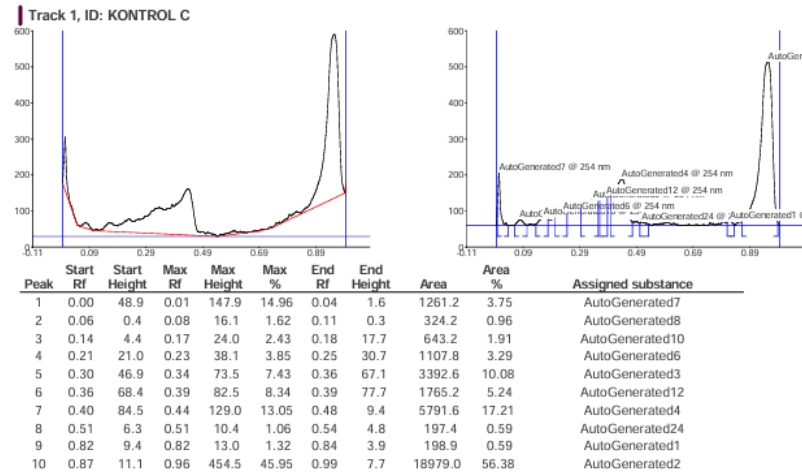
**Tabel 6.** Komposisi media produksi

Konsentrasi	Kepala Udang	<i>Malt</i> <i>Extract</i>	Yeast Extract	<i>Dextrose</i>	<i>Distilled</i> <i>Water</i>
Tanpa perlakuan	-	1,5 g	0,6 g	0,6 g	150 mL
0,25%	0,375 g	1,5 g	-	0,6 g	150 mL
0,5%	0,75 g	1,5 g	-	0,6 g	150 mL
1%	1,5 g	1,5 g	-	0,6 g	150 mL
2%	3 g	1,5 g	-	0,6 g	150 mL
4%	6 g	1,5 g	-	0,6 g	150 mL

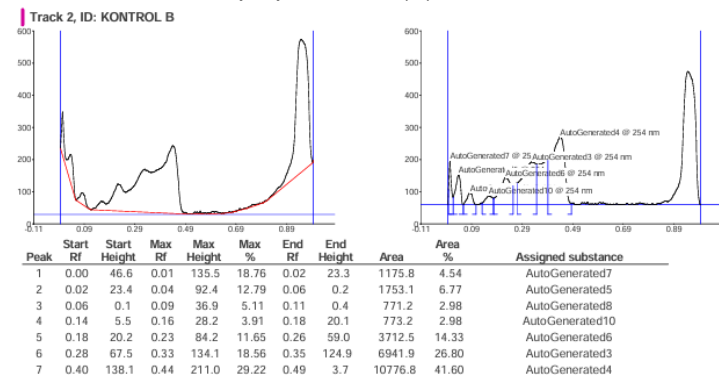
## Lampiran 4. Profil KLT-Densitometri

### Lampiran 4.a Gelombang 254 nm

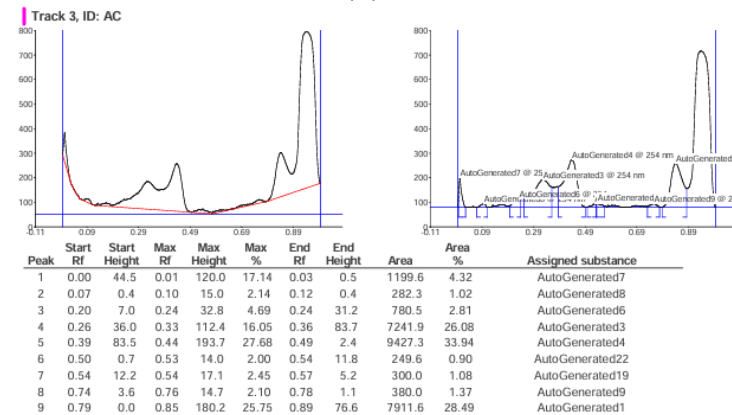
Track 1. Media tanpa perlakuan (K) ekstrak etil asetat cairan fermentasi



Track 2. Media tanpa perlakuan (K) ekstrak etil asetat biomassa



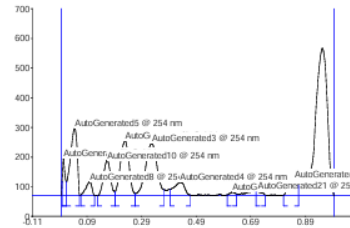
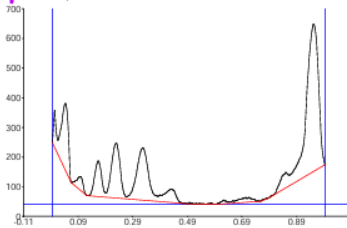
Track 3. Konsentrasi 0,25% (A) ekstrak etil asetat cairan fermentasi





## Track 4. Konsentrasi 0,25% (A) ekstrak etil asetat biomassa

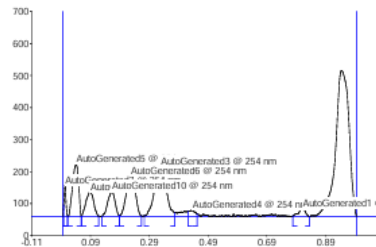
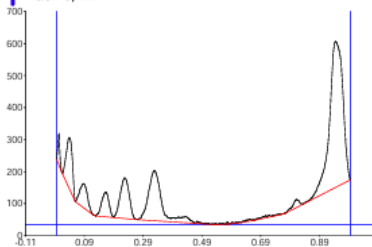
Track 4, ID: AB



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	48.0	0.01	124.6	12.40	0.02	46.3	1141.0	4.15	AutoGenerated7
2	0.02	46.6	0.05	227.0	22.58	0.07	2.2	5523.7	20.11	AutoGenerated5
3	0.07	2.4	0.10	46.6	4.63	0.12	0.8	1018.4	3.71	AutoGenerated8
4	0.13	0.6	0.17	119.5	11.88	0.20	13.1	2991.7	10.89	AutoGenerated10
5	0.20	13.7	0.23	185.0	18.41	0.27	6.9	5708.3	20.78	AutoGenerated6
6	0.27	6.9	0.33	176.1	17.52	0.38	20.5	7217.3	26.27	AutoGenerated3
7	0.40	21.2	0.43	45.4	4.52	0.47	2.4	1733.3	6.31	AutoGenerated4
8	0.61	2.5	0.63	12.7	1.26	0.64	4.5	234.5	0.85	AutoGenerated23
9	0.71	12.6	0.72	15.6	1.56	0.75	1.7	298.8	1.09	AutoGenerated21
10	0.82	2.1	0.85	52.7	5.24	0.87	35.2	1605.4	5.84	AutoGenerated1

## Track 5. Konsentrasi 0,5% (B) ekstrak etil asetat biomassa

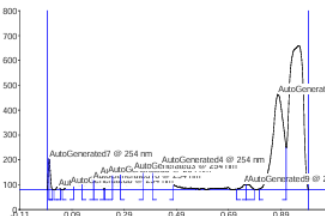
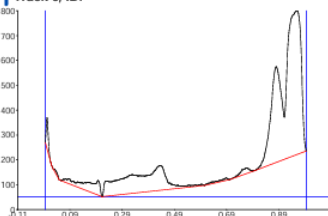
Track 5, ID:



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	35.3	0.01	97.3	13.21	0.02	2.5	603.4	3.28	AutoGenerated7
2	0.02	0.0	0.05	160.8	21.83	0.06	0.6	3254.3	17.67	AutoGenerated5
3	0.06	0.9	0.09	75.4	10.23	0.12	1.4	1933.1	10.50	AutoGenerated8
4	0.13	0.1	0.17	76.6	10.40	0.19	3.6	1864.6	10.13	AutoGenerated10
5	0.19	3.1	0.23	126.5	17.17	0.27	2.1	3786.7	20.56	AutoGenerated6
6	0.28	2.4	0.33	156.1	21.19	0.38	10.9	6005.4	32.61	AutoGenerated3
7	0.43	15.9	0.44	18.7	2.53	0.46	7.8	408.1	2.22	AutoGenerated4
8	0.78	1.3	0.82	25.3	3.44	0.84	0.3	558.1	3.03	AutoGenerated1

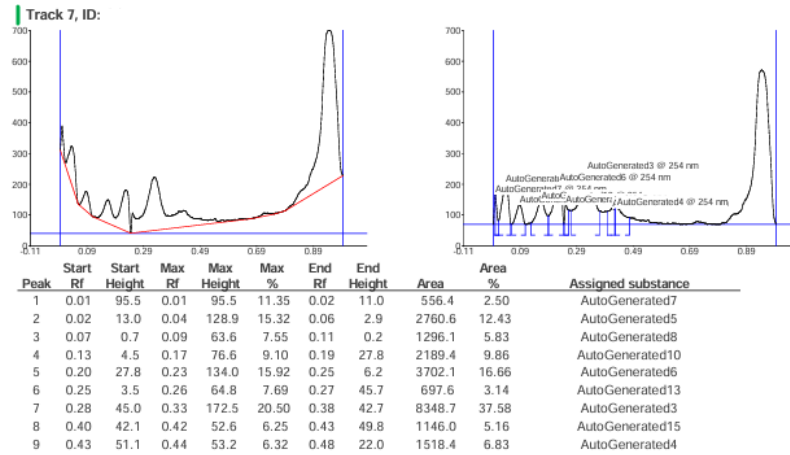
## Track 6. Konsentrasi 0,5% (B) ekstrak etil asetat cairan fermentasi

Track 6, ID:

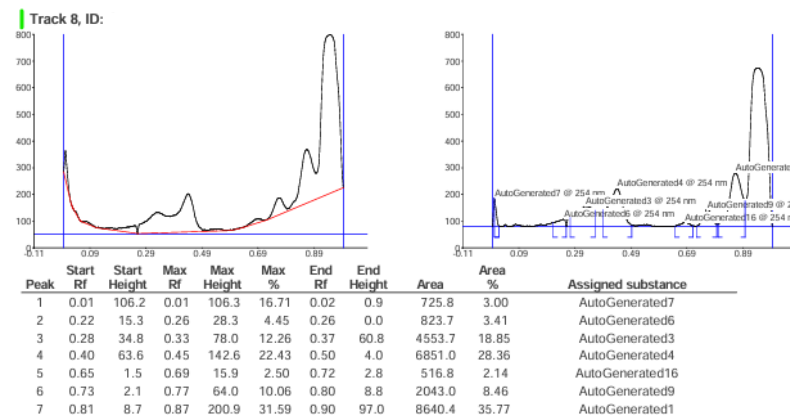


Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	123.8	0.01	125.4	13.65	0.02	0.2	679.5	2.18	AutoGenerated7
2	0.03	0.3	0.04	11.6	1.26	0.05	0.3	140.1	0.45	AutoGenerated5
3	0.06	0.0	0.09	19.4	2.11	0.10	12.1	421.1	1.35	AutoGenerated8
4	0.13	21.2	0.17	37.6	4.10	0.18	37.4	1124.3	3.61	AutoGenerated10
5	0.18	36.6	0.20	58.8	6.41	0.22	1.9	1309.6	4.20	AutoGenerated14
6	0.22	2.7	0.23	60.9	6.63	0.25	56.3	1304.3	4.18	AutoGenerated6
7	0.28	60.1	0.33	75.8	8.25	0.37	66.5	4925.7	15.80	AutoGenerated3
8	0.40	66.9	0.44	99.6	10.84	0.48	18.9	4645.3	14.90	AutoGenerated4
9	0.72	2.0	0.75	22.8	2.48	0.76	20.5	347.6	1.12	AutoGenerated17
10	0.76	20.7	0.77	21.9	2.39	0.79	2.6	396.7	1.27	AutoGenerated9
11	0.81	2.6	0.88	384.7	41.89	0.92	169.9	15875.5	50.93	AutoGenerated1

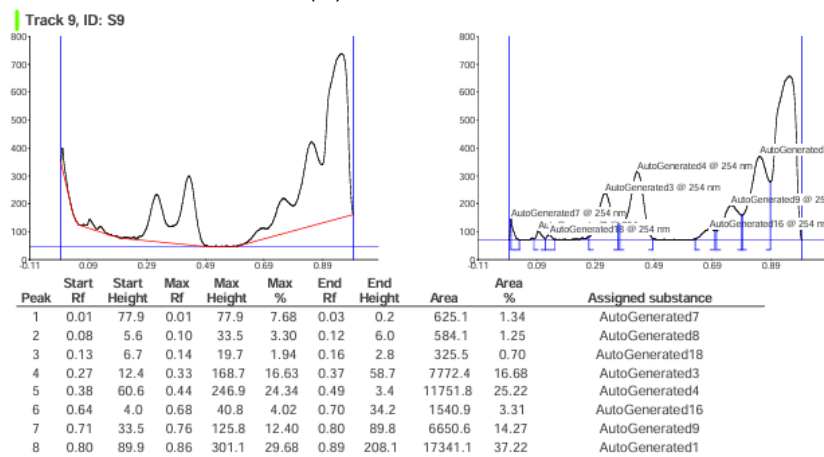
## Track 7. Konsentrasi 1% (C) ekstrak etil asetat biomassa



## Track 8. Konsentrasi 1% (C) ekstrak etil asetat cairan fermentasi

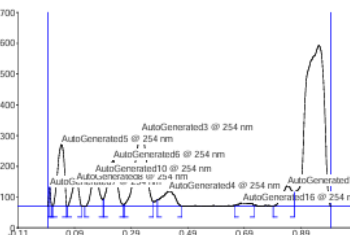
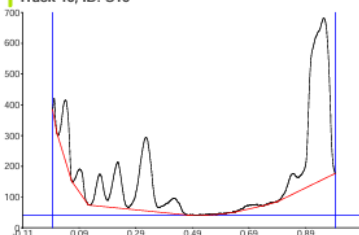


## Track 9. Konsentrasi 2% (D) ekstrak etil asetat cairan fermentasi



## Track 10. Konsentrasi 2% (D) ekstrak etil asetat biomassa

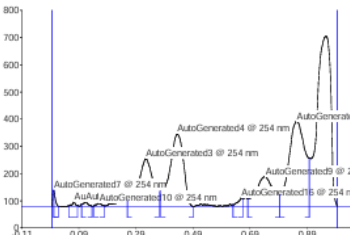
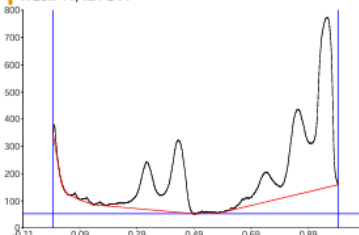
Track 10, ID: S10



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	64.1	0.01	64.1	6.65	0.01	2.0	211.9	0.75	AutoGenerated7
2	0.02	1.5	0.05	201.4	20.87	0.07	4.3	4535.0	15.98	AutoGenerated5
3	0.07	0.3	0.10	78.6	8.14	0.12	0.4	1781.2	6.28	AutoGenerated8
4	0.13	0.1	0.17	103.8	10.76	0.20	21.7	2749.1	9.69	AutoGenerated10
5	0.20	22.8	0.23	149.8	15.52	0.27	4.5	4518.6	15.92	AutoGenerated6
6	0.27	5.2	0.33	238.3	24.69	0.37	14.8	9548.1	33.65	AutoGenerated3
7	0.39	20.6	0.43	49.9	5.17	0.47	1.3	2217.6	7.81	AutoGenerated4
8	0.66	2.6	0.69	12.8	1.32	0.73	3.0	523.3	1.84	AutoGenerated16
9	0.80	0.0	0.85	66.4	6.88	0.87	45.6	2292.5	8.08	AutoGenerated1

## Track 11. Konsentrasi 4% (E) ekstrak etil asetat cairan fermentasi

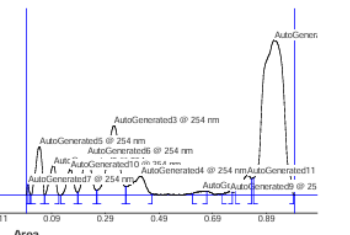
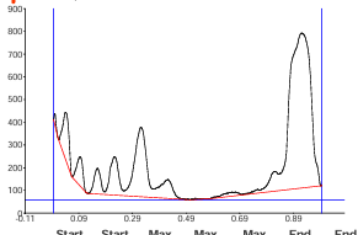
Track 11, ID: S11



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	61.0	0.01	61.0	6.10	0.02	0.4	320.7	0.69	AutoGenerated7
2	0.06	2.2	0.08	16.9	1.69	0.09	2.7	193.4	0.42	AutoGenerated20
3	0.10	7.3	0.12	16.3	1.63	0.14	0.1	268.0	0.58	AutoGenerated8
4	0.15	2.0	0.17	12.2	1.22	0.18	2.4	198.7	0.43	AutoGenerated10
5	0.26	20.6	0.33	175.0	17.50	0.38	55.8	8554.8	18.43	AutoGenerated3
6	0.38	57.4	0.44	265.3	26.53	0.50	0.0	12490.1	26.91	AutoGenerated4
7	0.63	5.6	0.66	31.5	3.15	0.67	28.2	522.5	1.13	AutoGenerated16
8	0.69	28.2	0.75	109.3	10.93	0.80	43.5	6481.8	13.97	AutoGenerated9
9	0.80	43.8	0.86	312.5	31.25	0.90	176.3	17376.1	37.44	AutoGenerated1

## Track 12. Konsentrasi 4% (E) ekstrak etil asetat biomassa

Track 12, ID: S12

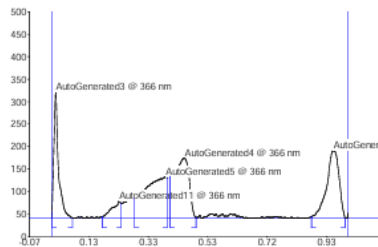
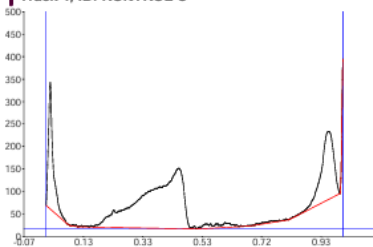


Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	48.9	0.01	48.9	2.63	0.01	1.1	178.7	0.20	AutoGenerated7
2	0.02	1.7	0.05	213.3	11.44	0.07	1.1	4715.4	5.40	AutoGenerated5
3	0.07	0.3	0.10	129.0	6.92	0.12	0.1	2853.1	3.26	AutoGenerated8
4	0.13	0.1	0.16	112.3	6.03	0.19	11.6	2740.1	3.13	AutoGenerated10
5	0.19	11.9	0.23	169.0	9.07	0.26	21.2	5308.1	6.07	AutoGenerated6
6	0.26	21.3	0.33	305.2	16.37	0.37	36.8	12995.7	14.87	AutoGenerated3
7	0.37	37.0	0.43	83.4	4.47	0.47	3.8	4038.5	4.62	AutoGenerated4
8	0.62	6.0	0.66	17.7	0.95	0.67	14.9	624.0	0.71	AutoGenerated16
9	0.73	3.7	0.76	16.7	0.90	0.77	13.1	349.4	0.40	AutoGenerated9
10	0.78	16.1	0.82	86.5	4.64	0.84	71.0	2882.1	3.30	AutoGenerated11
11	0.85	75.3	0.93	681.8	36.58	1.00	0.2	50717.5	58.03	AutoGenerated1

## Lampiran 4b. Gelombang 366 nm

Track 1. Media tanpa perlakuan (K) ekstrak etil asetat cairan fermentasi

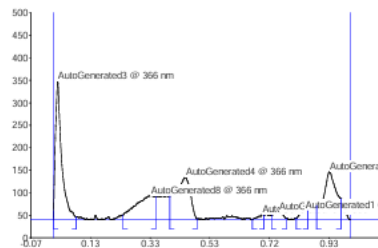
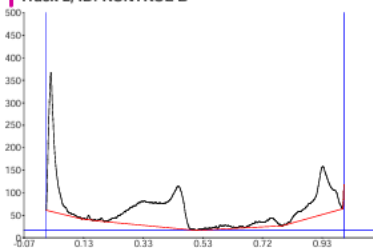
Track 1, ID: KONTROL C



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	15.0	0.01	281.3	40.30	0.07	0.0	4326.2	16.92	AutoGenerated3
2	0.17	4.2	0.23	38.8	5.56	0.23	33.3	1155.8	4.52	AutoGenerated11
3	0.28	44.1	0.38	92.5	13.25	0.39	91.2	6946.9	27.17	AutoGenerated5
4	0.40	93.7	0.45	134.7	19.29	0.49	2.3	6881.9	26.92	AutoGenerated4
5	0.88	3.8	0.95	150.8	21.61	0.99	0.7	6253.7	24.46	AutoGenerated2

Track 2. Media tanpa perlakuan (K) ekstrak etil asetat biomassa

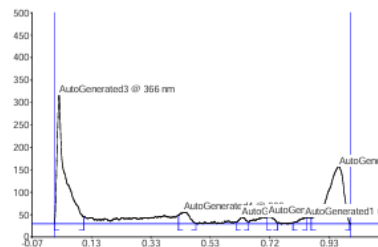
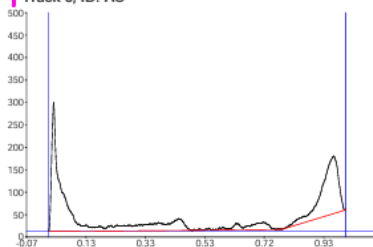
Track 2, ID: KONTROL B



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	19.7	0.02	308.8	50.13	0.08	6.2	6372.5	31.21	AutoGenerated3
2	0.23	10.4	0.33	54.0	8.76	0.34	52.0	3479.1	17.04	AutoGenerated8
3	0.39	52.8	0.45	94.1	15.28	0.48	2.2	4736.2	23.19	AutoGenerated4
4	0.67	1.4	0.70	12.9	2.09	0.71	10.1	234.1	1.15	AutoGenerated15
5	0.73	10.1	0.76	18.5	3.00	0.78	3.3	570.5	2.79	AutoGenerated7
6	0.82	3.5	0.85	21.4	3.48	0.85	20.3	505.4	2.47	AutoGenerated1
7	0.89	31.4	0.93	106.3	17.26	0.97	46.8	4523.0	22.15	AutoGenerated2

Track 3. Konsentrasi 0,25% (A) ekstrak etil asetat cairan fermentasi

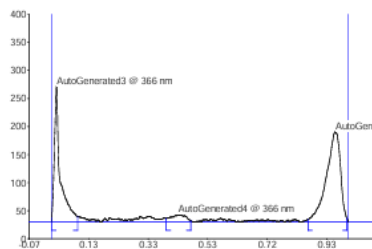
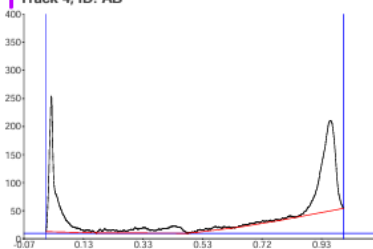
Track 3, ID: AC



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	5.0	0.02	288.1	58.95	0.10	15.7	7606.9	46.77	AutoGenerated3
2	0.42	18.6	0.44	26.5	5.42	0.48	0.8	854.5	5.25	AutoGenerated4
3	0.61	3.3	0.63	15.2	3.11	0.66	3.9	327.7	2.01	AutoGenerated19
4	0.72	13.6	0.72	17.0	3.49	0.75	1.9	357.1	2.20	AutoGenerated18
5	0.80	1.8	0.85	13.9	2.84	0.85	12.7	335.3	2.06	AutoGenerated1
6	0.87	12.4	0.96	128.0	26.20	1.00	0.1	6781.8	41.70	AutoGenerated2

## Track 4. Konsentrasi 0,25% (A) ekstrak etil asetat biomassa

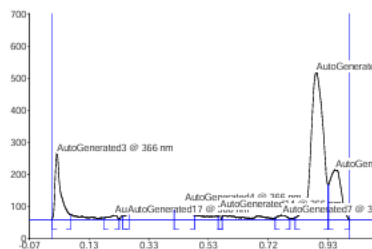
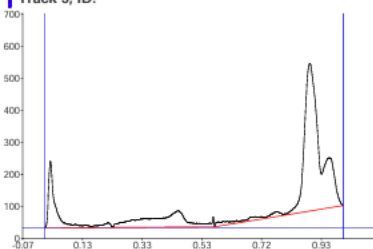
Track 4, ID: AB



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	7.5	0.02	241.4	58.18	0.09	9.8	4717.6	36.61	AutoGenerated3
2	0.39	6.3	0.43	12.9	3.12	0.47	2.5	657.3	5.10	AutoGenerated4
3	0.86	4.2	0.96	160.6	38.70	1.00	6.7	7509.5	58.28	AutoGenerated2

## Track 5. Konsentrasi 0,5% (B) ekstrak etil asetat biomassa

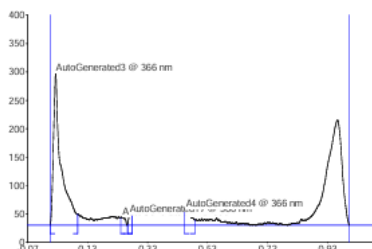
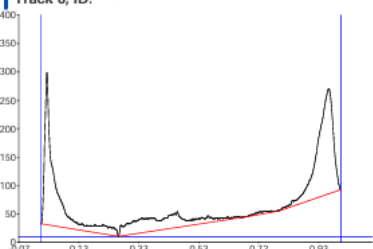
Track 5, ID:



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	5.1	0.02	207.2	21.90	0.06	14.9	3904.6	12.50	AutoGenerated3
2	0.17	5.7	0.21	14.6	1.54	0.23	2.1	401.7	1.29	AutoGenerated11
3	0.24	10.8	0.25	15.9	1.68	0.26	14.9	243.7	0.78	AutoGenerated17
4	0.41	29.7	0.45	50.2	5.31	0.48	13.3	2153.5	6.89	AutoGenerated4
5	0.56	9.5	0.56	30.0	3.17	0.57	7.4	163.7	0.52	AutoGenerated14
6	0.75	5.4	0.77	14.5	1.53	0.80	3.3	433.1	1.39	AutoGenerated7
7	0.82	6.1	0.89	458.4	48.45	0.93	108.4	18207.8	58.30	AutoGenerated1
8	0.93	109.4	0.95	155.2	16.41	1.00	1.7	5724.5	18.33	AutoGenerated2

## Track 6. Konsentrasi 0,5% (B) ekstrak etil asetat cairan fermentasi

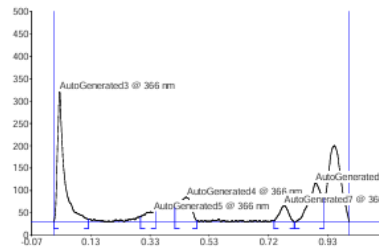
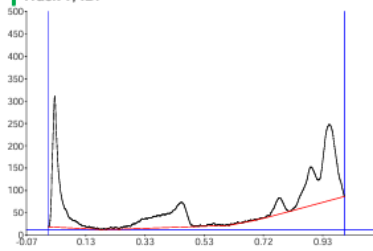
Track 6, ID:



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	2.5	0.02	268.1	81.34	0.09	19.2	6692.0	87.92	AutoGenerated3
2	0.24	12.5	0.24	14.8	4.50	0.26	0.1	204.0	2.68	AutoGenerated11
3	0.26	2.0	0.27	18.8	5.72	0.27	16.1	200.9	2.64	AutoGenerated17
4	0.45	22.4	0.45	27.8	8.45	0.48	9.0	514.8	6.76	AutoGenerated4

## Track 7. Konsentrasi 1% (C) ekstrak etil asetat biomassa

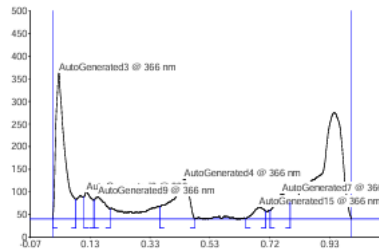
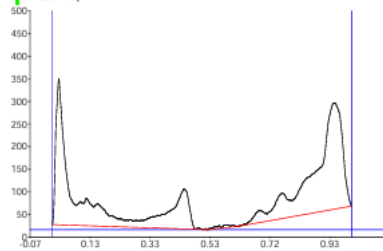
Track 7, ID:



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	1.4	0.02	292.5	59.26	0.12	5.5	6596.7	45.74	AutoGenerated3
2	0.29	11.2	0.34	23.4	4.75	0.34	23.1	840.3	5.83	AutoGenerated5
3	0.41	31.5	0.45	55.1	11.16	0.48	3.2	2357.8	16.35	AutoGenerated4
4	0.75	2.2	0.78	36.0	7.30	0.81	0.3	1067.0	7.40	AutoGenerated7
5	0.82	0.2	0.89	86.5	17.53	0.91	52.6	3560.3	24.69	AutoGenerated1

## Track 8. Konsentrasi 1% (C) ekstrak etil asetat cairan fermentasi

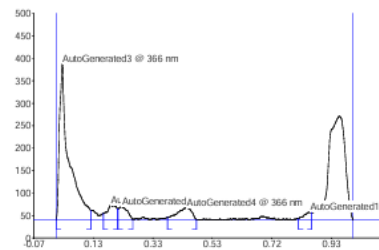
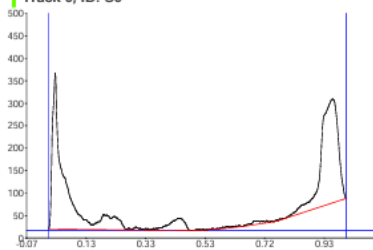
Track 8, ID:



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	6.1	0.02	322.2	53.40	0.08	43.6	9393.5	45.41	AutoGenerated3
2	0.10	49.3	0.11	60.4	10.01	0.14	41.6	1474.6	7.13	AutoGenerated6
3	0.14	41.7	0.15	49.6	8.22	0.19	22.3	1757.6	8.50	AutoGenerated9
4	0.36	27.6	0.44	88.5	14.67	0.48	0.4	4763.8	23.03	AutoGenerated4
5	0.65	0.9	0.69	26.7	4.43	0.71	17.6	915.9	4.43	AutoGenerated15
6	0.73	19.2	0.77	56.0	9.27	0.79	36.7	2378.8	11.50	AutoGenerated7

## Track 9. Konsentrasi 2% (D) ekstrak etil asetat cairan fermentasi

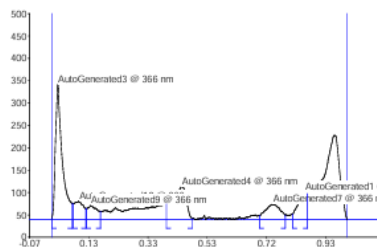
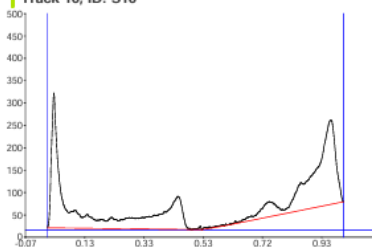
Track 9, ID: S9



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	4.1	0.02	347.2	76.16	0.12	21.2	10945.4	74.24	AutoGenerated3
2	0.16	14.6	0.18	33.7	7.39	0.21	25.4	1084.8	7.36	AutoGenerated13
3	0.21	25.5	0.22	29.9	6.56	0.26	1.5	885.0	6.00	AutoGenerated11
4	0.38	5.8	0.44	27.3	5.98	0.47	1.3	1366.9	9.27	AutoGenerated4
5	0.82	3.1	0.85	17.8	3.91	0.86	17.5	460.3	3.12	AutoGenerated1

## Track 10. Konsentrasi 2% (D) ekstrak etil asetat biomassa

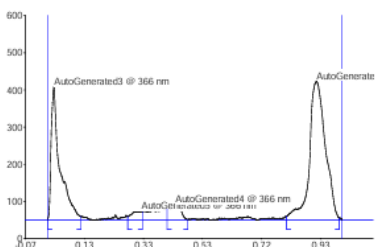
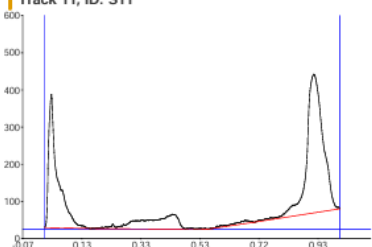
Track 10, ID: S10



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	4.1	0.02	301.5	55.66	0.07	34.9	6877.0	42.97	AutoGenerated3
2	0.07	34.8	0.09	40.3	7.44	0.12	24.5	1273.4	7.96	AutoGenerated10
3	0.12	24.3	0.13	30.9	5.70	0.17	17.6	1009.4	6.31	AutoGenerated9
4	0.39	33.8	0.44	73.5	13.58	0.48	1.8	3352.4	20.95	AutoGenerated4
5	0.70	8.4	0.75	33.9	6.25	0.79	9.5	1684.9	10.53	AutoGenerated7
6	0.81	11.8	0.86	61.6	11.37	0.87	57.4	1808.5	11.30	AutoGenerated1

## Track 11. Konsentrasi 4% (E) ekstrak etil asetat cairan fermentasi

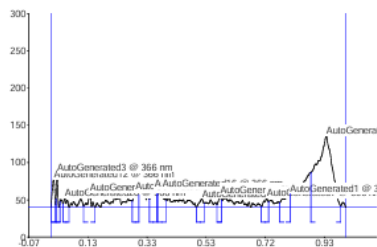
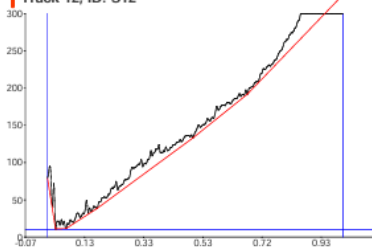
Track 11, ID: S11



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	2.3	0.02	358.4	45.13	0.11	8.8	10532.5	31.92	AutoGenerated3
2	0.27	9.0	0.32	22.4	2.82	0.32	21.5	799.7	2.42	AutoGenerated5
3	0.41	28.7	0.43	40.0	5.03	0.48	0.7	1623.8	4.92	AutoGenerated4
4	0.81	9.3	0.91	373.5	47.02	0.99	5.4	20040.3	60.74	AutoGenerated2

## Track 12. Konsentrasi 4% (E) ekstrak etil asetat biomassa

Track 12, ID: S12



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.00	5.2	0.01	37.5	11.05	0.02	3.6	305.7	3.96	AutoGenerated12
2	0.02	11.7	0.02	46.7	13.73	0.03	7.9	224.7	2.91	AutoGenerated3
3	0.04	5.0	0.05	12.2	3.60	0.06	0.2	128.9	1.67	AutoGenerated20
4	0.11	2.5	0.13	19.9	5.86	0.15	0.5	213.7	2.77	AutoGenerated9
5	0.28	9.0	0.29	20.7	6.10	0.30	17.0	334.7	4.34	AutoGenerated5
6	0.33	11.4	0.35	24.3	7.14	0.36	18.2	372.3	4.82	AutoGenerated8
7	0.36	18.1	0.38	24.7	7.26	0.39	9.8	426.9	5.53	AutoGenerated16
8	0.49	0.3	0.51	11.3	3.34	0.52	5.8	149.8	1.94	AutoGenerated21
9	0.56	3.9	0.57	16.8	4.94	0.58	9.9	159.1	2.06	AutoGenerated14
10	0.71	1.2	0.73	11.8	3.46	0.74	8.3	169.1	2.19	AutoGenerated7
11	0.77	6.4	0.81	18.3	5.39	0.81	18.1	420.8	5.45	AutoGenerated1
12	0.88	47.2	0.93	95.7	28.15	0.98	2.1	4813.5	62.36	AutoGenerated2

**Lampiran 4. Dokumentasi penelitian**

**Gambar 11.** Inokulasi isolat ke medium starter



**Gambar 12.** Inokulasi starter ke media produksi



**Gambar 13.** Sentrifugasi hasil fermentasi



**Gambar 14.** Ekstraksi cair-cair



**Gambar 15.** Penguapan ekstrak



**Gambar 16.** Uji KLT