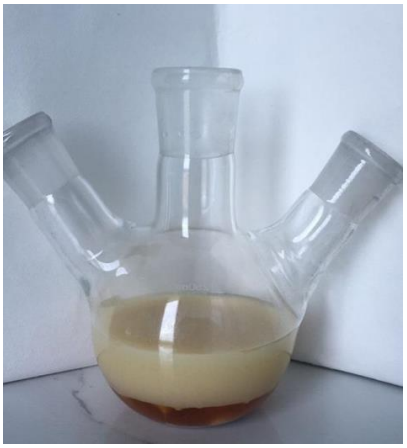
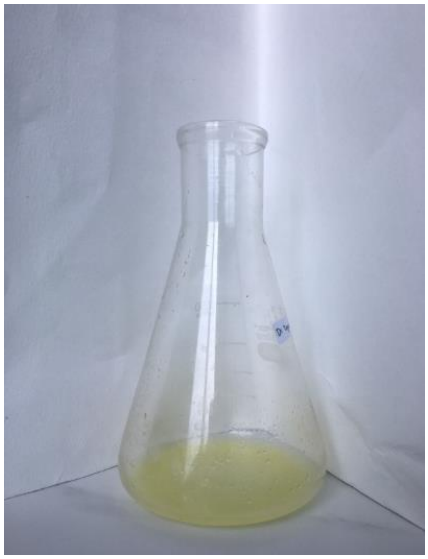
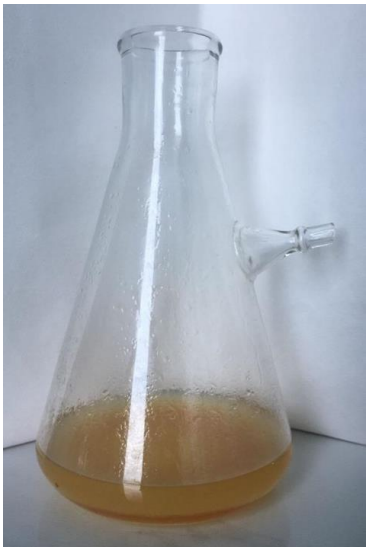
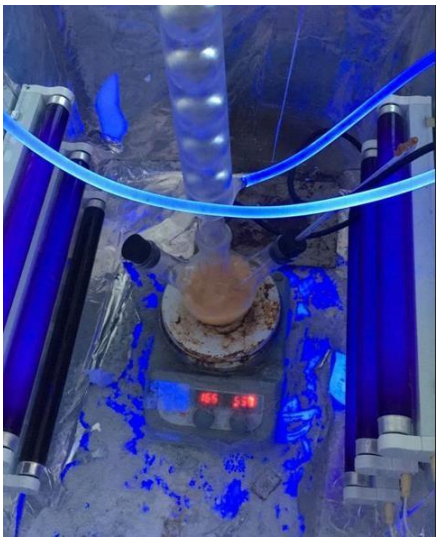
LAMPIRAN

A. Dokumemtasi Penelitian










500ml
PYREX
GLASS

B. Perhitungan

Menghitung %FFA

N NaOH = 0,1M
BM Asam lemak = 856 gr/mol
Massa minyak = 4 gram
V NaOH = 0,6 mL

$$\%FFA = \frac{\text{NaOH x n NaOH x BM Asam Lemak Beb}}{\text{(Berat Sampel x 1000) x 100\%}}$$

$$\%FFA = \frac{0{,}6 \times 0{,}1 \times 856}{(4 \times 1000)\ 100\%}$$

%FFA = 1,28%

Menghitung Rasio Umpan

Rasio molar = 1:10
Massa Minyak Jelantah = 80 gram

Mol minyak jelantah = $\frac{massa\ minyak\ jelantah}{BM\ minyak\ jelantah}$

$= \frac{80\ g}{856\ g/mol}$

= 0,09346 mol

Mol metanol = $10\ x\ mol\ minyak\ jelantah$

= $10\ x$ 0,011682
= 0,93458 mol

Massa metanol = $mol\ metanol\ x\ BM\ metanol$

= 0,93458 mol x 32,04 g/mol
= 29,9439 g

Volume metanol = $\frac{massa\ metanol \rho}{metanol}$

= 3,742913 g / 0,7915 g/mL
= 37,8319 mL

Katalis	
2wt%	1,6 g
3wt%	2,4 g
4wt%	3,2 g

Rasio molar = 1:12
Massa Minyak Jelantah = 80 gram

Katalis

Mol minyak jelantah = $\frac{massa\ minyak\ jelantah}{BM\ minyak\ jelantah}$

2wt%	1,6 g
3wt%	2,4 g
4wt%	3,2 g

= $\frac{80\ g}{856\ g/mol}$

= 0,09346 mol

Mol metanol = $12\ x\ mol\ minyak\ jelantah$

= 12 x 0,011682

= 1,1215 mol

Massa metanol = $mol\ metanol\ x\ BM\ metanol$

= 1,1215 mol x 32,04 g/mol

= 35,9327 g

Volume metanol = $\frac{massa\ metanol}{metanol}\rho$

= 35,9327 g / 0,7915 g/mL

= 45,3982 mL

Rasio molar = 1:14

Massa Minyak Jelantah = 80 gram

Katalis

Mol minyak jelantah = $\frac{massa\ minyak\ jelantah}{BM\ minyak\ jelantah}$

2wt%	1,6 g
3wt%	2,4 g
4wt%	3,2 g

= $\frac{80\ g}{856\ g/mol}$

= 0,09346 mol

Mol metanol = $14\ x\ mol\ minyak\ jelantah$

= 14 x 0,011682

= 1,30841 mol

Massa metanol = $mol\ metanol\ x\ BM\ metanol$

= 1,30841 mol x 32,04 g/mol

= 41,9215 g

Volume metanol = $\frac{massa\ metanol}{metanol}\rho$

= 41,9215 g / 0,7915 g/mL

= 52,9646 mL

UJI KARAKTERISTIK BIODIESEL

				Densitas 850-890 (kg/m3)			Visjositas 2,4 - 6 cst									
NO	SAMPEL	Jumlah Katalis	WAKTU	M Biodiesel + piknometer	M piknometer kosong	V piknometer (gram)	DENSITAS (Kg/l)	M Bidiesel	YIELD	VISKOSITAS	waktu 1	waktu 2	average	V Biodiesel awal	V Biodiesel akhir	Kadar Air (%)
1	1:10	2wt%	3 jam	20.846	12.159	10	0.869	71.096	88.87	5.0568525	10.22	10.15	10.185	81.885	81.842	0.053
2		3wt%		20.917	12.137		0.878	70.469	88.09	5.049405	10.15	10.19	10.17	80.298	80.261	0.046
3		4wt%		20.952	12.14		0.881	67.494	84.37	5.38206	10.96	10.72	10.84	76.638	76.601	0.048
4	1:12	2wt%	3 jam	20.72	12.127		0.859	72.148	90.19	5.2653825	10.62	10.59	10.605	84.002	83.961	0.048
5		3wt%		20.883	12.138		0.875	71.004	88.76	5.4689475	11.09	10.94	11.015	81.233	81.194	0.048
6		4wt%		20.954	12.17		0.878	69.975	87.47	4.7738475	9.21	10.02	9.615	79.705	79.662	0.054
7	1:14	2wt%	3 jam	20.926	12.17		0.876	72.881	91.10	4.443675	8.7	9.2	8.95	83.275	83.235	0.047
8		3wt%		20.851	12.135		0.872	71.329	89.16	5.0643	10.46	9.94	10.2	81.874	81.837	0.045
9		4wt%		20.826	12.156		0.867	70.811	88.51	4.523115	8.8	9.42	9.11	81.714	81.674	0.049
10	1:14 (Reusability 1)	2wt%	3 jam	20.851	12.16		0.869	72.683	90.85	5.01465	9.97	10.23	10.1	83.671	83.630	0.049
11	1:14 (Reusability 2)	2wt%		20.796	12.135		0.866	69.946	87.43	5.0816775	10.05	10.42	10.235	80.796	80.760	0.045
12	1:14 (Tanpa sinar UV)	2wt%		20.853	12.121		0.873	69.567	86.96	5.158635	10.27	10.51	10.39	79.711	79.669	0.053

C. Lampiran Hasil Uji

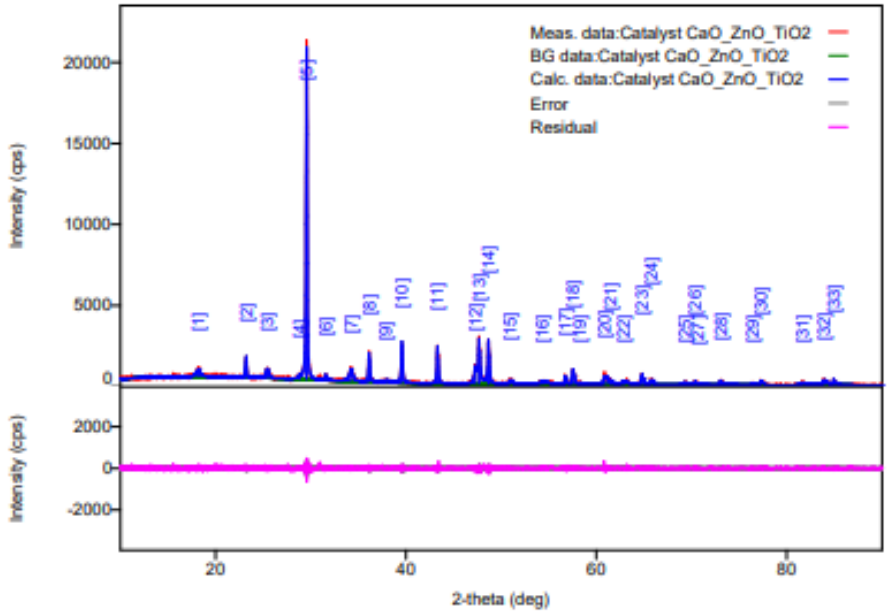
Uji XRD

Peak List

General information

Analysis date	2022/06/16 14:48:45		
Sample name		Measurement date	2022/06/16 14:25:01
File name	Catalyst CaO_ZnO_TiO2.ras	Operator	administrator
Comment			

Measurement profile



Peak list

No.	2-theta(deg)	d(ang.)	Height(cps)	FWHM(deg)	Int. I(cps deg)	Int. W(deg)	Asym. factor
1	18.23(2)	4.864(6)	284(49)	0.46(4)	188(14)	0.66(16)	2.6(6)
2	23.227(9)	3.8265(14)	933(88)	0.152(11)	182(7)	0.20(3)	3.4(14)
3	25.403(9)	3.5034(12)	395(57)	0.36(3)	178(11)	0.45(9)	0.7(3)
4	28.79(2)	3.098(2)	124(32)	0.18(7)	24(10)	0.20(13)	1(2)
5	29.564(3)	3.0191(3)	16060(366)	0.140(3)	3008(21)	0.187(6)	1.66(16)
6	31.57(3)	2.831(2)	272(48)	0.14(7)	74(9)	0.27(8)	1.8(14)
7	34.23(3)	2.618(2)	536(67)	0.40(3)	325(10)	0.61(9)	1.0(3)
8	36.120(8)	2.4847(6)	1480(111)	0.139(12)	308(8)	0.21(2)	1.3(4)
9	37.892(19)	2.3725(11)	124(32)	0.20(5)	48(6)	0.39(15)	0.5(7)
10	39.565(6)	2.2760(3)	2192(135)	0.138(8)	428(8)	0.195(16)	1.3(2)
11	43.310(6)	2.0874(3)	2064(131)	0.131(8)	378(8)	0.183(16)	1.2(2)
12	47.270(9)	1.9214(3)	813(82)	0.20(3)	274(28)	0.34(7)	1.1(2)
13	47.666(3)	1.90635(11)	2364(140)	0.146(10)	574(28)	0.24(3)	1.1(2)

14	48.666(7)	1.8695(3)	2366(140)	0.147(10)	532(11)	0.225(18)	1.2(3)
15	50.94(5)	1.7912(17)	176(38)	0.36(4)	77(7)	0.44(13)	0.8(5)
16	54.34(5)	1.6868(15)	112(31)	1.06(9)	151(9)	1.4(5)	0.71(11)
17	56.706(6)	1.62200(16)	493(64)	0.137(13)	87(4)	0.18(3)	0.71(11)
18	57.556(11)	1.6001(3)	838(84)	0.177(13)	209(6)	0.25(3)	1.0(3)
19	58.26(4)	1.5823(9)	106(30)	0.15(5)	23(4)	0.22(10)	1.3(18)
20	60.879(9)	1.5204(2)	367(55)	0.51(3)	231(10)	0.63(12)	0.67(16)
21	61.521(10)	1.5061(2)	226(43)	0.15(2)	41(5)	0.18(6)	0.67(16)
22	62.871(19)	1.4770(4)	149(35)	0.76(6)	139(7)	0.9(3)	0.67(16)
23	64.819(16)	1.4372(3)	580(70)	0.184(19)	168(6)	0.29(5)	1.6(8)
24	65.754(10)	1.41902(19)	276(48)	0.23(3)	87(5)	0.31(7)	0.5(3)
25	69.32(2)	1.3544(4)	150(35)	0.16(3)	37(4)	0.25(9)	1.0(7)
26	70.39(3)	1.3365(4)	161(37)	0.18(3)	39(14)	0.24(14)	3(2)
27	70.71(7)	1.3312(12)	45(19)	0.3(3)	20(14)	0.5(5)	3(2)
28	73.08(3)	1.2938(4)	256(46)	0.18(3)	57(5)	0.22(6)	2.2(18)
29	76.41(4)	1.2455(6)	110(30)	0.15(5)	25(4)	0.23(10)	0.6(9)
30	77.27(2)	1.2338(3)	262(47)	0.21(2)	66(5)	0.25(6)	0.6(3)
31	81.65(4)	1.1782(4)	130(33)	0.41(8)	113(7)	0.9(3)	0.8(4)
32	83.92(2)	1.1521(2)	261(47)	0.26(4)	124(6)	0.47(11)	1.0(4)
33	84.936(9)	1.14087(10)	336(53)	0.099(19)	71(4)	0.21(5)	1.3(6)

Hasil Uji GC-MS

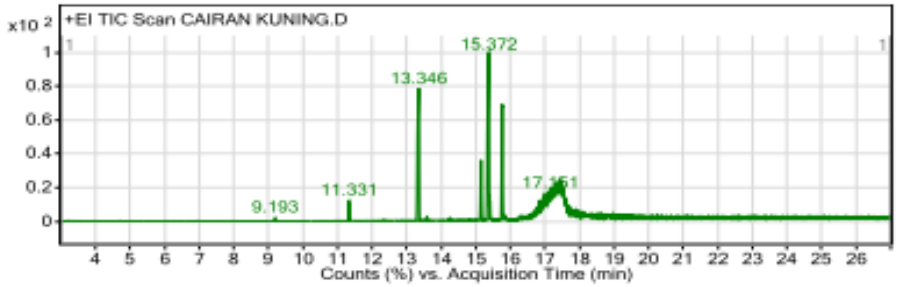
Qualitative Analysis Report

Data Filename	CAIRAN KUNING.D	**Sample Name**	CAIRAN KUNING
Sample Type		**Position**	4
Instrument Name	GCMSMS	**User Name**	
Acq Method	SCAN UMUM.M	**Acquired Time**	2/28/2023 1:15:29 PM
IRM Calibration Status	Not Applicable	**DA Method**	default.m
Comment			

Expected Barcode		**Sample Amount**	
Dual Inj Vol	1	**TuneName**	atunes.eiex.tune.xml
TunePath	D:\MassHunter\GCMS\1\7000\	**TuneDateStamp**	2023-01-27T16:45:03+07:00
MSFirmwareVersion	DSP: 7000.3509, qqqServer: G.7000.058-RUN	**OperatorName**	
RunCompletedFlag	True	**Acquisition SW Version**	MassHunter GC/MS Acquisition B.07.06.2704 18-Jul-2017 Copyright © 1989-2017 Agilent Technologies, Inc.

User Chromatograms

Fragmentor Voltage **Collision Energy** 0 **Ionization Mode** EI

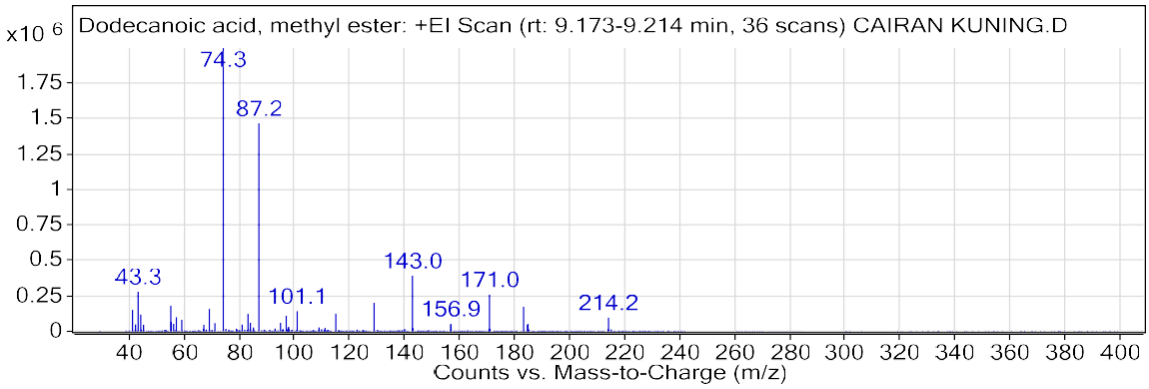


Integration Peak List

Peak	Start	RT	End	Height	Area	Area %
1	11.295	11.331	11.376	73851049.11	114766158.3	6.22
2	13.265	13.346	13.439	476334057.8	1534225158	83.18
3	13.548	13.583	13.621	15164622.78	22923072.35	1.24
4	15.101	15.148	15.246	217971379.6	441601975.7	23.94
5	15.291	15.372	15.396	603997706.2	1844369462	100
6	15.396	15.408	15.448	66068529.39	85067632.09	4.61
7	15.712	15.76	15.818	416774161.1	847123804.2	45.93
8	16.79	16.817	16.846	24005343.08	37330728.28	2.02
9	16.969	17.007	17.035	14921639.06	31483036.83	1.71
10	17.093	17.151	17.172	13894149.6	36701987.45	1.99

User Spectra

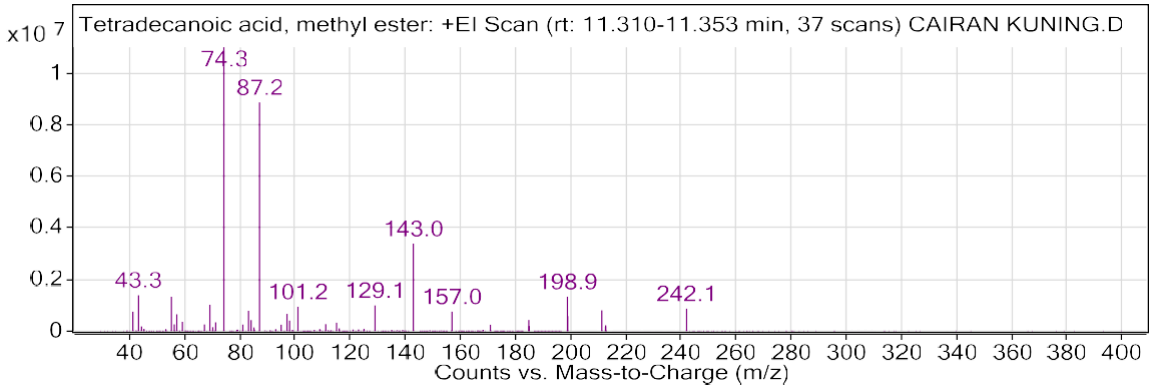
Spectrum Source	Collision Energy	Ionization Mode
Peak (1) in "+ TIC Scan"	0	EI



Peak List

m/z	Abund
41.3	151057.44
43.3	278888.91
55.2	181140.09
69.2	158086.16
74.3	1997905.75
87.2	1466957
129.1	200972.89
143	392153.72
171	259893.89
183.4	173814.38

Spectrum Source	Collision Energy	Ionization Mode
Peak (2) in "+ TIC Scan"	0	EI

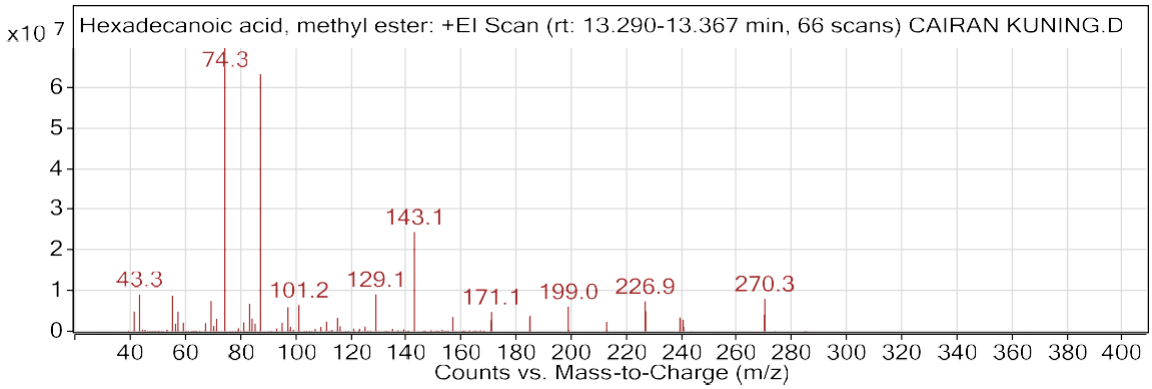


Peak List

m/z	Abund
43.3	1395576.88
55.2	1332030.13
69.2	1023771.13
74.3	11001987
87.2	8865398
101.2	948976.44
129.1	1002958.81
143	3391103.75
198.9	1338159.75
242.1	876043

Spectrum Source	Collision Energy	Ionization Mode
Peak (3) in "+ TIC Scan"	0	EI

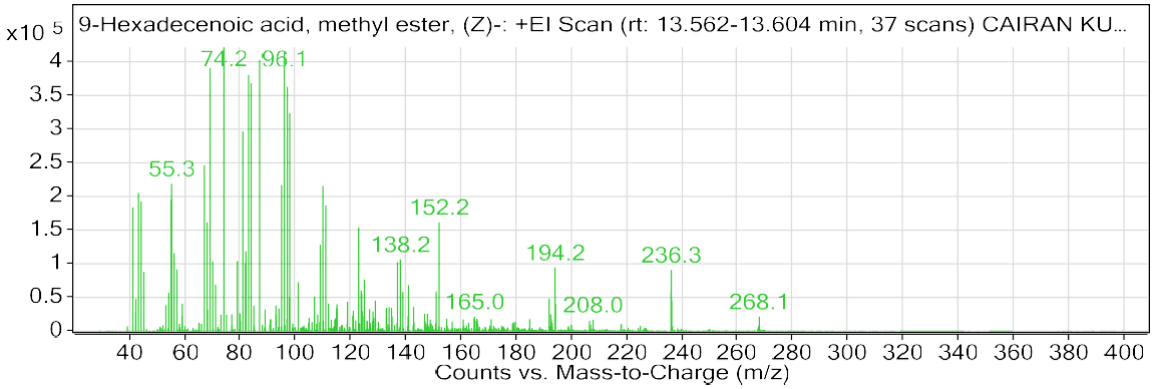
Qualitative Analysis Report



Peak List

m/z	Abund
43.3	9061694
55.3	8780220
69.3	7454313.5
74.3	69606856
83.3	6750670.5
87.2	63197360
129.1	9101602
143.1	24430880
226.9	7397401.5
270.3	8022612.5

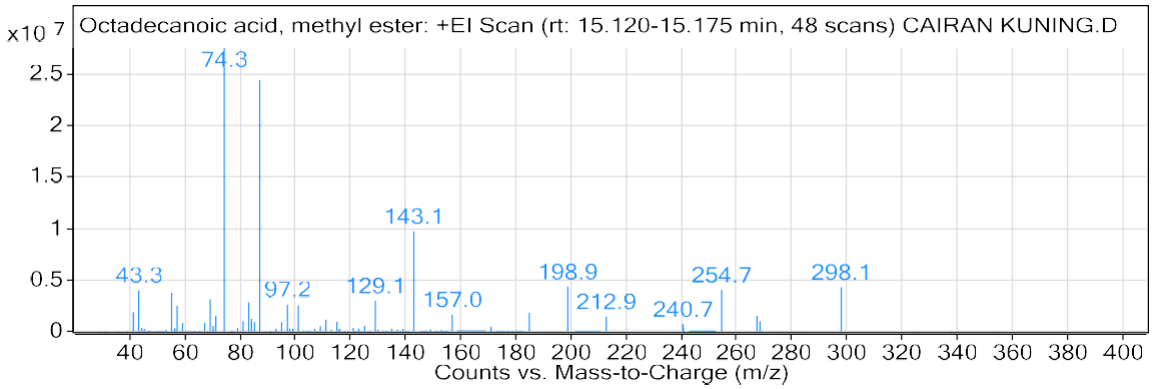
Spectrum Source	Collision Energy	Ionization Mode
Peak (4) in "+ TIC Scan"	0	EI



Peak List

m/z	Abund
67.2	246844.84
69.3	391652.66
74.2	422609.91
81.1	297337.09
83.2	381581.03
84.1	368970.44
87.2	403409.47
96.1	416752.53
97.3	363907.41
98.1	324328.06

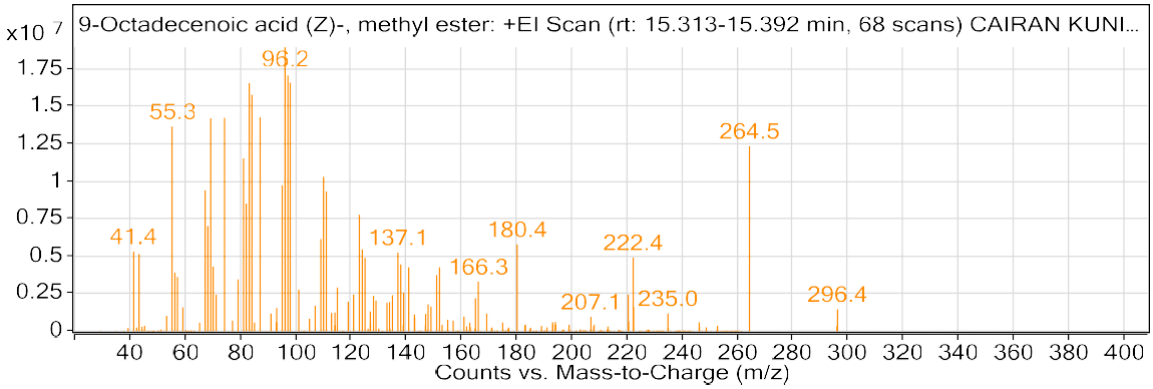
Spectrum Source	Collision Energy	Ionization Mode
Peak (5) in "+ TIC Scan"	0	EI



Peak List

m/z	Abund
43.3	3997941.75
55.2	3754465
69.2	3137346.25
74.3	27577608
87.2	24467498
129.1	2981968
143.1	9748784
198.9	4343644
254.7	4036673
298.1	4305293

Spectrum Source	Collision Energy	Ionization Mode
Peak (6) in "+ TIC Scan"	0	EI

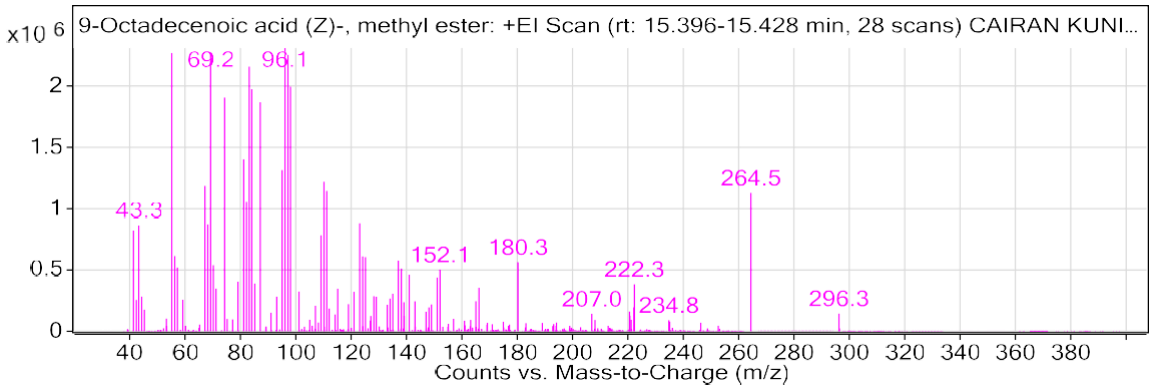


Peak List

m/z	Abund
55.3	13658623
69.3	14203953
74.3	14243675
83.3	16548045
84.2	15783500
87.2	14275727
96.2	18948128
97.3	17068960
98.1	16591524
264.5	12353006

Spectrum Source	Collision Energy	Ionization Mode
Peak (7) in "+ TIC Scan"	0	EI

Qualitative Analysis Report



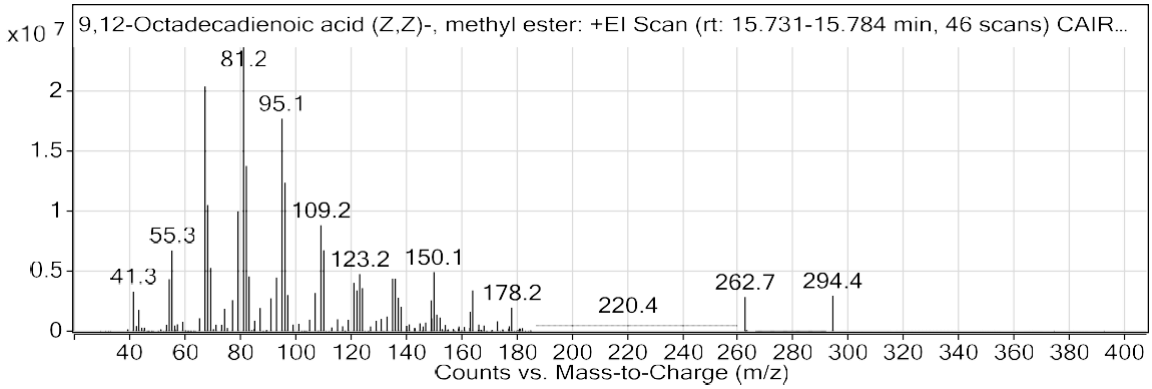
Peak List

m/z	Abund
55.2	2275936.5
69.2	2283709.25
74.3	1911552
81.2	1406669.38
83.2	2164958.75
84.1	1979380.25
87.2	1872344
96.1	2315343.25
97.2	2260328.25
98.1	1999728.63

Spectrum Source Peak (8) in "+ TIC Scan"

Collision Energy 0

Ionization Mode EI



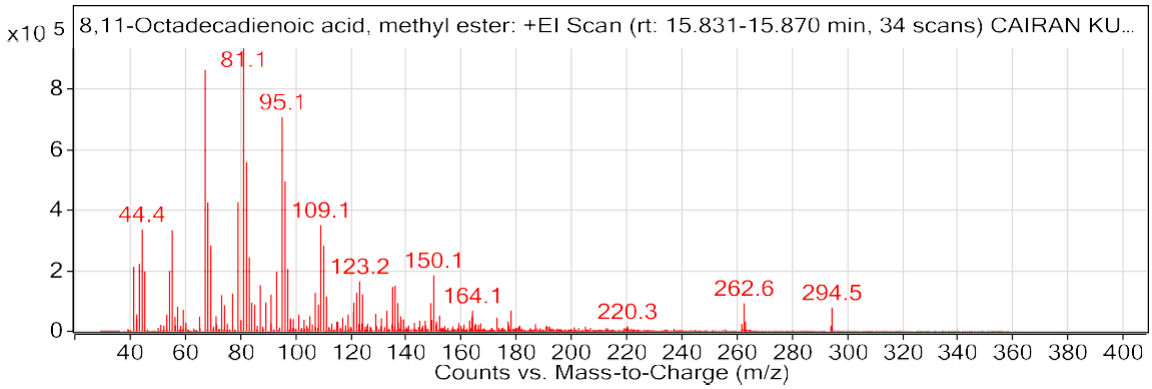
Peak List

m/z	Abund
55.3	6715946.5
67.3	20362672
68.2	10502789
79.2	9954805
81.2	23619718
82.2	13756033
95.1	17687088
96.2	12354425
109.2	8821226
110.2	6739884

Spectrum Source Peak (9) in "+ TIC Scan"

Collision Energy 0

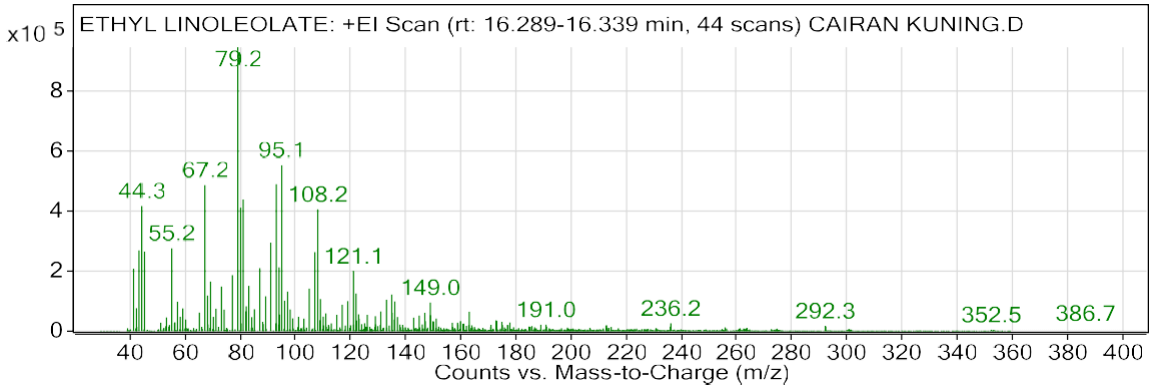
Ionization Mode EI



Peak List

m/z	Abund
44.4	337067.22
55.2	334655.25
67.2	866067.44
68.2	427499.06
79.1	428295.34
81.1	937489.44
82.2	560404.13
95.1	709587.19
96.2	497196.72
109.1	351996.75

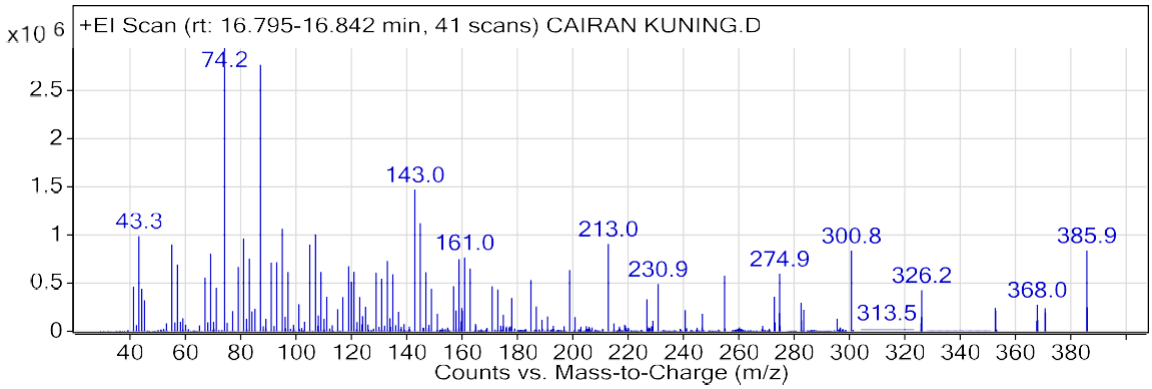
Spectrum Source	Collision Energy	Ionization Mode
Peak (10) in "+ TIC Scan"	0	EI



Peak List

m/z	Abund
44.3	417515.63
55.2	276523.78
67.2	487161.38
79.2	946510.63
80.2	411489.69
81.1	438877.91
91.1	294960.97
93.1	490349.72
95.1	553263.75
108.2	406618.69

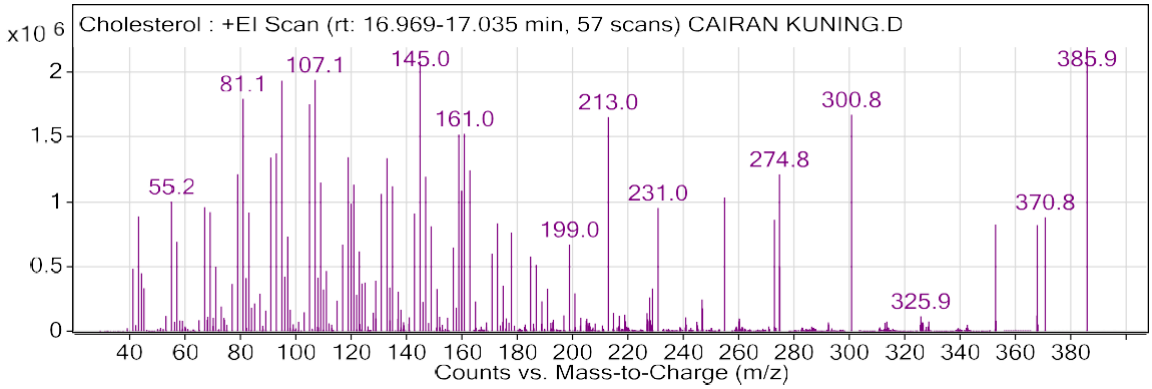
Spectrum Source	Collision Energy	Ionization Mode
Peak (11) in "+ TIC Scan"	0	EI



Peak List

m/z	Abund
43.3	989873.88
55.2	903365.44
74.2	2943954
81.1	965383.31
87.2	2771696
95.1	1066410.5
107.1	1006884.38
143	1473420.63
145	1125654.5
213	909384.31

Spectrum Source	Collision Energy	Ionization Mode
Peak (12) in "+ TIC Scan"	0	EI

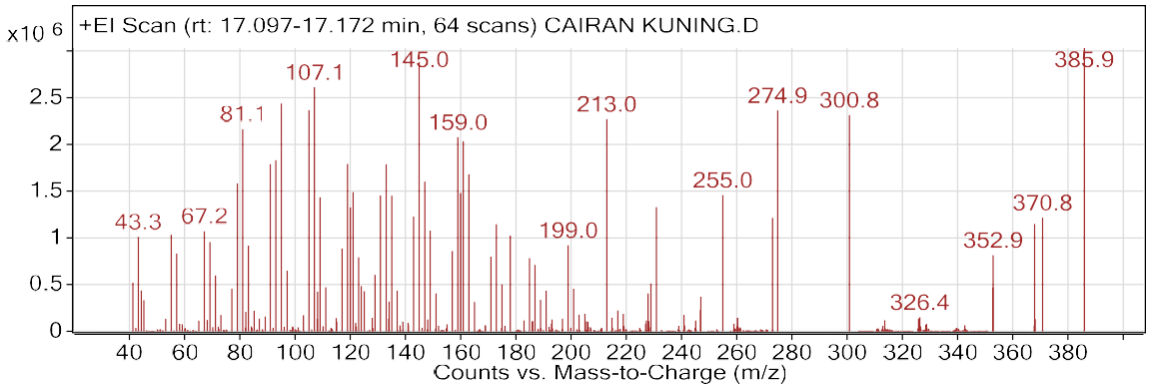


Peak List

m/z	Abund
81.1	1795264.38
95.1	1934950.13
105.1	1751857.13
107.1	1941301.88
145	2088469.88
159	1518228.38
161	1524937.5
213	1653916.13
300.8	1672265.5
385.9	2192341

Spectrum Source	Collision Energy	Ionization Mode
Peak (13) in "+ TIC Scan"	0	EI

Qualitative Analysis Report



Peak List

m/z	Abund
81.1	2169155
95.1	2444274.25
105.1	2374026.5
107.1	2618078.75
145	2890205.25
159	2082219.88
213	2277081.5
274.9	2369377
300.8	2320496.5
385.9	3037798.5

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