BAB VI

RINGKASAN

Mojo (*Aegle marmelos* L.) mengandung banyak senyawa kimia yang telah banyak diteliti dan mempunyai banyak aktivitas. Mojo digunakan pada bagian yang mengalami peradangan dan sangat manjur untuk bisul yang tidak sehat, daun muda dapat dimakan dan beberapa kejadian menyebabkan kemandulan atau aborsi, jus daun segar dapat digunakan sebagai tindakan pencahar dan keluhan asma, rebusan daun digunakan sebagai obat penurun panas (Hariana, 2007). Daun juga digunakan dalam abses, sakit punggung, gangguan perut, muntah, luka, basal, beri-beri, kelemahan jantung, kolera, diare, diabetes, luka yang disebabkan oleh hewan, gangguan saraf (George, 2003).

Buah mojo dapat dimakan langsung atau dibuat serbat, sirup dan nektar buah dan digunakan sebagai obat disentri kronis, diare, dan sembelit. Kulit batang mojo dimanfaatkan untuk mengobati demam, digunakan untuk meracuni ikan. Kulit batang ini juga digunakan dalam gigitan anjing, masalah lambung, gangguan jantung, rematik. Akar mojo digunakan sebagai obat penenang obat debar jantung, gangguan pencernaan dan bengkak lambung (Veerappen, 2000).

Penelitian ini bertujuan untuk mengetahui senyawa aktif dari Aegle marmelos L. yang mempunyai aktivitas imunomodulator yang dapat meningkatkan fagositosis sel makrofag dan proliferasi sel limfosit. Penelitian ini merupakan lanjutan dari penelitian terdahulu mengenai tumbuhan mojo. Smplisia kering kulit batang dari tumbuhan mojo diambil dari daerah Sebulu, Kutai

Kartanegara, Kalimantan Timur yang diambil secara acak, dengan kondisi kering dan telah di determinasi.

Peneliti menguji bagian kulit batang mojo tentang pengaruh pemberian ekstrak etanol kulit batang mojo terhadap aktivitas dan fagositosis sel makrofag dan proliferasi sel limfosit. Penelitian ini dilakukan secara *in-vitro* dan merupakan eksperimental laboratorium.

Ekstraksi kulit batang mojo dilakukan dengan maserasi. Kemudian dilakukan fraksinasi dengan Kromatografi Cair Vakum, selanjutnya diidentifikasi senyawa yang terkandung dengan KLT, kemudian fraksi yang paling baik dilanjutkan identifikasi senyawa dengan menggunakan LCMS. Parameter aktivitas imunostimulator adalah fagositosis makrofag dan proliferasi limfosit, sediaan dibuat dalam beberapa konsentrasi ekstrak uji.

Hasil penelitian menunjukkan bahwa fraksi yang paling aktif dalam aktivitas fagositosis makrofag adalah fraksi pada 750 ppm. Sedangkan aktivitas proliferasi limfosit ditunjukkan oleh konsentrasi 750 ppm. Hasil analisis fitokimia dari kulit batang mojo menunjukkan adanya kandungan flavonoid, alkaloid, tanin, dan saponin. Senyawa yang terkandung dalam fraksi adalah *aegeline.*

DAFTAR PUSTAKA

Abbas AK and Lichtman AH. 2002., *Cellular and molecular immunology*, 6th edition. Philadelphia: Elsevier Science.

Ahmad N. 2006. *Fitokimia II*. Fakultas Farmasi. Universitas Muslim Indonesia

Anief M. 1997. Ilmu Meracik Obat Teori dan Praktek. Yogyakarta: Gadjah Mada University Press. hlm 168-171.

Anonim. 2008. *Direktorat Obat Asli Indonesia*. Badan POM RI, Jakarta

Ansel HC. 1989. *Pengantar Bentuk Sediaan Farmasi*. Ibrahim F, penerjamah; Jakarta: UI Press. Terjemahan dari: *Pharmaceutical Dosage Forms, and Drug Delivery System.*

Backer. C. A. & R. C. Bakhuizen van den Brink, Jr. 1968. *Flora of Java*.

Bratawidjaja KG. 2003. *Imunologi Dasar*, Edisi 6, Balai Penerbit Fakultas Kedokteran Universitas Indonesia; Jakarta.

Bratawidjaja K. 2006. *Sistem Imun*, Dalam: *Imunologi Dasar*, Balai Penerbit FKUI, Jakarta, Edisi 7

Canell P. 1998. How to approach the isolation of natural product, in Methods in Biotechnology, vol 4: *Natural Products Isolation*, Humana Press, Totowa, NJ, pp. 1-51.

Dahlan, S.M. 2008, *Statistik untuk Kedokteran dan Kesehatan*, Edisi V, 1-112, Salemba Medika, Jakarta.

Daniel A. 2011. Biological Activity and Mass Spectrometric Analysis of Vernonia amygdalina Fractions. *Journal of Bioscience and Technology*. Vol 2 (3).

Dhankhar. S. 2011. Aegle marmelos (Linn.) Correa: A Potential Source of Phytomedicine, *Journal of Medicinal Plants Research*, Vol 5(9)

[Departemen Kesehatan]. 1986. *Sediaan Galenik*. Direktorat Jenderal Pengawasan Obat dan Makanan; Jakarta

[Departemen Kesehatan]. 1979. *Farmakope Indonesia*. Edisi III. Departemen Kesehatan Republik Indonesia; Jakarta.

Doyle. A. & Griffiths. J.B. 2000. *Cell and Tissue Culture for Medical Reseach*, 47. John Wiley Ltd. New York.

Ediati, Yuniarti, N., & Soegihardjo, C.J., 2008, Mekanisme Imunomodulator Ekstrak Buah Mengkudu (Morinda citrifolia L.) pada mencit Balb/c yang diinduksi Vaksin Hepatitis B, Majalah Obat Tradisional, 13 (43), dapat diperoleh online melalui http://mot.farmasi.ugm.ac.id/artikel-59-mekanisme-imunomodulator-ekstrakbuah-mengkudu-morinda-citrifolia-l-pada-mencit-balbc-yang-diinduksi-vaksin-hepatitis-b.html, diakses tanggal 1 Agustus 2014.

Farooq S. 2005. *555 Medical Plants*. Field and laboratory manual, International book distributors, Dehradun, 40-42

Ferrer (2009). *Liquid chromatography-Time of Flight Mass Spectrometry: Principles, Tools and Applications for Accurate Mass Analysis*. New York, NJ: Wiley.

Fudenberg HH. Basic and Clinical Immunology. 2nd edition, *Lange Medical Publications,* Los Altos.

Flora E. 2011. *Tanaman Obat* Indonesia *untuk pengobatan Herbs Medicine Herba Tanaman Obat*, Indonesia

Gandjar I.G. dan Rohman A. 2007. *Kimia Farmasi Analisis*. Cetakan III. Pustaka Pelajar; Yogyakarta

Ganong W.F. 1979. *Fisiologi Kedokteran.* Penerbit BUku Kedokteran EGC., Jakarta.

George KV. Mohanan N. 2003. *Ethnobotanical investigations of Aegle marmelos (Linn.) Corr.* in: Ethnbot. Med. Plants India and Nepal, Scientific Publishiers, Jodhpur, 29-35.

Ghisalberti, E.L. 2008. *Detection and Isolation of Bioactive Natural Products*: Detection, Isolation, and Structural Determination, Taylor & Francis Group Inc, USA.

Gritter FJ. 1991. *Pengantar Kromatografi* (terjemahan K. Padmawinata), edisi 2. ITB. Bandung. 107

Harborne JR. 1987. *Metode Fitokimia*. Penuntun Cara Modern Menganalisa Tumbuhan. Edisi II. Bandung: Institut Teknologi Bandung.

Harborne JR. 1984. *Physichemical Methods*. Diterjemahkan oleh K. Padmawinata dan I. Soediro. 1996. *Metode Fitokimia Penuntun Cara Modern Menganalisis Tumbuhan*. Bandung: Institut Teknologi Bandung.

Hariana. 2007. *Tumbuhan Obat dan Khasiatnya*. Penebar Swadaya. Jakarta

Jii Boo Jeng. 2011. Anti-inflammatory Effect of 2-Methoxy-4-Vinylphenol via the Suppression of NF-kb and MAPK Activation, and Acetylation of Histone H3. *Pharmacal Research*. Vol 34 (12).

Jobo F. 2001. *Fitokimia I*. Laboratorium Fitokimia Jurusan Farmasi Universitas Hasanuddin. Makassar

Kalaiselvan A. 2012. Gas chromatography-Mass spectrum analysis of bioactive components of the ethanol extract of Andrographis paniculata. *Journal of Pharmaceutical and Biomedical Sciences*. Vol 20 (15).

Kusmardi. 2006. Pengaruh Pemberian Ekstrak Etanol Daun Johar (*Cassia siamea* Lamk.) terhadap Aktivitas dan Kapasitas Fagositosis Sel Makrofag, *Makara Kesehatan,* Vol 10, No. 2, 50-53

Kusmardi. 2007. Efek Imunomodulator Ekstrak Daun Ketepeng Cina (*Cassia alata* L.) terhadap Aktivitas dan Kapasitas Fagositosis Makrofag, *Makara Kesehatan,* Vol 11, No. 2, 89-93

Kresno dan S. Boedina. 2001. *Imunologi: Diagnosis dan Prosedur Laboratorium*. Ed. 4, FKUI, Jakarta.

Krombach F. Münzing S. Allmeling. A. M., Gerlach, J. T., Behr, J., Dörger, M. 1997. "*Cell size of alveolar macrophages: an interspecies comparison".Environ. Health Perspect*. 105 Suppl 5 (Suppl 5): 1261–3

Leijh, P.C., Van Furth, R., & Van Zwet, Th.L., 1986. In Vitro Determination of Phagocytosis and Intracellular by Polymorphonuclear and Mononuclear Phagocyte, dalam Herzenberg, L.A., Weir, D.R., Blackwell, C., (Eds.) *Handbook of Experimental Immunology*, 1-21, Blackwell Scientific Publication, London

Manjang. 2006. *Kimia Analisis Organik*. Proyek Peningkatan Pengembangan Perguruan Tinggi, UNAND, Padang

Markham KM. 1998. *Cara Identifikasi Flavonoid*. Kosasih Padmawinata, penerjemahl Bandung: Institut Teknologi Bandung. Hal 1-54

Marry J. 2002. *Thyroid Guide, Understanding the Immune System*.

Miksusanti. 2010. Proliferasi Sel Limfosit secara In Vitro oleh Minyak Atsiri Teu Kunci dan Film Edibel Anti Bakteri, *Jurnal Penelitian Sains*, Vol 10, 6-7

Muhlisah. 2005. Tanaman Obat Keluarga. Penebar Swadaya. Jakarta.

Muhtadi. 2009. *Fraksinasi dengan Kromatografi Vakum Cair*, dalam Workshop Isolasi Chemical Marker dari Bahan Alam 2009, hal. 1-4, 6, Fakultas Farmasi Universitas Muhammadiyah Surakarta, Surakarta.

Musbita. E. 2006. Efek Imunostimulator Propolis terhadap Proliferasi Limfosit T dan Viabilitas Sel Tumor Mammae Mencit secara In Vitro, *ISSN*, Vol 1, 1-7

Nurcahyati S. 2008. *Efektivitas Ekstrak Daun Mojo (Aegle marmelos L.) terhadap kematian Larva Nyamuk Instar III*. Universitas Muhammadiyah Surakarta, Surakarta

Nursid M. et al. 2010. Kultivasi Kapang MFW-01-08 yang diisolasi dari Ascidia Alplidum longithorax dan Uji Aktivitas Sitotoksiknya terhadap Sel Kanker Payudara T47D. *Jurnal Pascapanen dan Bioteknologi Kelautan dan Perikanan*. 6 (2).

Patel P. 2010. Immunodulatory activity of methanolic fruit extract of Aegle marmelos in experimental animals, *Saudi Pharmaceutical Journal*, Vol 18, 161-165

Parmar C. and M.K. Kaushal. 1982. *Aegle marmelos*. In: Wild Fruits. Kalyani Publishers, New Delhi, India., 1-5

Pavia, Donald L., Gary M. Lampman, George S. Kritz, Randall G. Engel (2006). Introduction to Organic Laboratory Techniques (4th Ed.). Thomson Brooks/Cole. pp. 797–817.

Priyanga. 2014. Anti hyperlipidemic effect of aqueous extract of Aegle marmelos and Camellia sinensis in oil fed hyperlipidemic rats. *International Journal of Pharmacy*. Vol 6.

Rehana. 2010. Aktivasi Fagositosis Makrofag menggunakan Ekstrak *n*-Heksana Daun Lidah Buaya (*Aloe vera*), *Acta Pharmacie Indonesia*, Vol 1(1), 32-35

Richard A. 2000. *Kuby Immunology. 4th edition*. New York.

Sarker P. 2003. *Effect in liquid chromatography-tandem mass spectrometry*. 785

Sastrohamidjojo H. 1996. *Sintesis Bahan Alam.* Gadjah Mada Press. Yogyakarta

Seehan, C. 1997. *Clinical Immunology Principles and Laboratory Diagnosis*, 2nd edition, 7. Lippincott Company. Philadelpia

Sudjadi. 2010. *Kimia Farmasi Analisis*, 91, 122, Pustaka Pelajar, Yogyakarta

Tika M. 2012. *Identifikasi Metabolit Sekunder dan Aktivitas Ekstrak Batang Mojo (Aegle marmelos L.) terhadap Larva Udang Artemia salina Leach*. [Skripsi]. Universitas Mulawarman, Samarinda

Thurman E. 2003. *Liquid chromatography/mass spectrometry, MS/MS and time of flight MS: analysis of emerging contaminants*. Columbus, OH: American Chemical Society.

Ugar A. 2004. An in vitro study on microbial activity of propolis from Mugla Province in Turkey. *Journal of Medical Foods* 7 (1): 90-94

Veerappan AKS. Renganathan D. 2000. *Cardiotonic effect of Aegle marmelos Corr. On amphibian heart in situ preparation*. Proc. Internet World Congress for Biomed. Sci

Voight R. 1994. *Buku Pelajaran Teknologi Farmasi*. Edisi 5. Yogyakarta: Universitas Gadjah Mada Press.

Wijayakusuma H. 1994. *Tanaman Berkhasiat Obat Indonesia*. Jilid 3. Jakarta: Pustaka Kartini

Wijayanti M.A. 2003. Efek bee propolis terhadap infeksi Plasmodium berghei pada mencit Swiss. *Berkala Ilmu Kedokteran* 35 (2); 81-89

Yohnston RB., 1993, *Monocytes and macrophages*. Dalam: Lachman PJ, Keith DP, Rosen FS, Walport MJ, penyunting. *Clinicial aspects of immnology*, Vol 1 (5), Oxford.

LAMPIRAN

Lampiran I. Surat Identifikasi Tanaman

BAGIAN BIOLOGI FARMASI
FAKULTAS FARMASI
UNIVERSITAS GADJAH MADA YOGYAKARTA
Alamat: Sekip Utara Jl. Kaliurang Km 4, Yogyakarta 55281
Telp. , 0274.542738, 0274.649.2568 Fax. +274-543120

SURAT KETERANGAN
No. : BF/294/ Ident/Det/VI/2014

Kepada Yth. :
Sdri/Sdr. Ahmad Purmawarman Faisal
NIM. SBF041310042
Fakultas Farmasi USB
Di Surakarta

Dengan hormat,

Bersama ini kami sampaikan hasil identifikasi/determinasi sampel yang Saudara kirimkan ke Bagian Biologi Farmasi, Fakultas Farmasi UGM, adalah :

No.Pendaftaran	Jenis	Suku
294	*Aegle marmelos* L.	Rutaceae

Demikian, semoga dapat digunakan sebagaimana mestinya.

Yogyakarta, 27 Juni 2014
Ketua

Prof. Dr. Wahyono, SU., Apt.
NIP. 195007011977021001

Lampiran II. Perhitungan Ekstrak, Rendemen, dan Suspensi Uji

A. Perhitungan Ekstrak dan Rendemen

Sampel Segar : 4280 gram

Sampel Kering : 864 gram

Serbuk : 400 gram

Ekstrak

1. 159.1589 (Berat Akhir) - 146.5781 (Berat Awal)= 12.5808

2. 174.4108 (Berat Akhir) - 160.7486 (Berat Awal)= 13,6622

Total = 26,243 gram

B. Perhitungan Suspensi Uji

1. Makrofag

   Ditimbang 10 mg + DMSO 100 µL + 950 medium komplit

   Konsentrasi larutan induk = 10.000 µg/mL

   a. Perhitungan dosis

      Konsentrasi 750 ppm

      Diambil 750 µL + 9250 µL medium komplit hingga 10 mL

      Konsentrasi 600 ppm

      Diambil 1600 µL + 400 µL medium komplit hingga 2 mL

      Konsentrasi 450 ppm

      Diambil 1200 µL + 800 µL medium komplit hingga 2 mL

      Konsentrasi 300 ppm

      Diambil 800 µL + 1200 µL medium komplit hingga 2 mL

Konsentrasi 150 ppm

Diambil 400 µL + 1600 µL medium komplit hingga 2 mL

b. Perhitungan jumlah sel dan volume bahan uji:

Perhitungan jumlah sel makrofag dengan hemasitometer

$= \frac{378+379+448+419}{4}$ = 4,06 x 106 sel/ml

Volume suspensi sel makrofag yang dimasukkan kedalam *coverslip* :

Tiap sumuran harus mengandung 5 x 105 sel

Berarti $\frac{0,5}{4,06}$ = 0,123 ml = 123 µL/well

2. Limfosit

a. Perhitungan dosis

Oleh karena di dalam sumuran telah terdapat medium (suspensi limfosit dalam medium komplit), maka konsentrasi pembuatan suspensi uji menjadi 2 kalinya untuk mendapat konsentrasi akhir bahan uji.

Konsentrasi 750 ppm

Diambil 750 µL + 9250 µL medium komplit hingga 10 mL

Konsentrasi 600 ppm

Diambil 1600 µL + 400 µL medium komplit hingga 2 mL

Konsentrasi 450 ppm

Diambil 1200 µL + 800 µL medium komplit hingga 2 mL

Konsentrasi 300 ppm

Diambil 800 µL + 1200 µL medium komplit hingga 2 mL

Konsentrasi 150 ppm

Diambil 400 µL + 1600 µL medium komplit hingga 2 mL

b. Perhitungan jumlah sel dan volume bahan uji

Perhitungan sel limfosit dengan haemositometer

$= \frac{228+246+228+236}{4} = 234{,}5 \times 10^6$ sel/mL

Volume suspensi sel limfosit yang dimasukkan kedalam sumuran :

Tiap sumuran harus mengandung $1{,}5 \times 10^6$ sel/ml = 15×10^6 sel/10 mL

Berarti $\frac{15}{234{,}5}$ = 0,0064 mL = 64 µL → 10 mL, medium komplit 9936 µL.

Lampiran III. Gambar dan Tahap-tahap Penelitian

Kulit Batang Mojo

Kulit Batang Mojo

Maserasi

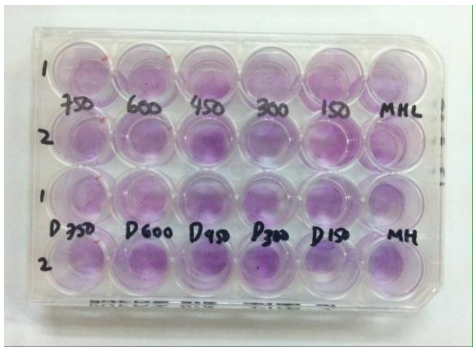
Rotary Evaporator

Fraksinasi menggunakan KCV

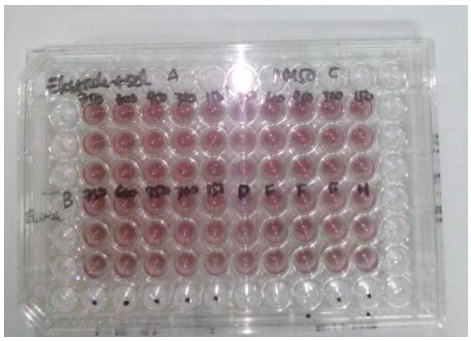
Eluen n-heksana-etil asetat (9:1, 8:2, 7:3, ... 1:9)

Eluen etil asetat-etanol (9:1, 8:2, 7:3, ... 1:9)

Fraksi 1-5



Uji Aktivitas Fagositosis Makrofag

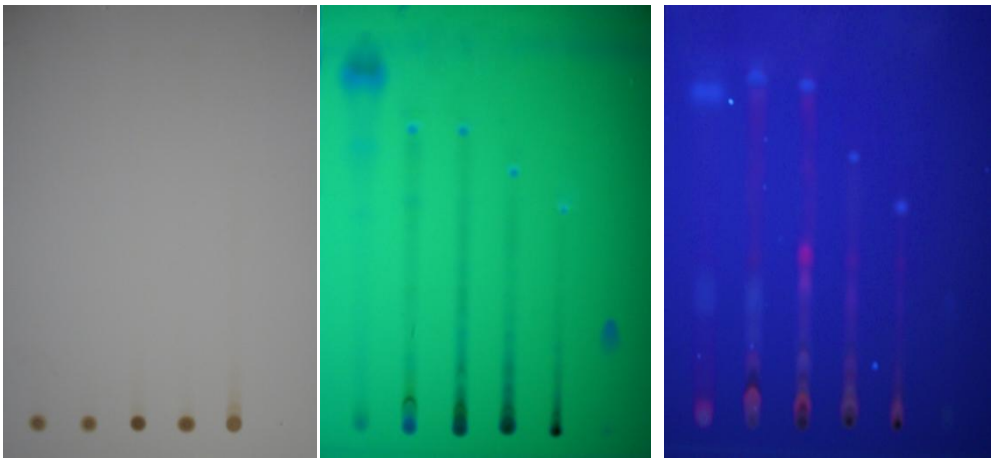


Uji Proliferasi Sel Limfosit

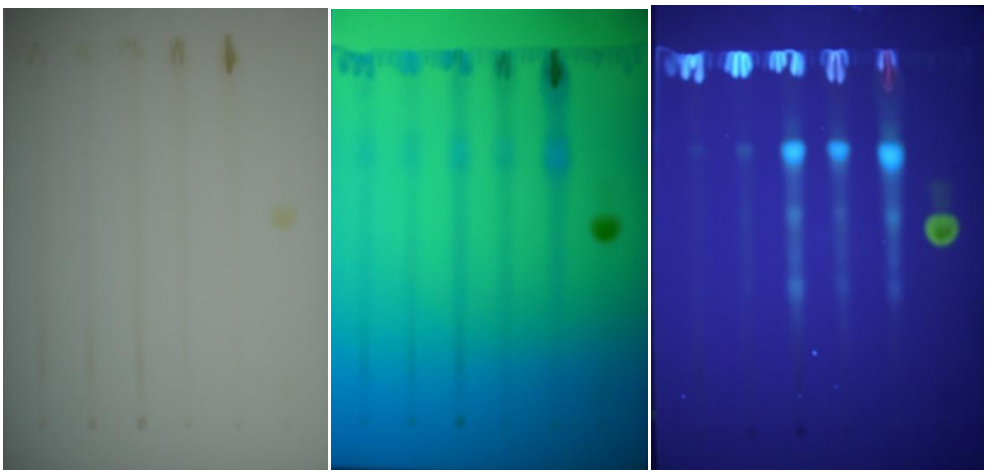
Identifikasi KLT

Senyawa Kimia	Fase gerak	Fase diam	Pembanding	Deteksi
Alkaloid	Toluen: etilasetat : dietilamin (7 : 2 : 1)	Silica Gel 60 F254	Quinin 10 mg / 1 ml etanol	Dragendorf
Flavonoid	etilaseta : asam formiat : asam asetat glassial : air (100 : 11 : 11 : 27)	Silica Gel 60 F254	Rutin 10 mg / 1 ml etanol	Sitroborat
Saponin	kloroform : metanol : air (64 : 50 : 10)	Silica Gel 60 F254	saponin 10 mg / 1 ml etanol	Liberman Bouchard (LB)
Tanin	Etil asetat : asam formiat : toluene : air (6 : 1,5 : 3 : 0,5)	Silica Gel 60 F254	Asam galat 10 mg / 1 ml etanol	FeCl3

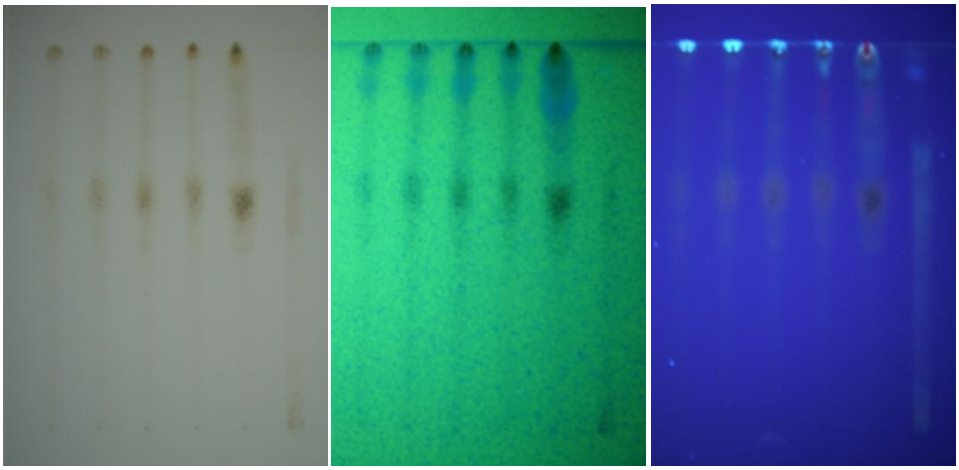
1. Alkaloid



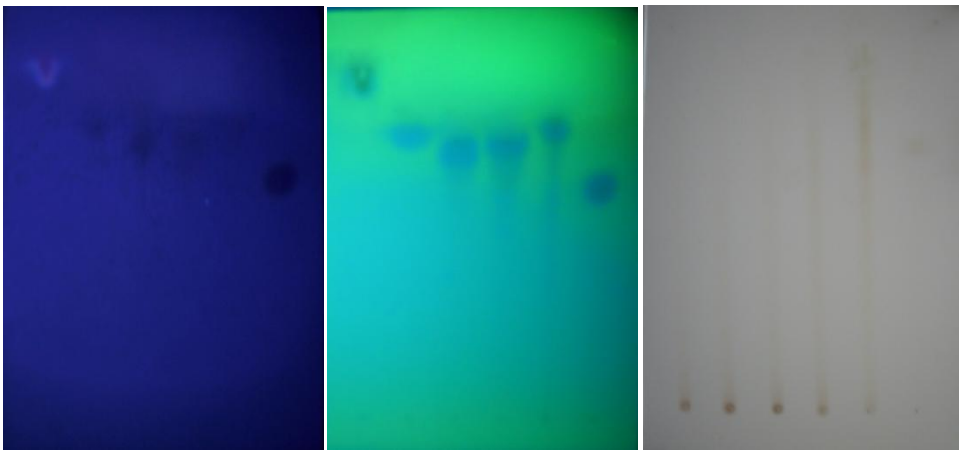
2. Flavonoid



3. Saponin

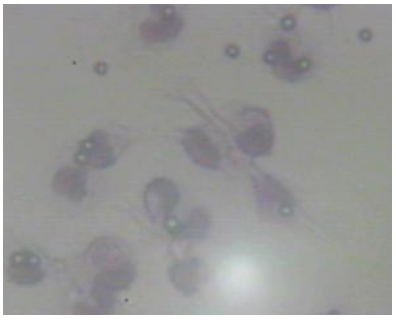


4. Tanin

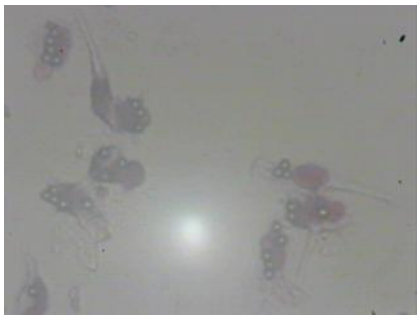


Lampiran IV. Gambar Hasil Pengujian Fagositosis Sel Makrofag dan Proliferasi Sel Limfosit

1. Uji Fagositosis Sel Makrofag

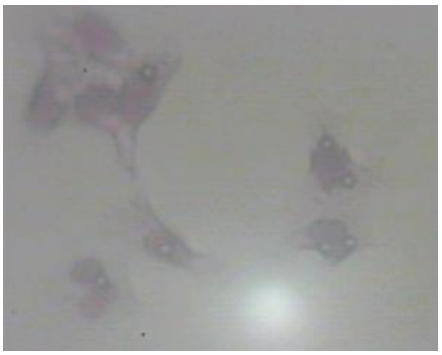


Kontrol Negatif (DMSO + Engerik)

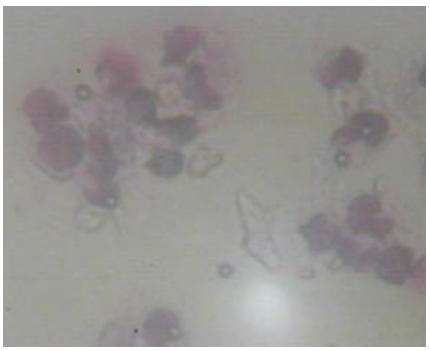


Kontrol Positif (PHA, DMSO + Engerik)

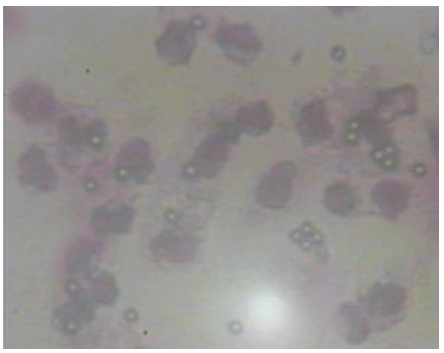
Ekstrak 150 ppm + Engerik



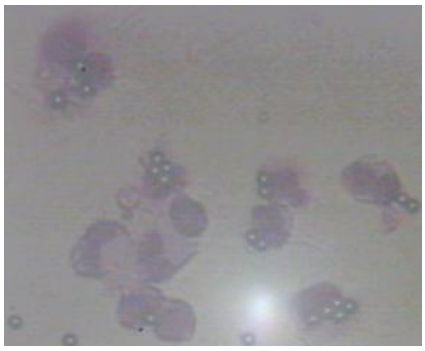
Ekstrak 300 ppm + Engerik



Ekstrak 450 ppm + Engerik



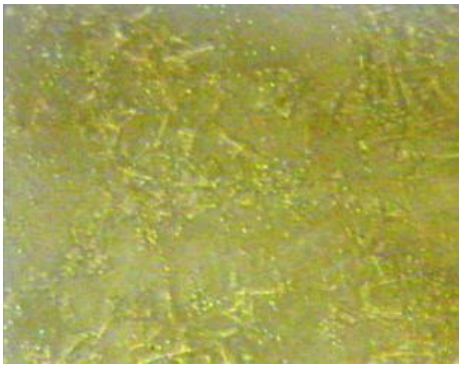
Ekstrak 600 ppm + Engerik



Ekstrak 750 ppm + Engerik

2. Uji Proliferasi Sel Limfosit

Kontrol negatif (DMSO + Engerik)



Kontrol positif (PHA, DMSO + Engerik)

Ekstrak 150 ppm

Ekstrak 300 ppm

Ekstrak 450 ppm

Ekstrak 600 ppm

Ekstrak 750 ppm

Lampiran V. Optical Density Sel Limfosit dibaca dengan *Microplate Reader*

Microplate Manager Bio-Rad Laboratories, Inc.
Raw Data Report

Reader Type : Model 680 XR Plate File : Plate1
Date : 22/07/2014 10:15

Measurement Wavelength: 550nm
Incubator Temperature: 22.0 °C
Reading Type: Endpoint (Fast Read)
Mix Time: 0 sec

	1	2	3	4	5	6	7	8	9	10	11	12
A	0.031	0.031	0.032	0.031	0.031	0.031	0.031	0.032	0.030	0.031	0.032	0.031
B	0.039	0.482	0.455	0.432	0.414	0.408	0.395	0.395	0.392	0.399	0.414	0.025
C	0.042	0.466	0.454	0.423	0.397	0.390	0.385	0.382	0.388	0.376	0.400	0.020
D	0.039	0.466	0.443	0.416	0.415	0.402	0.377	0.383	0.388	0.395	0.396	0.018
E	0.039	0.467	0.447	0.412	0.405	0.368	0.375	0.393	0.397	0.384	0.384	0.021
F	0.043	0.483	0.448	0.423	0.431	0.368	0.403	0.409	0.399	0.372	0.385	0.023
G	0.044	0.479	0.451	0.428	0.393	0.377	0.386	0.399	0.408	0.395	0.405	0.028
H	0.033	0.033	0.036	0.035	0.032	0.032	0.032	0.032	0.033	0.032	0.033	0.038

Microplate Manager Bio-Rad Laboratories, Inc.
Raw Data Report

Reader Type : Model 680 XR Plate File : Plate2
Date : 22/07/2014 10:17

Measurement Wavelength: 550nm
Incubator Temperature: 22.0 °C
Reading Type: Endpoint (Fast Read)
Mix Time: 0 sec

	1	2	3	4	5	6	7	8	9	10	11	12
A	0.031	0.032	0.032	0.032	0.033	0.031	0.032	0.033	0.031	0.031	0.033	0.036
B	0.041	0.503	0.448	0.426	0.415	0.410	0.388	0.385	0.390	0.395	0.405	0.032
C	0.043	0.506	0.459	0.433	0.418	0.418	0.391	0.384	0.386	0.391	0.390	0.025
D	0.045	0.479	0.463	0.448	0.416	0.413	0.393	0.396	0.394	0.402	0.398	0.024
E	0.049	0.488	0.456	0.409	0.399	0.362	0.360	0.387	0.403	0.350	0.375	0.029
F	0.043	0.476	0.444	0.434	0.399	0.356	0.378	0.390	0.399	0.353	0.372	0.026
G	0.040	0.481	0.449	0.413	0.399	0.368	0.368	0.379	0.389	0.349	0.377	0.030
H	0.036	0.034	0.039	0.034	0.036	0.035	0.035	0.036	0.035	0.035	0.037	0.033

Lampiran VI. Analisis Stastistik

1. Indeks Fagositosis

Tests of Normality

	Perlakuan	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
sel_makrofag	A	.253	3	.	.964	3	.637
	B	.353	3	.	.824	3	.174
	C	.175	3	.	1.000	3	1.000
	D	.340	3	.	.848	3	.235
	E	.269	3	.	.949	3	.567
	F	.219	3	.	.987	3	.780
	G	.207	3	.	.992	3	.831

a. Lilliefors Significance Correction

ANOVA

sel_makrofag

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1556.952	6	259.492	5.438	.004
Within Groups	668.000	14	47.714		
Total	2224.952	20			

Multiple Comparisons

sel_makrofag

Tukey HSD

(I) Perlakuan	(J) Perlakuan	Mean Difference (I-J)	Std. Error	Sig.	80% Confidence Interval	
					Lower Bound	Upper Bound
A	B	-12.000	5.640	.389	-26.62	2.62
	C	-1.333	5.640	1.000	-15.96	13.29
	D	-2.000	5.640	1.000	-16.62	12.62
	E	-9.000	5.640	.687	-23.62	5.62
	F	-15.667*	5.640	.149	-30.29	-1.04
	G	-25.667*	5.640	.006	-40.29	-11.04
B	A	12.000	5.640	.389	-2.62	26.62
	C	10.667	5.640	.516	-3.96	25.29

	D	10.000	5.640	.584	-4.62	24.62
	E	3.000	5.640	.998	-11.62	17.62
	F	-3.667	5.640	.993	-18.29	10.96
	G	-13.667	5.640	.258	-28.29	.96
C	A	1.333	5.640	1.000	-13.29	15.96
	B	-10.667	5.640	.516	-25.29	3.96
	D	-.667	5.640	1.000	-15.29	13.96
	E	-7.667	5.640	.813	-22.29	6.96
	F	-14.333	5.640	.216	-28.96	.29
	G	-24.333*	5.640	.010	-38.96	-9.71
D	A	2.000	5.640	1.000	-12.62	16.62
	B	-10.000	5.640	.584	-24.62	4.62
	C	.667	5.640	1.000	-13.96	15.29
	E	-7.000	5.640	.867	-21.62	7.62
	F	-13.667	5.640	.258	-28.29	.96
	G	-23.667*	5.640	.012	-38.29	-9.04
E	A	9.000	5.640	.687	-5.62	23.62
	B	-3.000	5.640	.998	-17.62	11.62
	C	7.667	5.640	.813	-6.96	22.29
	D	7.000	5.640	.867	-7.62	21.62
	F	-6.667	5.640	.890	-21.29	7.96
	G	-16.667*	5.640	.111	-31.29	-2.04
F	A	15.667*	5.640	.149	1.04	30.29
	B	3.667	5.640	.993	-10.96	18.29
	C	14.333	5.640	.216	-.29	28.96
	D	13.667	5.640	.258	-.96	28.29
	E	6.667	5.640	.890	-7.96	21.29
	G	-10.000	5.640	.584	-24.62	4.62
G	A	25.667*	5.640	.006	11.04	40.29
	B	13.667	5.640	.258	-.96	28.29
	C	24.333*	5.640	.010	9.71	38.96
	D	23.667*	5.640	.012	9.04	38.29
	E	16.667*	5.640	.111	2.04	31.29
	F	10.000	5.640	.584	-4.62	24.62

*. The mean difference is significant at the 0.20 level.

Homogeneous Subsets

sel_makrofag

Tukey HSD[a]

Perlakuan	N	Subset for alpha = 0.20		
		1	2	3
A	3	29.67		
C	3	31.00	31.00	
D	3	31.67	31.67	
E	3	38.67	38.67	
B	3	41.67	41.67	41.67
F	3		45.33	45.33
G	3			55.33
Sig.		.389	.216	.258

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3.000.

2. Proliferasi Sel Limfosit

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
sel_limfosit	.149	54	.010	.938	54	.014

a. Lilliefors Significance Correction

Karena data tidak terdistribusi normal, data ditransform ke lg10

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
sel_limfosit	.131	54	.039	.953	54	.053

a. Lilliefors Significance Correction

ANOVA

sel_limfosit

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.069	15	.005	75.481	.000
Within Groups	.002	32	.000		
Total	.071	47			

Multiple Comparisons

sel_limfosit

LSD

(I) Perlakuan	(J) Perlakuan	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A 750 ppm	A 600 ppm	.035667*	.006226	.000	.02304	.04829
	A 450 ppm	.056667*	.006226	.000	.04404	.06929
	A 300 ppm	.076000*	.006226	.000	.06337	.08863
	A 150 ppm	.078667*	.006226	.000	.06604	.09129
	B 750 ppm	.012667*	.006226	.049	.00004	.02529

	B 600 ppm	.042667*	.006226	.000	.03004	.05529
	B 450 ppm	.073667*	.006226	.000	.06104	.08629
	B 300 ppm	.094333*	.006226	.000	.08171	.10696
	B 150 ppm	.136667*	.006226	.000	.12404	.14929
	C 750 ppm	.103667*	.006226	.000	.09104	.11629
	C 600 ppm	.106333*	.006226	.000	.09371	.11896
	C 450 ppm	.104333*	.006226	.000	.09171	.11696
	C 300 ppm	.097667*	.006226	.000	.08504	.11029
	C 150 ppm	.096000*	.006226	.000	.08337	.10863
	D	.129000*	.006226	.000	.11637	.14163
	E	.096591*	.006226	.000	.08396	.10922
	F	.121695*	.006226	.000	.10907	.13432
A 600 ppm	A 750 ppm	-.035667*	.006226	.000	-.04829	-.02304
	A 450 ppm	.021000*	.006226	.002	.00837	.03363
	A 300 ppm	.040333*	.006226	.000	.02771	.05296
	A 150 ppm	.043000*	.006226	.000	.03037	.05563
	B 750 ppm	-.023000*	.006226	.001	-.03563	-.01037
	B 600 ppm	.007000	.006226	.268	-.00563	.01963
	B 450 ppm	.038000*	.006226	.000	.02537	.05063
	B 300 ppm	.058667*	.006226	.000	.04604	.07129
	B 150 ppm	.101000*	.006226	.000	.08837	.11363
	C 750 ppm	.068000*	.006226	.000	.05537	.08063
	C 600 ppm	.070667*	.006226	.000	.05804	.08329
	C 450 ppm	.068667*	.006226	.000	.05604	.08129
	C 300 ppm	.062000*	.006226	.000	.04937	.07463
	C 150 ppm	.060333*	.006226	.000	.04771	.07296
	D	.093333*	.006226	.000	.08071	.10596
	E	.060924*	.006226	.000	.04830	.07355
	F	.086028*	.006226	.000	.07340	.09865
A 450 ppm	A 750 ppm	-.056667*	.006226	.000	-.06929	-.04404
	A 600 ppm	-.021000*	.006226	.002	-.03363	-.00837
	A 300 ppm	.019333*	.006226	.004	.00671	.03196
	A 150 ppm	.022000*	.006226	.001	.00937	.03463
	B 750 ppm	-.044000*	.006226	.000	-.05663	-.03137
	B 600 ppm	-.014000*	.006226	.031	-.02663	-.00137

	B 450 ppm	.017000*	.006226	.010	.00437	.02963
	B 300 ppm	.037667*	.006226	.000	.02504	.05029
	B 150 ppm	.080000*	.006226	.000	.06737	.09263
	C 750 ppm	.047000*	.006226	.000	.03437	.05963
	C 600 ppm	.049667*	.006226	.000	.03704	.06229
	C 450 ppm	.047667*	.006226	.000	.03504	.06029
	C 300 ppm	.041000*	.006226	.000	.02837	.05363
	C 150 ppm	.039333*	.006226	.000	.02671	.05196
	D	.072333*	.006226	.000	.05971	.08496
	E	.039924*	.006226	.000	.02730	.05255
	F	.065028*	.006226	.000	.05240	.07765
A 300 ppm	A 750 ppm	-.076000*	.006226	.000	-.08863	-.06337
	A 600 ppm	-.040333*	.006226	.000	-.05296	-.02771
	A 450 ppm	-.019333*	.006226	.004	-.03196	-.00671
	A 150 ppm	.002667	.006226	.671	-.00996	.01529
	B 750 ppm	-.063333*	.006226	.000	-.07596	-.05071
	B 600 ppm	-.033333*	.006226	.000	-.04596	-.02071
	B 450 ppm	-.002333	.006226	.710	-.01496	.01029
	B 300 ppm	.018333*	.006226	.006	.00571	.03096
	B 150 ppm	.060667*	.006226	.000	.04804	.07329
	C 750 ppm	.027667*	.006226	.000	.01504	.04029
	C 600 ppm	.030333*	.006226	.000	.01771	.04296
	C 450 ppm	.028333*	.006226	.000	.01571	.04096
	C 300 ppm	.021667*	.006226	.001	.00904	.03429
	C 150 ppm	.020000*	.006226	.003	.00737	.03263
	D	.053000*	.006226	.000	.04037	.06563
	E	.020591*	.006226	.002	.00796	.03322
	F	.045695*	.006226	.000	.03307	.05832
A 150 ppm	A 750 ppm	-.078667*	.006226	.000	-.09129	-.06604
	A 600 ppm	-.043000*	.006226	.000	-.05563	-.03037
	A 450 ppm	-.022000*	.006226	.001	-.03463	-.00937
	A 300 ppm	-.002667	.006226	.671	-.01529	.00996
	B 750 ppm	-.066000*	.006226	.000	-.07863	-.05337
	B 600 ppm	-.036000*	.006226	.000	-.04863	-.02337
	B 450 ppm	-.005000	.006226	.427	-.01763	.00763

	B 300 ppm	.015667*	.006226	.016	.00304	.02829
	B 150 ppm	.058000*	.006226	.000	.04537	.07063
	C 750 ppm	.025000*	.006226	.000	.01237	.03763
	C 600 ppm	.027667*	.006226	.000	.01504	.04029
	C 450 ppm	.025667*	.006226	.000	.01304	.03829
	C 300 ppm	.019000*	.006226	.004	.00637	.03163
	C 150 ppm	.017333*	.006226	.009	.00471	.02996
	D	.050333*	.006226	.000	.03771	.06296
	E	.017924*	.006226	.007	.00530	.03055
	F	.043028*	.006226	.000	.03040	.05565
B 750 ppm	A 750 ppm	-.012667*	.006226	.049	-.02529	-.00004
	A 600 ppm	.023000*	.006226	.001	.01037	.03563
	A 450 ppm	.044000*	.006226	.000	.03137	.05663
	A 300 ppm	.063333*	.006226	.000	.05071	.07596
	A 150 ppm	.066000*	.006226	.000	.05337	.07863
	B 600 ppm	.030000*	.006226	.000	.01737	.04263
	B 450 ppm	.061000*	.006226	.000	.04837	.07363
	B 300 ppm	.081667*	.006226	.000	.06904	.09429
	B 150 ppm	.124000*	.006226	.000	.11137	.13663
	C 750 ppm	.091000*	.006226	.000	.07837	.10363
	C 600 ppm	.093667*	.006226	.000	.08104	.10629
	C 450 ppm	.091667*	.006226	.000	.07904	.10429
	C 300 ppm	.085000*	.006226	.000	.07237	.09763
	C 150 ppm	.083333*	.006226	.000	.07071	.09596
	D	.116333*	.006226	.000	.10371	.12896
	E	.083924*	.006226	.000	.07130	.09655
	F	.109028*	.006226	.000	.09640	.12165
B 600 ppm	A 750 ppm	-.042667*	.006226	.000	-.05529	-.03004
	A 600 ppm	-.007000	.006226	.268	-.01963	.00563
	A 450 ppm	.014000*	.006226	.031	.00137	.02663
	A 300 ppm	.033333*	.006226	.000	.02071	.04596
	A 150 ppm	.036000*	.006226	.000	.02337	.04863
	B 750 ppm	-.030000*	.006226	.000	-.04263	-.01737
	B 450 ppm	.031000*	.006226	.000	.01837	.04363
	B 300 ppm	.051667*	.006226	.000	.03904	.06429

	B 150 ppm	.094000*	.006226	.000	.08137	.10663
	C 750 ppm	.061000*	.006226	.000	.04837	.07363
	C 600 ppm	.063667*	.006226	.000	.05104	.07629
	C 450 ppm	.061667*	.006226	.000	.04904	.07429
	C 300 ppm	.055000*	.006226	.000	.04237	.06763
	C 150 ppm	.053333*	.006226	.000	.04071	.06596
	D	.086333*	.006226	.000	.07371	.09896
	E	.053924*	.006226	.000	.04130	.06655
	F	.079028*	.006226	.000	.06640	.09165
B 450 ppm	A 750 ppm	-.073667*	.006226	.000	-.08629	-.06104
	A 600 ppm	-.038000*	.006226	.000	-.05063	-.02537
	A 450 ppm	-.017000*	.006226	.010	-.02963	-.00437
	A 300 ppm	.002333	.006226	.710	-.01029	.01496
	A 150 ppm	.005000	.006226	.427	-.00763	.01763
	B 750 ppm	-.061000*	.006226	.000	-.07363	-.04837
	B 600 ppm	-.031000*	.006226	.000	-.04363	-.01837
	B 300 ppm	.020667*	.006226	.002	.00804	.03329
	B 150 ppm	.063000*	.006226	.000	.05037	.07563
	C 750 ppm	.030000*	.006226	.000	.01737	.04263
	C 600 ppm	.032667*	.006226	.000	.02004	.04529
	C 450 ppm	.030667*	.006226	.000	.01804	.04329
	C 300 ppm	.024000*	.006226	.000	.01137	.03663
	C 150 ppm	.022333*	.006226	.001	.00971	.03496
	D	.055333*	.006226	.000	.04271	.06796
	E	.022924*	.006226	.001	.01030	.03555
	F	.048028*	.006226	.000	.03540	.06065
B 300 ppm	A 750 ppm	-.094333*	.006226	.000	-.10696	-.08171
	A 600 ppm	-.058667*	.006226	.000	-.07129	-.04604
	A 450 ppm	-.037667*	.006226	.000	-.05029	-.02504
	A 300 ppm	-.018333*	.006226	.006	-.03096	-.00571
	A 150 ppm	-.015667*	.006226	.016	-.02829	-.00304
	B 750 ppm	-.081667*	.006226	.000	-.09429	-.06904
	B 600 ppm	-.051667*	.006226	.000	-.06429	-.03904
	B 450 ppm	-.020667*	.006226	.002	-.03329	-.00804
	B 150 ppm	.042333*	.006226	.000	.02971	.05496

	C 750 ppm	.009333	.006226	.143	-.00329	.02196
	C 600 ppm	.012000	.006226	.062	-.00063	.02463
	C 450 ppm	.010000	.006226	.117	-.00263	.02263
	C 300 ppm	.003333	.006226	.596	-.00929	.01596
	C 150 ppm	.001667	.006226	.790	-.01096	.01429
	D	.034667*	.006226	.000	.02204	.04729
	E	.002257	.006226	.719	-.01037	.01488
	F	.027361*	.006226	.000	.01473	.03999
B 150 ppm	A 750 ppm	-.136667*	.006226	.000	-.14929	-.12404
	A 600 ppm	-.101000*	.006226	.000	-.11363	-.08837
	A 450 ppm	-.080000*	.006226	.000	-.09263	-.06737
	A 300 ppm	-.060667*	.006226	.000	-.07329	-.04804
	A 150 ppm	-.058000*	.006226	.000	-.07063	-.04537
	B 750 ppm	-.124000*	.006226	.000	-.13663	-.11137
	B 600 ppm	-.094000*	.006226	.000	-.10663	-.08137
	B 450 ppm	-.063000*	.006226	.000	-.07563	-.05037
	B 300 ppm	-.042333*	.006226	.000	-.05496	-.02971
	C 750 ppm	-.033000*	.006226	.000	-.04563	-.02037
	C 600 ppm	-.030333*	.006226	.000	-.04296	-.01771
	C 450 ppm	-.032333*	.006226	.000	-.04496	-.01971
	C 300 ppm	-.039000*	.006226	.000	-.05163	-.02637
	C 150 ppm	-.040667*	.006226	.000	-.05329	-.02804
	D	-.007667	.006226	.226	-.02029	.00496
	E	-.040076*	.006226	.000	-.05270	-.02745
	F	-.014972*	.006226	.021	-.02760	-.00235
C 750 ppm	A 750 ppm	-.103667*	.006226	.000	-.11629	-.09104
	A 600 ppm	-.068000*	.006226	.000	-.08063	-.05537
	A 450 ppm	-.047000*	.006226	.000	-.05963	-.03437
	A 300 ppm	-.027667*	.006226	.000	-.04029	-.01504
	A 150 ppm	-.025000*	.006226	.000	-.03763	-.01237
	B 750 ppm	-.091000*	.006226	.000	-.10363	-.07837
	B 600 ppm	-.061000*	.006226	.000	-.07363	-.04837
	B 450 ppm	-.030000*	.006226	.000	-.04263	-.01737
	B 300 ppm	-.009333	.006226	.143	-.02196	.00329
	B 150 ppm	.033000*	.006226	.000	.02037	.04563

	C 600 ppm	.002667	.006226	.671	-.00996	.01529
	C 450 ppm	.000667	.006226	.915	-.01196	.01329
	C 300 ppm	-.006000	.006226	.342	-.01863	.00663
	C 150 ppm	-.007667	.006226	.226	-.02029	.00496
	D	.025333*	.006226	.000	.01271	.03796
	E	-.007076	.006226	.263	-.01970	.00555
	F	.018028*	.006226	.006	.00540	.03065
C 600 ppm	A 750 ppm	-.106333*	.006226	.000	-.11896	-.09371
	A 600 ppm	-.070667*	.006226	.000	-.08329	-.05804
	A 450 ppm	-.049667*	.006226	.000	-.06229	-.03704
	A 300 ppm	-.030333*	.006226	.000	-.04296	-.01771
	A 150 ppm	-.027667*	.006226	.000	-.04029	-.01504
	B 750 ppm	-.093667*	.006226	.000	-.10629	-.08104
	B 600 ppm	-.063667*	.006226	.000	-.07629	-.05104
	B 450 ppm	-.032667*	.006226	.000	-.04529	-.02004
	B 300 ppm	-.012000	.006226	.062	-.02463	.00063
	B 150 ppm	.030333*	.006226	.000	.01771	.04296
	C 750 ppm	-.002667	.006226	.671	-.01529	.00996
	C 450 ppm	-.002000	.006226	.750	-.01463	.01063
	C 300 ppm	-.008667	.006226	.172	-.02129	.00396
	C 150 ppm	-.010333	.006226	.106	-.02296	.00229
	D	.022667*	.006226	.001	.01004	.03529
	E	-.009743	.006226	.126	-.02237	.00288
	F	.015361*	.006226	.018	.00273	.02799
C 450 ppm	A 750 ppm	-.104333*	.006226	.000	-.11696	-.09171
	A 600 ppm	-.068667*	.006226	.000	-.08129	-.05604
	A 450 ppm	-.047667*	.006226	.000	-.06029	-.03504
	A 300 ppm	-.028333*	.006226	.000	-.04096	-.01571
	A 150 ppm	-.025667*	.006226	.000	-.03829	-.01304
	B 750 ppm	-.091667*	.006226	.000	-.10429	-.07904
	B 600 ppm	-.061667*	.006226	.000	-.07429	-.04904
	B 450 ppm	-.030667*	.006226	.000	-.04329	-.01804
	B 300 ppm	-.010000	.006226	.117	-.02263	.00263
	B 150 ppm	.032333*	.006226	.000	.01971	.04496
	C 750 ppm	-.000667	.006226	.915	-.01329	.01196

	C 600 ppm	.002000	.006226	.750	-.01063	.01463
	C 300 ppm	-.006667	.006226	.291	-.01929	.00596
	C 150 ppm	-.008333	.006226	.189	-.02096	.00429
	D	.024667*	.006226	.000	.01204	.03729
	E	-.007743	.006226	.222	-.02037	.00488
	F	.017361*	.006226	.008	.00473	.02999
C 300 ppm	A 750 ppm	-.097667*	.006226	.000	-.11029	-.08504
	A 600 ppm	-.062000*	.006226	.000	-.07463	-.04937
	A 450 ppm	-.041000*	.006226	.000	-.05363	-.02837
	A 300 ppm	-.021667*	.006226	.001	-.03429	-.00904
	A 150 ppm	-.019000*	.006226	.004	-.03163	-.00637
	B 750 ppm	-.085000*	.006226	.000	-.09763	-.07237
	B 600 ppm	-.055000*	.006226	.000	-.06763	-.04237
	B 450 ppm	-.024000*	.006226	.000	-.03663	-.01137
	B 300 ppm	-.003333	.006226	.596	-.01596	.00929
	B 150 ppm	.039000*	.006226	.000	.02637	.05163
	C 750 ppm	.006000	.006226	.342	-.00663	.01863
	C 600 ppm	.008667	.006226	.172	-.00396	.02129
	C 450 ppm	.006667	.006226	.291	-.00596	.01929
	C 150 ppm	-.001667	.006226	.790	-.01429	.01096
	D	.031333*	.006226	.000	.01871	.04396
	E	-.001076	.006226	.864	-.01370	.01155
	F	.024028*	.006226	.000	.01140	.03665
C 150 ppm	A 750 ppm	-.096000*	.006226	.000	-.10863	-.08337
	A 600 ppm	-.060333*	.006226	.000	-.07296	-.04771
	A 450 ppm	-.039333*	.006226	.000	-.05196	-.02671
	A 300 ppm	-.020000*	.006226	.003	-.03263	-.00737
	A 150 ppm	-.017333*	.006226	.009	-.02996	-.00471
	B 750 ppm	-.083333*	.006226	.000	-.09596	-.07071
	B 600 ppm	-.053333*	.006226	.000	-.06596	-.04071
	B 450 ppm	-.022333*	.006226	.001	-.03496	-.00971
	B 300 ppm	-.001667	.006226	.790	-.01429	.01096
	B 150 ppm	.040667*	.006226	.000	.02804	.05329
	C 750 ppm	.007667	.006226	.226	-.00496	.02029
	C 600 ppm	.010333	.006226	.106	-.00229	.02296

	C 450 ppm	.008333	.006226	.189	-.00429	.02096
	C 300 ppm	.001667	.006226	.790	-.01096	.01429
	D	.033000*	.006226	.000	.02037	.04563
	E	.000591	.006226	.925	-.01204	.01322
	F	.025695*	.006226	.000	.01307	.03832
D	A 750 ppm	-.129000*	.006226	.000	-.14163	-.11637
	A 600 ppm	-.093333*	.006226	.000	-.10596	-.08071
	A 450 ppm	-.072333*	.006226	.000	-.08496	-.05971
	A 300 ppm	-.053000*	.006226	.000	-.06563	-.04037
	A 150 ppm	-.050333*	.006226	.000	-.06296	-.03771
	B 750 ppm	-.116333*	.006226	.000	-.12896	-.10371
	B 600 ppm	-.086333*	.006226	.000	-.09896	-.07371
	B 450 ppm	-.055333*	.006226	.000	-.06796	-.04271
	B 300 ppm	-.034667*	.006226	.000	-.04729	-.02204
	B 150 ppm	.007667	.006226	.226	-.00496	.02029
	C 750 ppm	-.025333*	.006226	.000	-.03796	-.01271
	C 600 ppm	-.022667*	.006226	.001	-.03529	-.01004
	C 450 ppm	-.024667*	.006226	.000	-.03729	-.01204
	C 300 ppm	-.031333*	.006226	.000	-.04396	-.01871
	C 150 ppm	-.033000*	.006226	.000	-.04563	-.02037
	E	-.032409*	.006226	.000	-.04504	-.01978
	F	-.007305	.006226	.248	-.01993	.00532
E	A 750 ppm	-.096591*	.006226	.000	-.10922	-.08396
	A 600 ppm	-.060924*	.006226	.000	-.07355	-.04830
	A 450 ppm	-.039924*	.006226	.000	-.05255	-.02730
	A 300 ppm	-.020591*	.006226	.002	-.03322	-.00796
	A 150 ppm	-.017924*	.006226	.007	-.03055	-.00530
	B 750 ppm	-.083924*	.006226	.000	-.09655	-.07130
	B 600 ppm	-.053924*	.006226	.000	-.06655	-.04130
	B 450 ppm	-.022924*	.006226	.001	-.03555	-.01030
	B 300 ppm	-.002257	.006226	.719	-.01488	.01037
	B 150 ppm	.040076*	.006226	.000	.02745	.05270
	C 750 ppm	.007076	.006226	.263	-.00555	.01970
	C 600 ppm	.009743	.006226	.126	-.00288	.02237
	C 450 ppm	.007743	.006226	.222	-.00488	.02037

	C 300 ppm	.001076	.006226	.864	-.01155	.01370
	C 150 ppm	-.000591	.006226	.925	-.01322	.01204
	D	.032409*	.006226	.000	.01978	.04504
	F	.025104*	.006226	.000	.01248	.03773
F	A 750 ppm	-.121695*	.006226	.000	-.13432	-.10907
	A 600 ppm	-.086028*	.006226	.000	-.09865	-.07340
	A 450 ppm	-.065028*	.006226	.000	-.07765	-.05240
	A 300 ppm	-.045695*	.006226	.000	-.05832	-.03307
	A 150 ppm	-.043028*	.006226	.000	-.05565	-.03040
	B 750 ppm	-.109028*	.006226	.000	-.12165	-.09640
	B 600 ppm	-.079028*	.006226	.000	-.09165	-.06640
	B 450 ppm	-.048028*	.006226	.000	-.06065	-.03540
	B 300 ppm	-.027361*	.006226	.000	-.03999	-.01473
	B 150 ppm	.014972*	.006226	.021	.00235	.02760
	C 750 ppm	-.018028*	.006226	.006	-.03065	-.00540
	C 600 ppm	-.015361*	.006226	.018	-.02799	-.00273
	C 450 ppm	-.017361*	.006226	.008	-.02999	-.00473
	C 300 ppm	-.024028*	.006226	.000	-.03665	-.01140
	C 150 ppm	-.025695*	.006226	.000	-.03832	-.01307
	D	.007305	.006226	.248	-.00532	.01993
	E	-.025104*	.006226	.000	-.03773	-.01248

*. The mean difference is significant at the 0.05 level.

Lampiran VI. Analisis LCMS Fraksi kulit batang mojo

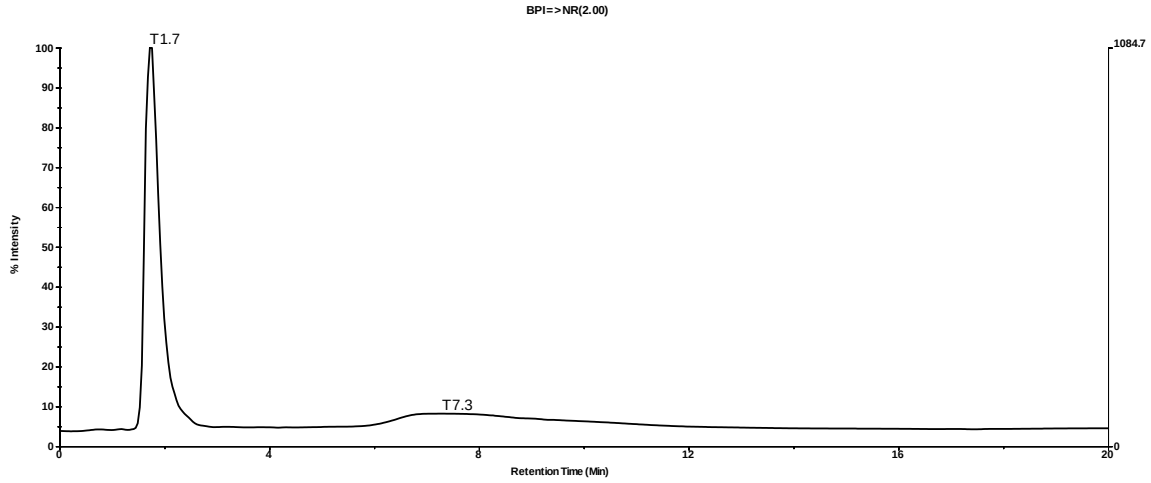
Ahmad Purnawarman F Mojo LC MS –ESI pos ion

Vol injection 20 ul

Flow 1 ml/min

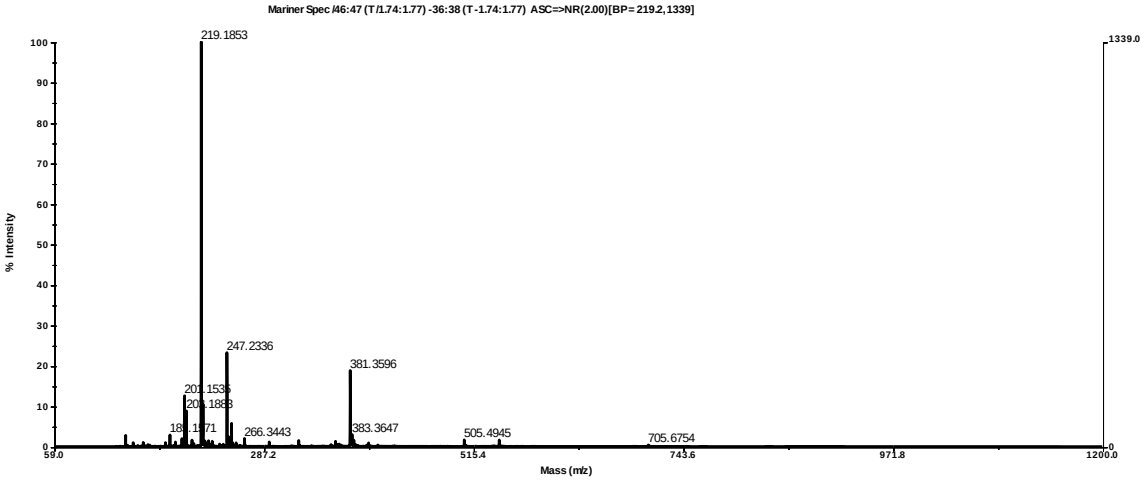
Eluent MeOH

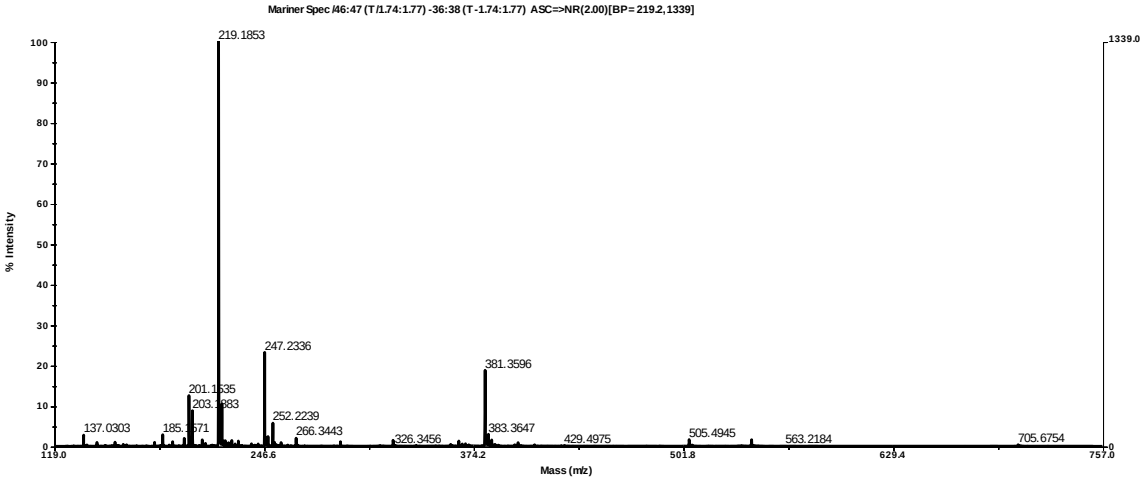
Operating by : Puspa D N Lotulung



Index	Time	Lower Bound	Upper Bound	Height	Area
1	1.735483	1.347600	2.938883	1085	9466.24
2	7.313350	4.566566	9.477950	87	2711.00

Rt 1.73


Mariner Spec #46:47 (T/1.74:1.77) -36:38 (T-1.74:1.77) ASC=>NR(2.00)[BP=219.2,1339]
% Intensity
Mass (m/z)
219.1853
247.2336
381.3596
201.1535
203.1883
185.1571
266.3443
383.3647
505.4945
705.6754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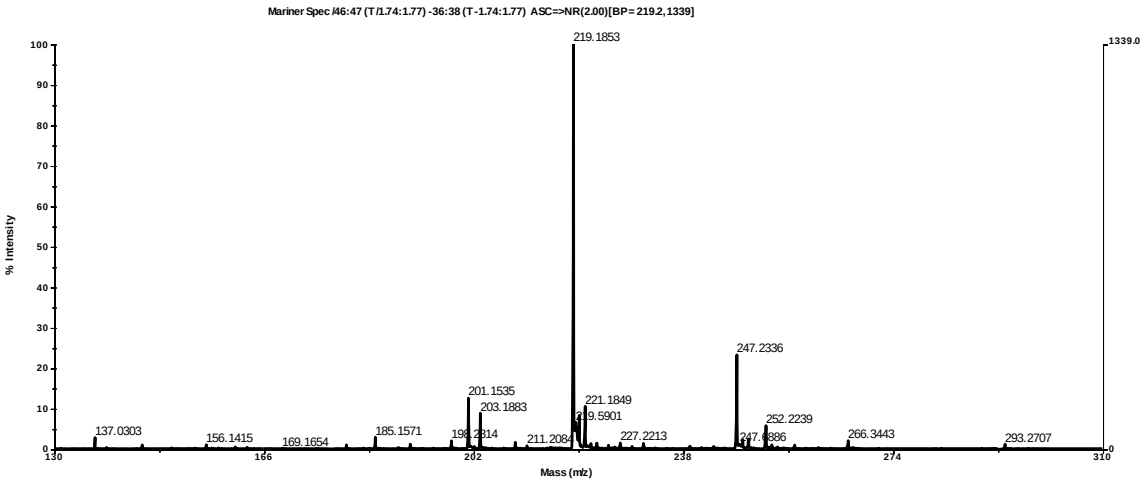
% Intensity
Mass (m/z)
219.1853
247.2336
381.3596
201.1535
203.1883
252.2239
137.0303
185.1571
266.3443
326.3456
383.3647
429.4975
505.4945
563.2184
705.6754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Mass (m/z)
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247.2336
201.1535
221.1849
203.1883
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137.0303
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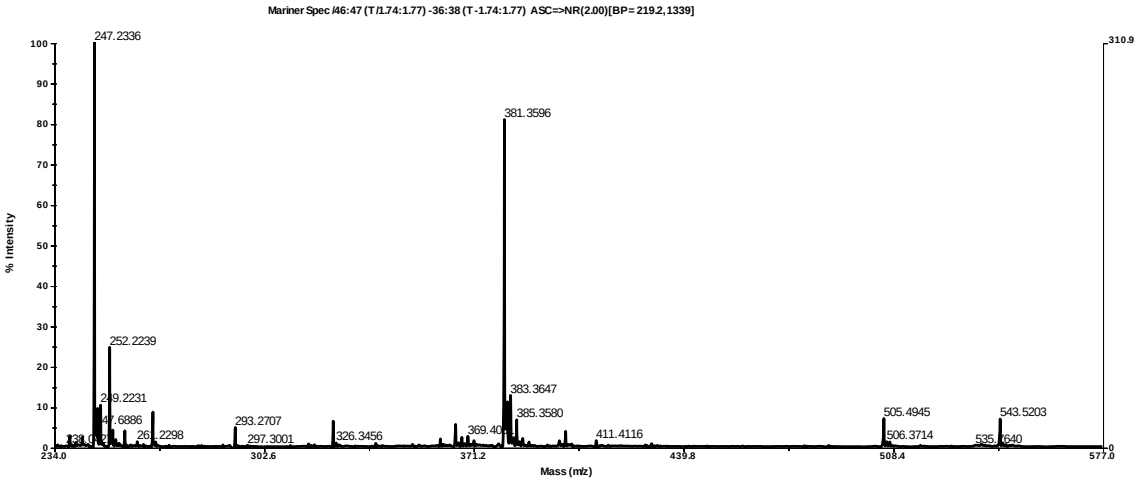
211.2084
227.2213
266.3443
293.2707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% Intensity
Mass (m/z)
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381.3596
252.2239
249.2231
383.3647
385.3580
505.4945
543.5203
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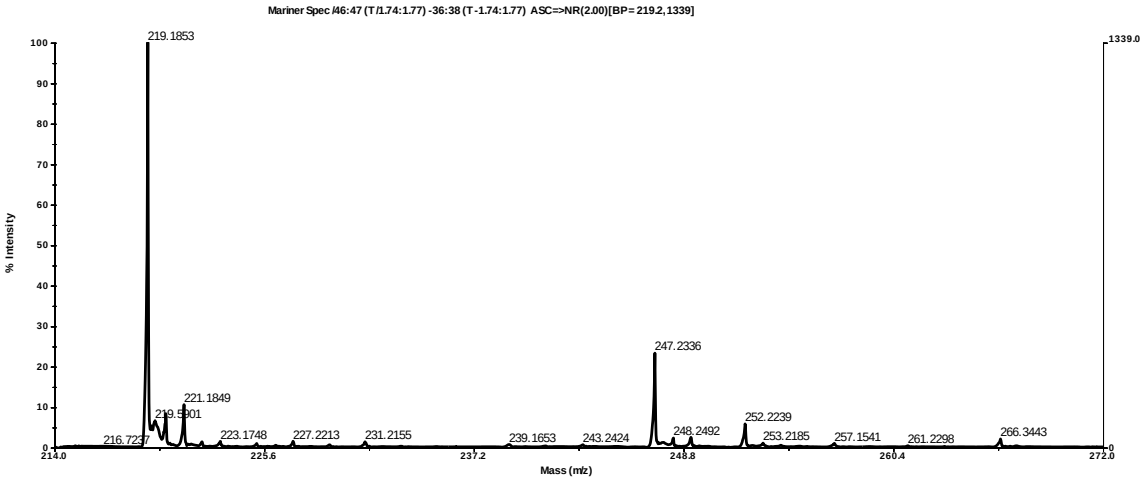
297.3001
326.3456
411.4116
506.3714
310.9
1339.0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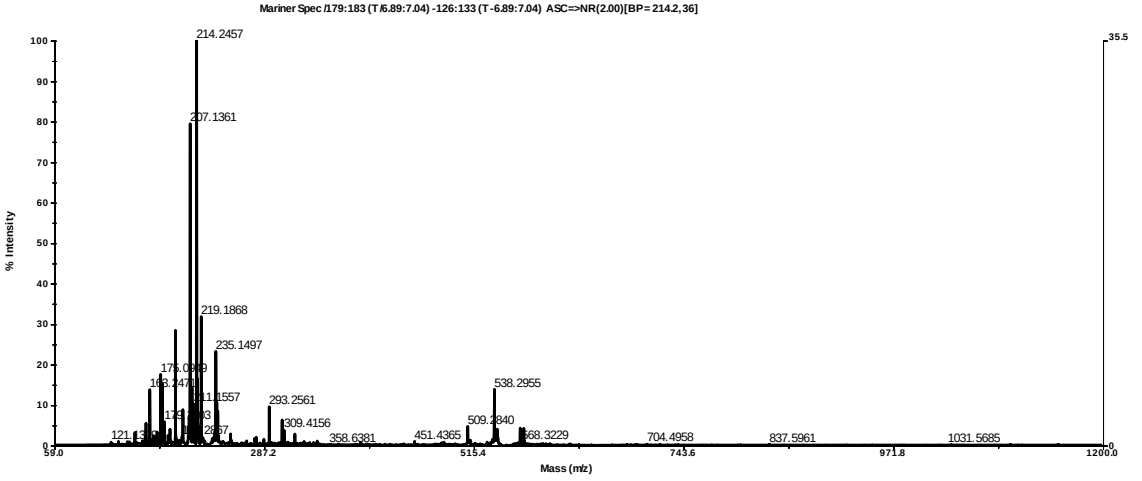
% Intensity
Mass (m/z)
219.1853
221.1849
247.2336
252.2239
223.1748
227.2213
231.2155
239.1653
243.2424
248.2492
253.2185
257.1541
261.2298
266.3443

Rt 7.3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% Intensity
Mass (m/z)
214.2457
207.1361
219.1868
235.1497
538.2955
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309.4156
509.2840
358.6381
451.4365
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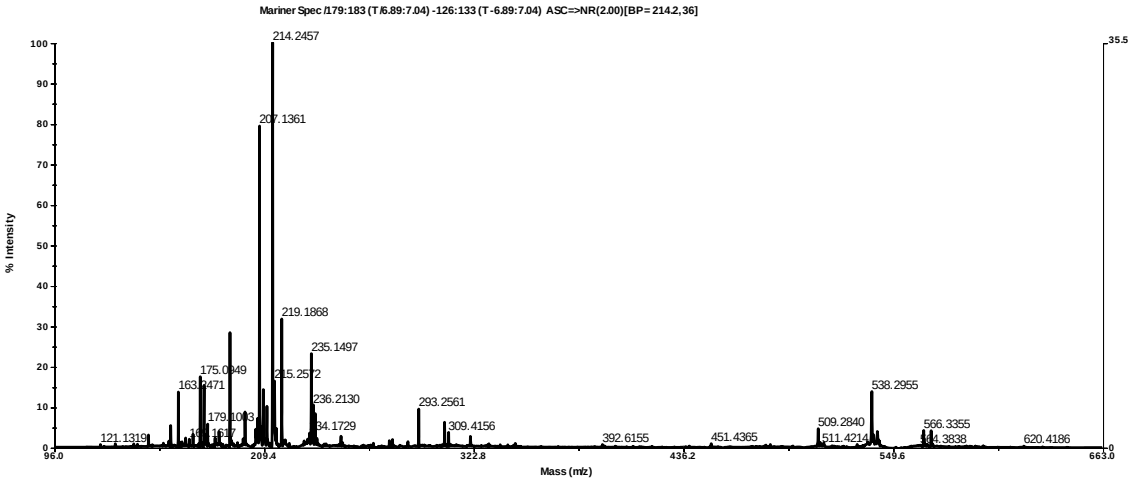
837.5961
1031.5685
35.5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% Intensity
Mass (m/z)
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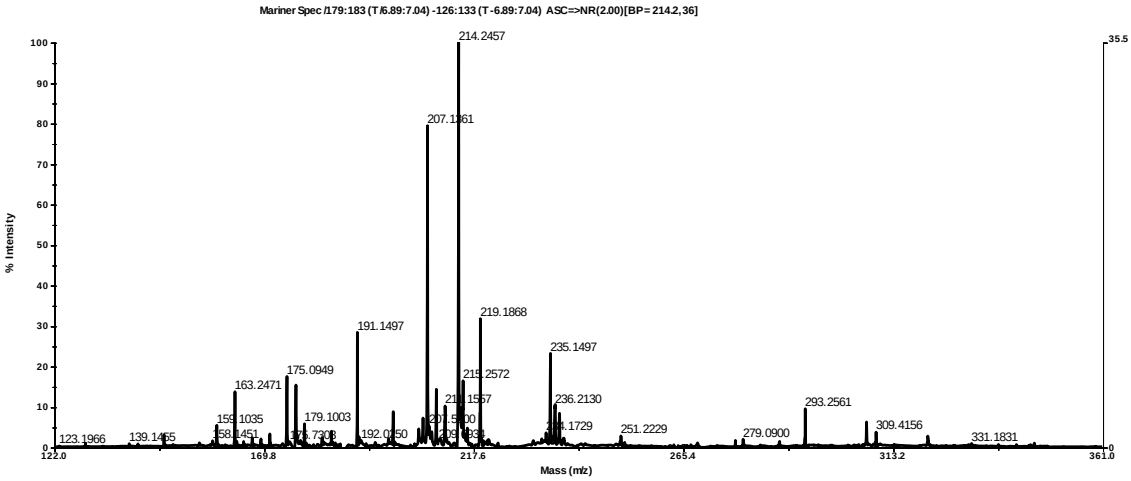
207.1361
219.1868
235.1497
175.0949
215.2572
236.2130
293.2561
309.4156
538.2955
509.2840
566.3355
392.6155
451.4365
620.4186


Mariner Spec /179:183 (T/6.89:7.04) -126:133 (T -6.89:7.04) ASC=>NR(2.00)[BP= 214.2,36]
% Intensity
Mass (m/z)
214.2457
207.1361
219.1868
191.1497
235.1497
175.0949
163.2471
215.2572
236.2130
293.2561
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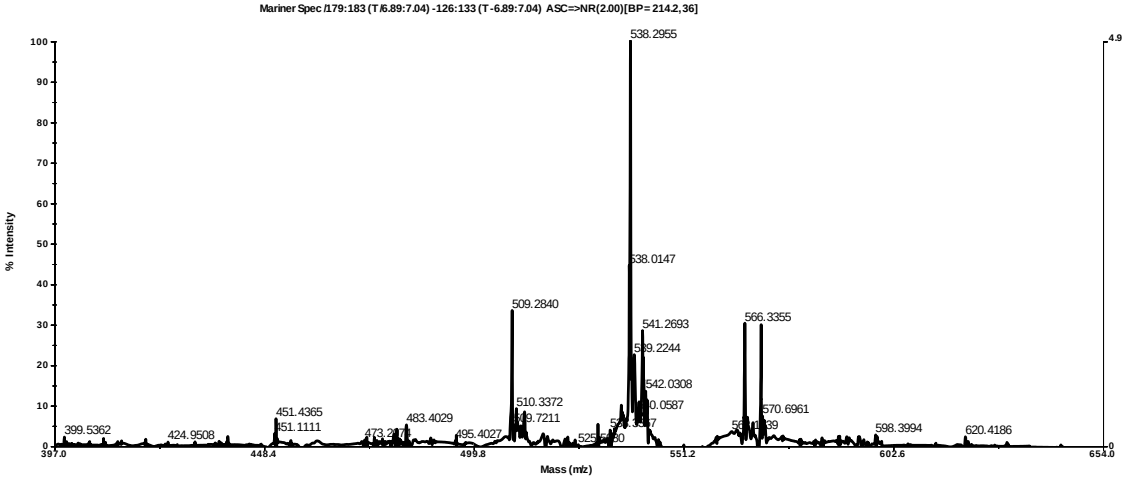
139.1465
251.2229
279.0900
331.1831


Mariner Spec /179:183 (T/6.89:7.04) -126:133 (T -6.89:7.04) ASC=>NR(2.00)[BP= 214.2,36]
% Intensity
Mass (m/z)
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538.0147
509.2840
541.2693
566.3355
542.0308
510.3372
570.6961
451.4365
483.4029
399.5362
424.9508
598.3994
620.4186

Sample
Vol injection 20 ul
Flow rate 0.5 ml/min
Eluent Methanol
LC-MS : Mariner Biospectrometry
LC: Hitachi L 6200
System ESI (Electrospray Ionisation)
Positive ion mode
Kolom C18 (RP 18) Phenomenex
Column length : 150 mm
ID : 2 mm
Particle size : 5 μm
Analysis by : Puspa .D. Lotulung, Pusat Penelitian Kimia – LIPI

BPI = Base Peak Intensity
BP = Base Peak
TIC = Total Ion Current
NR = NoiseRemoval
BC = Base Correction
MC = Mass Calibration
BP = Base Peak
CT = Centroiding
SM = Gaussian smooth

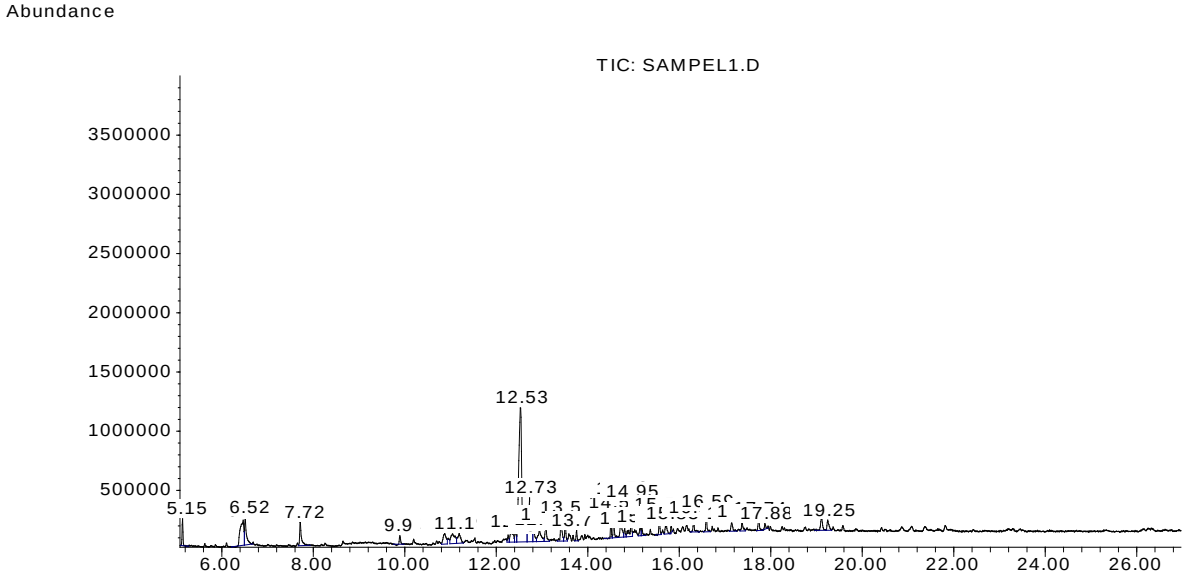
Temperatur kolom = temp ruangan ; isokratik, Detector massa

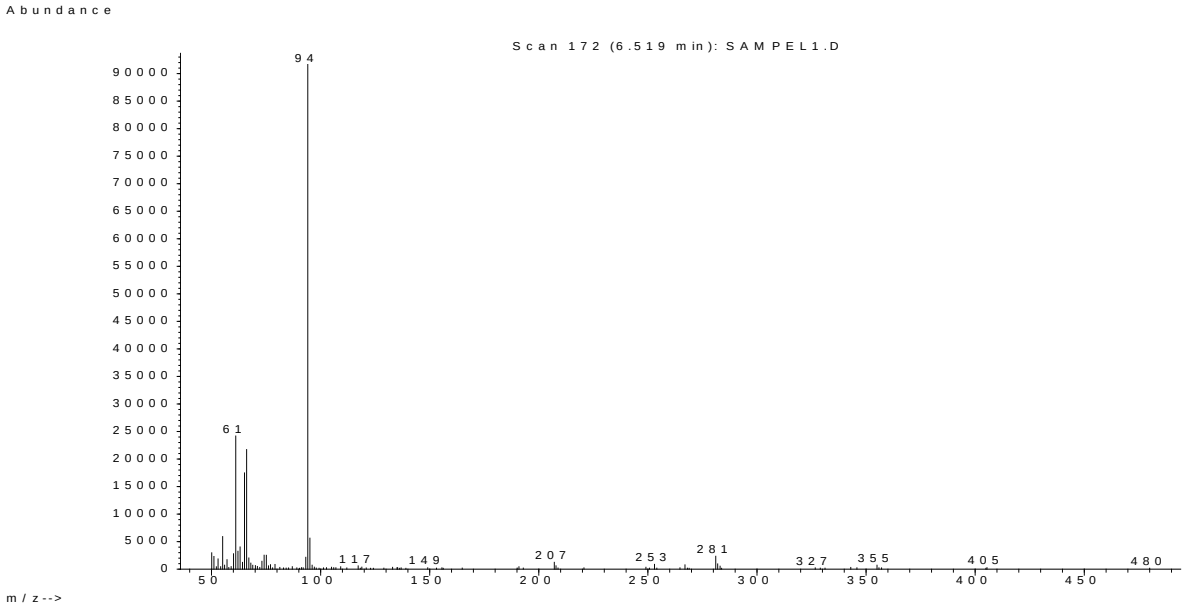
Method : positive ion

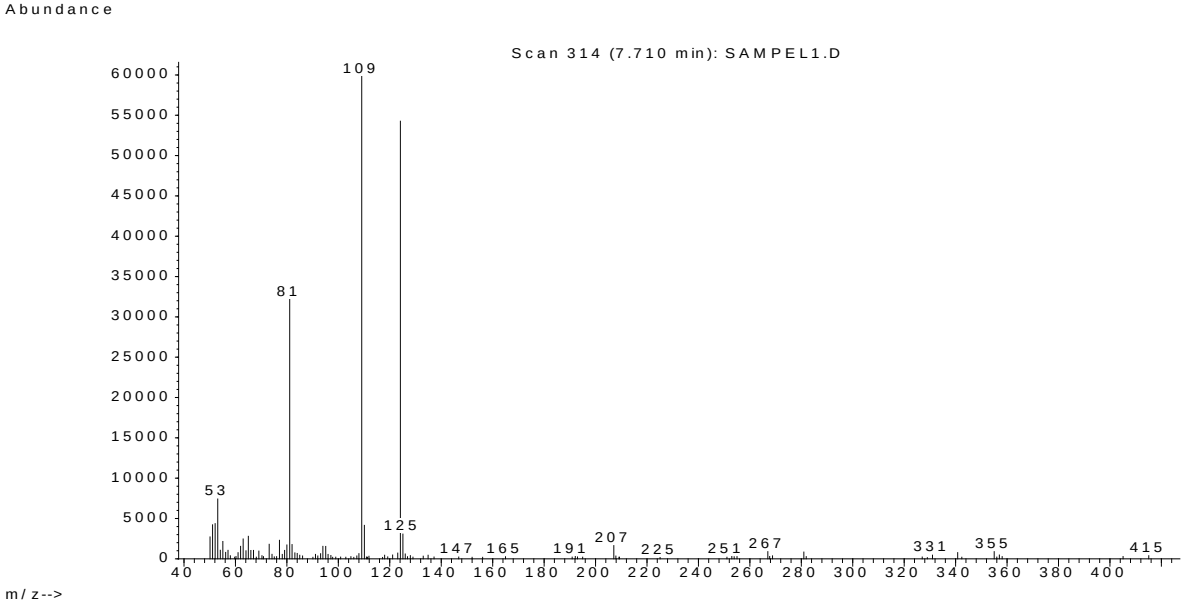
LC-MS Analysis

LC-MS analysis was performed using an Mariner Biospectrometry equipped with a binary pump. The HPLC was interfaced with a Q-tof mass spectrometer fitted with an ESI source. Full-scan mode from *m*/*z* 100 to 1200 was performed with a source temperature of 140 ° C. HPLC column (Phenomenex 5 μ C18, 150 $\times$ 2 mm i.d.,) was used for the analysis. Solvent was Methanol with 0.3% acetic acid. Solvents were delivered at a total flow rate of 0.5 mL/min. The solvent running by isocratic elution

Lampiran VII. Analisis GCMS Fraksi kulit batang mojo



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40000
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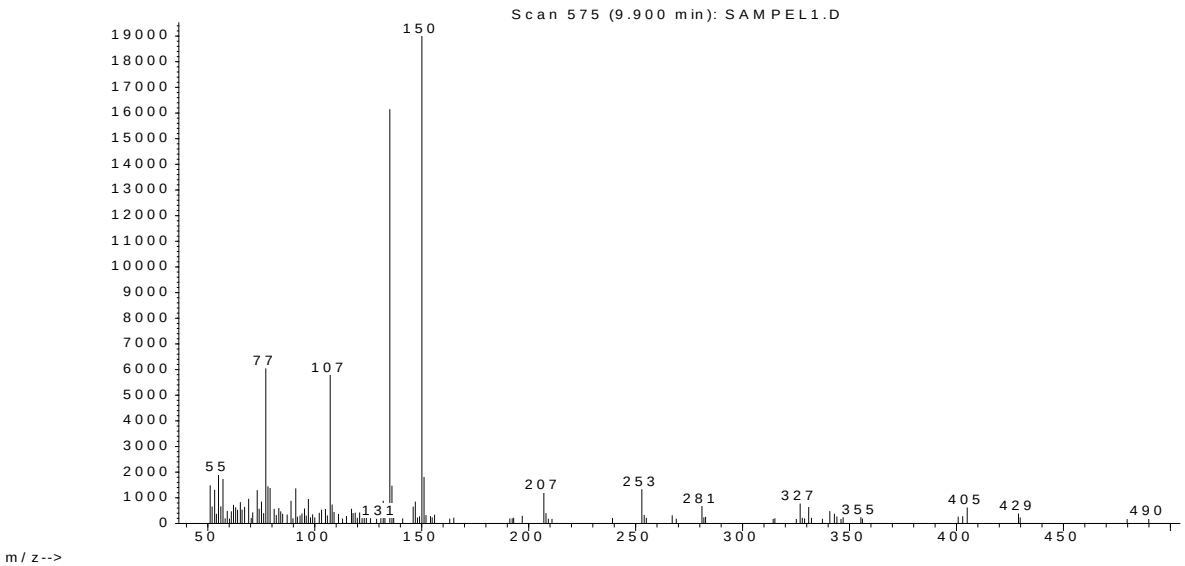
30000
25000
20000
15000
10000
5000
0
109
81
53
125
147
165
191
207
225
251
267
331
355
415
40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400
m/z-->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12000
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9000
8000
7000
6000
5000
4000
3000
2000
1000
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107
55
131
207
253
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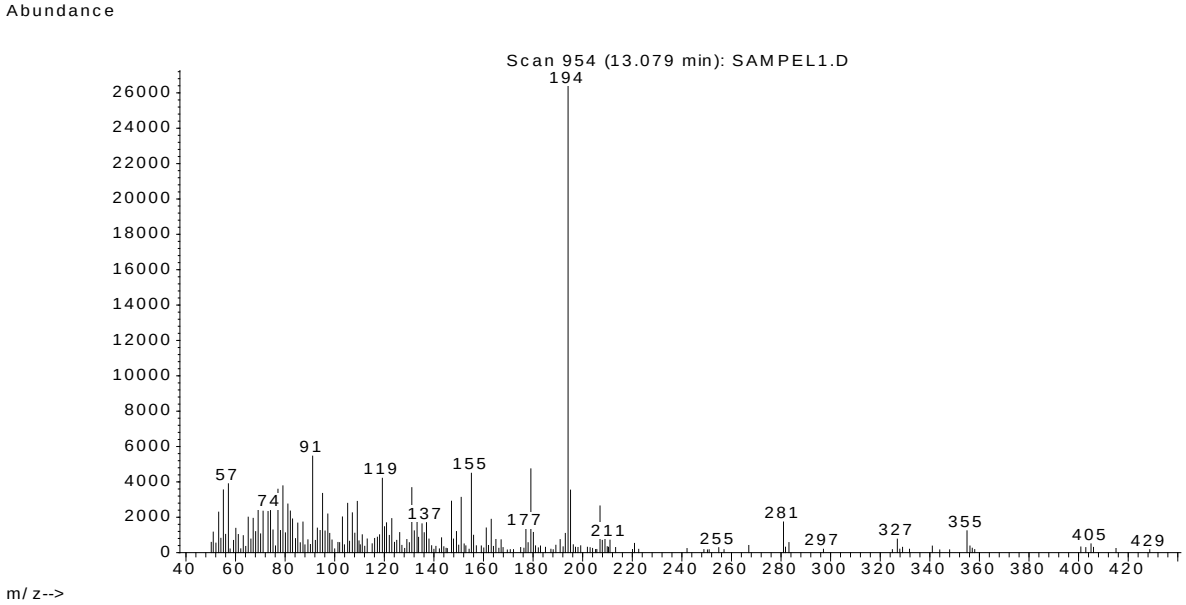
327
355
405
429
490
50 100 150 200 250 300 350 400 450
m/z-->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405
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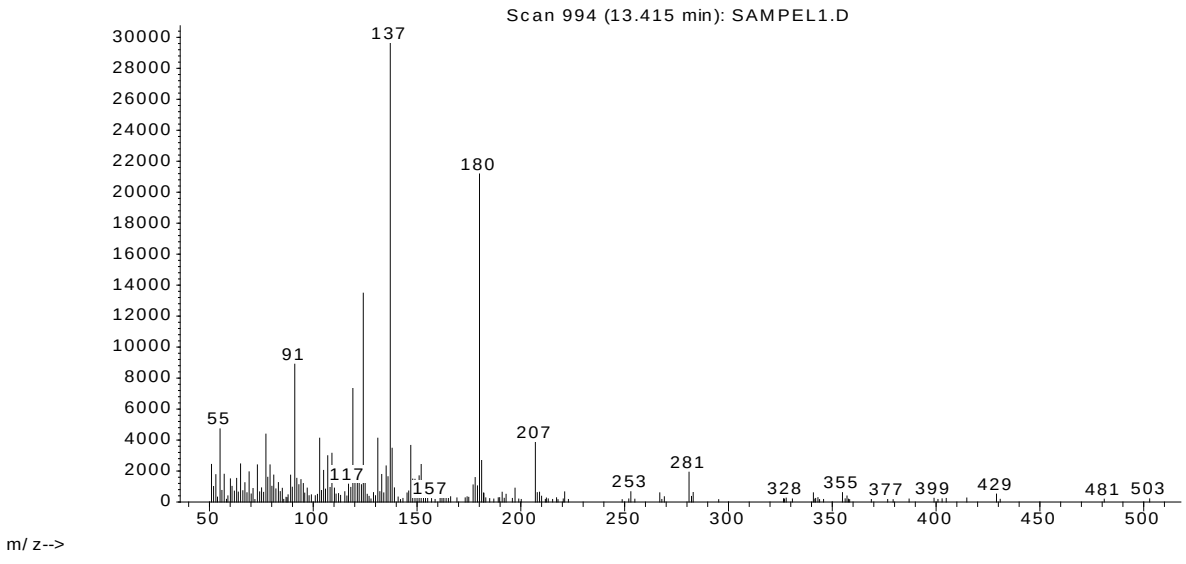
Abundance
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157
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399
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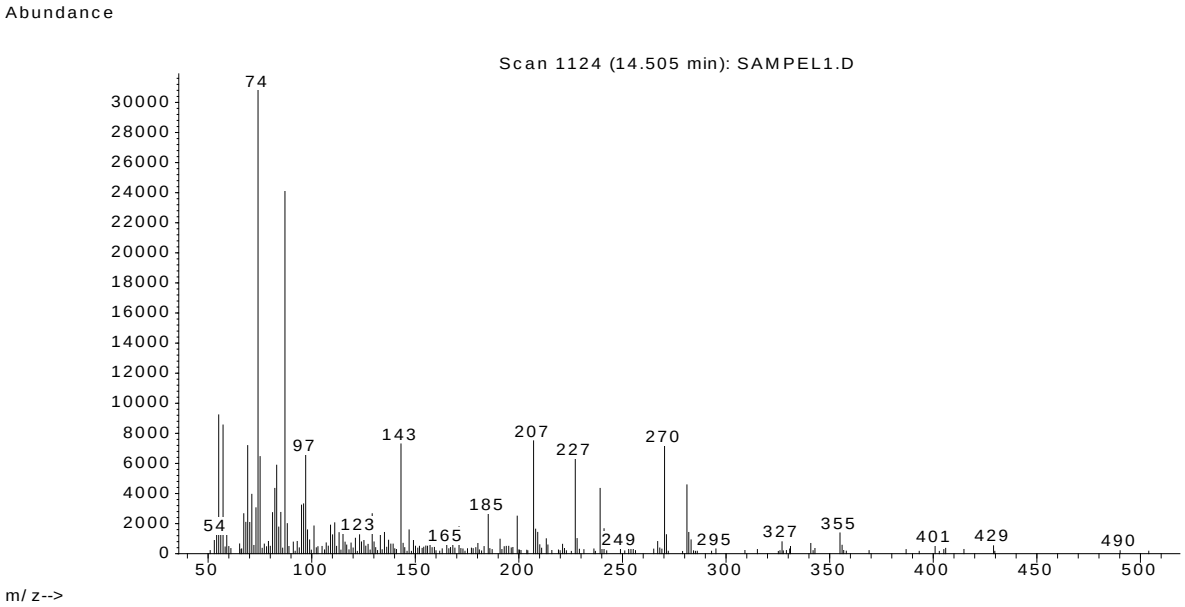
481
503
m/z-->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270
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165
185
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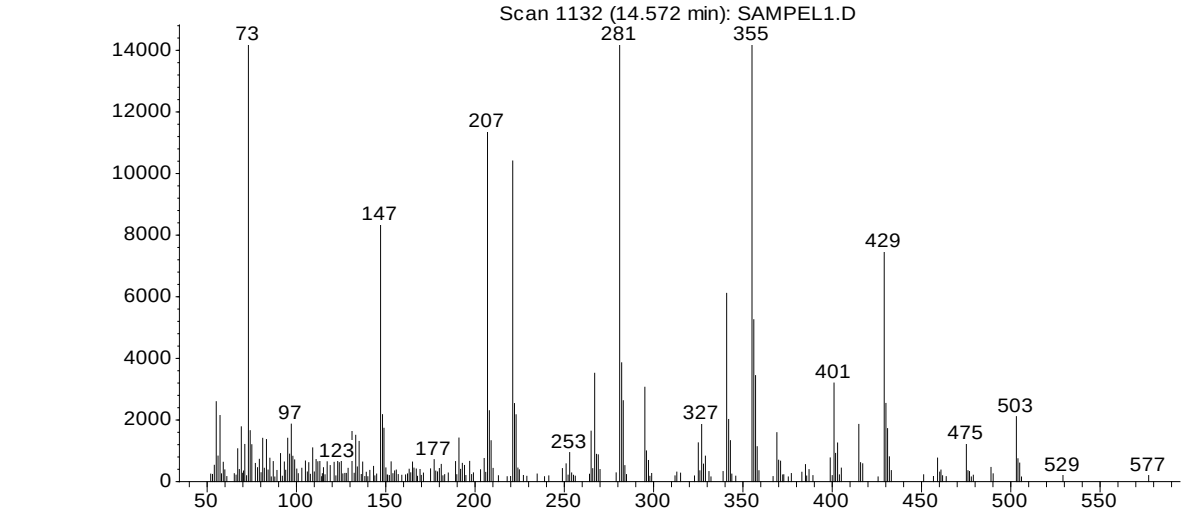
295
327
355
401
429
490
m/z-->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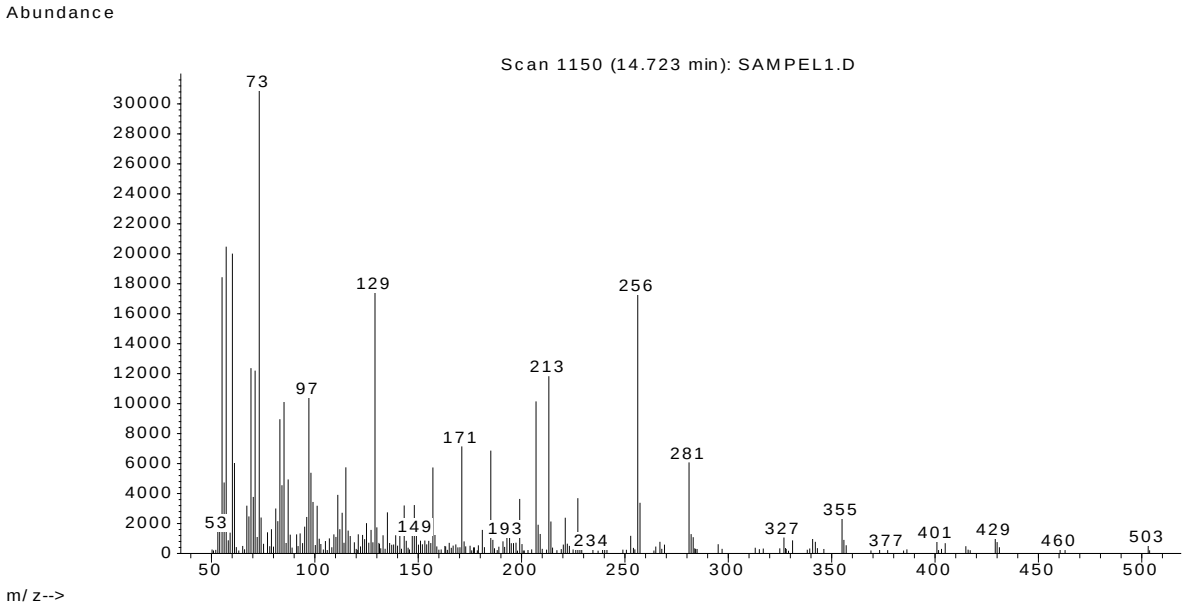
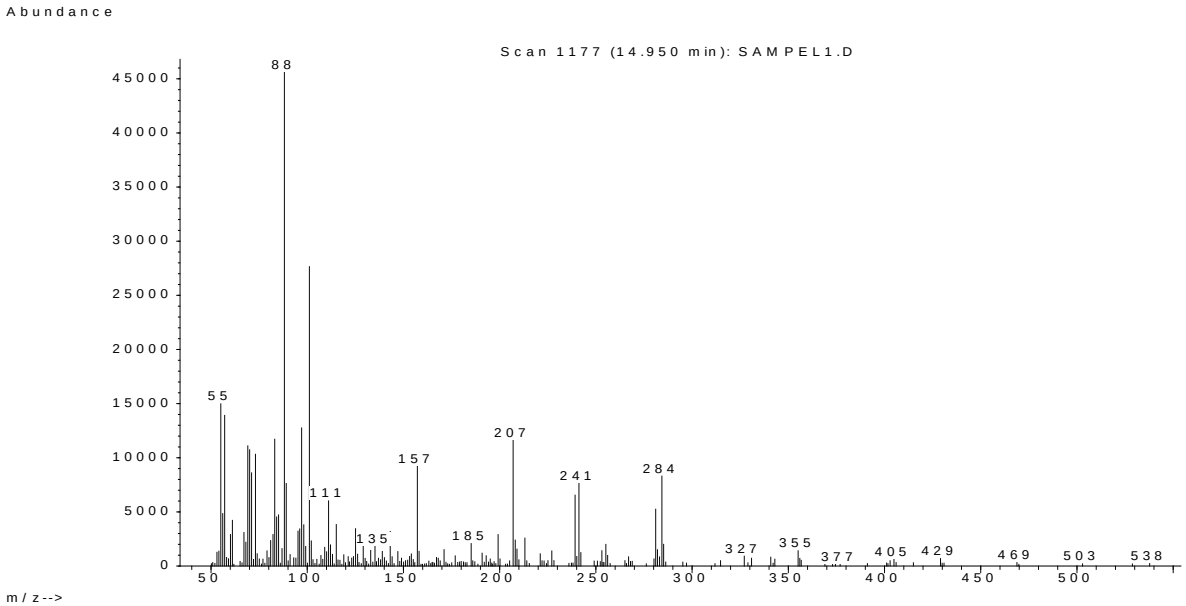
529
577
m/z-->





Library Search Report

Data Path : E:\DATA INJEK 2014\MAHASISWA\S2 SETIA BUDI\PURNA\
Data File : SAMPEL1.D
Acq On : 7 Jul 2014 10:52
Operator : AHMAD PURNAWARMAN
Sample : EKSTRAK KULIT BATANG MOJO
Misc : UNIV.SETIA BUDI
ALS Vial : 1 Sample Multiplier: 1

Search Libraries: C:\Database\WILLEY09TH.L Minimum Quality: 0

Unknown Spectrum: Apex
Integration Events: Chemstation Integrator - VINA.E

Pk#	RT	Area%	Library/ID	Ref#	CAS#	Qual
1	6.52	3.62	C:\Database\WILLEY09TH.L Phenol (CAS) $$ Izal $$ PhOH $$ Be nzenol $$ Oxybenzene $$ Monophenol	7624	000108-95-2	87
2	7.72	2.95	C:\Database\WILLEY09TH.L Phenol, 2-methoxy- $$ Phenol, o-me thoxy- $$ o-Guaiacol $$ o-Hydroxya nisole	28590	000090-05-1	94
3	9.90	0.65	C:\Database\WILLEY09TH.L 2-Methoxy-4-vinylphenol $$ Phenol, 4-ethenyl-2-methoxy- $$ p-Vinylgu aiacol	66050	007786-61-0	87
			Thymol $$ Phenol, 5-methyl-2-(1-me thylethyl)- $$ p-Cymen-3-ol $$ Thy	66478	000089-83-8	80
4	11.19	2.09	C:\Database\WILLEY09TH.L TETRADECAMETHYLCYCLOHEPTASILOXANE $$ Cycloheptasiloxane, tetradecame thyl- (CAS)	755136	000107-50-6	81
6	13.08	2.02	C:\Database\WILLEY09TH.L Phenol, 2,6-dimethoxy-4-(2-propeny l)- $$ Phenol, 4-allyl-2,6-dimetho xy-	163850	006627-88-9	89
7	13.42	2.45	C:\Database\WILLEY09TH.L 4-((1E)-3-Hydroxy-1-propenyl)-2-me thoxyphenol	129869	999129-86-9	96
8	14.51	1.18	C:\Database\WILLEY09TH.L Hexadecanoic acid, methyl ester (C AS) $$ Methyl palmitate $$ Uniphat A60	377200	000112-39-0	97
			Hexadecanoic acid, methyl ester $$	377172	000112-39-0	93

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                 Palmitic acid, methyl ester $$ Un
                iphat A60
                Hexadecanoic acid, methyl ester $$ 377171
000112-39-0 93
                 Palmitic acid, methyl ester $$ Un
                iphat A60

 9  14.57  1.85 C:\Database\WILLEY09TH.L
                1-Acetyl-2,2,6-trimethyl-9-formylb 275030
000000-00-0 91


 10  14.73  3.46 C:\Database\WILLEY09TH.L
                n-Hexadecanoic acid $$ Hexadecanoi 337721
000057-10-3 98
                c acid $$ n-Hexadecoic acid $$ Pal
                mitic acid


11  14.95  3.11 C:\Database\WILLEY09TH.L
                Hexadecanoic acid, ethyl ester $$  415903
000628-97-7 89
                Palmitic acid, ethyl ester $$ Ethy
                l palmitate
12  15.18  0.82 C:\Database\WILLEY09TH.L
                4-[1-(2-Aminophenyl)iminoethyl]-3- 473347
999473-34-7 86
                methyl-1-phenyl-5-hydroxypyrazole

13  15.57  1.45 C:\Database\WILLEY09TH.L
                1-Acetyl-2,2,6-trimethyl-9-formylb 275030
000000-00-0 90
                icyclo[4.3.0]nonane

14  16.32  1.30 C:\Database\WILLEY09TH.L
                Octadecanoic acid, ethyl ester (CA 489648
000111-61-5 83
                S) $$ Ethyl stearate $$ Ethyl octa
                decanoate
```

Mon Jul 07 11:07:12 2014