DAFTAR PUSTAKA

Adawiyah R., Yusriadi., & Dermiati T., (2019). Uji Aktivitas Antidiabetes Fraksi Kulit Buah Rambutan (*Nephelium lappaceum* L.) Pada Tikus Putih Jantan (*Rattus norvegicus*). *Farmakologika Jurnal Farmasi.*Vol.XVI.https://jfarma.org/index.php/farmakologika/article/view/53.

Apriliana E. & Hawarima V., (2016). Kandungan Buah Rambutan (*Nephelium lappaceum* L.) sebagai Antibakteri terhadap E. coli Penyebab Diare. *Jurnal Biologi Medik.* 126-130. http://juke.kedokteran.unila.ac.id/index.php/majority/article/view/1088/928.

Annisa, B. N., Tama, A. P., Sa'adah, C. N., & Sary, N. V. (2021). Metode Isolasi Flavonoid pada Tumbuhan di Indonesia Bunga. *Pharmacine*, *02*, 22–35.

Anggara D., Meassy Shawitry H., Alvika Musfitasari. *et al*., (2019). Potensi Limbah Kulit Rambutan (*Nephelium lappaceum* L.) sebagai Minuman Seduhan Herbal. *Jurnal Agroteknologi*. Vol.13 No.02. doi: 10.13140/RG.2.1.2424.9042.

Astuti, E., Ahmad, A., & Dali, S., (2019). Pengaruh Ion Logam Mg (II) terhadap Aktivitas Antioksidan Ekstrak Etanol Kulit Rambutan (*Nephelium lappaceum* L.). *Jurnal Akta Kimia Indonesia.* 11(1), 46. https://doi.org/10.20956/ica.v11i1.6403.

Azwir, Said Nazaruddin, Chairuni AR, M. R. M. (2021). Inventarisasi Hama Insecta Pada Tanaman Rambutan (*Nephelium lappaceum* L.) dan Upaya Pemberantasannya Secara Alami di Gampong Seuot Kecamatan Iindrapuri Kabupaten Aceh Besar. Biology Education, 9 (November), 114–122. doi: 10.32672/jbe.v9i2.3720.

Chang, C. C., Yang, M. H., Wen, H. M., & Chern, J. C. (2002). Estimation of total flavonoid content in propolis by two complementary colometric methods. *Journal of Food and Drug Analysis*, *10*(3), 178–182. https://doi.org/10.38212/2224-6614.2748.

Da Silva, A. B., Cerqueira Coelho, P. L., das Neves Oliveira, M., Oliveira, J. L., Oliveira Amparo, J. A., da Silva, K. C., Soares, J. R. P., Pitanga, B. P. S., dos Santos Souza, C., de Faria Lopes, G. P., da Silva, V. D. A., de Fátima Dias Costa, M., Junier, M. P., Chneiweiss, H., Moura-Neto, V., & Costa, S. L. (2020). The flavonoid rutin and its aglycone quercetin modulate the microglia inflammatory profile improving antiglioma activity*. Brain, Behavior, and Immunity*, *85* (January), 170–185. https://doi.org/10.1016/j.bbi.2019.05.003.

Dupont, M. F., Elbourne, A., Cozzolino, D., Chapman, J., Truong, V. K., Crawford, R. J., & Latham, K., (2020). Chemometrics for environmental monitoring: A review. *Analytical Methods*, *12* (38), 4597–4620. https://doi.org/10.1039/d0ay01389g.

Escandar, G.M., & Damiani, P,C,H., (2006). *A review of multivariate calibration methods applied to biomedical analysis.* Microchem.J. 82: 29–42.

Gandjar, G.H & Rohman, A., (2007). *Kimia Farmasi Analisis: Spektrofotometri Infra Merah.* Buku. Yogyakarta. Pustaka Pelajar.136.

Ganeshpurkar A, Saluja AK. (2017). The Pharmacological Potential of Rutin. *Saudi Pharm J*. 25(2):149-164. doi:10.1016/j.jsps.2016.04.025.

Gemperline, P., and Francis G. (2006). *Practical Guide to Chemometrics: Second Edition. France:* Taylor & Francis.

Giuliani, A., (2017). The application of principal component analysis to drug discovery and biomedical data. *Drug Discovery Today*, *22*(7), 1069–1076. https://doi.org/10.1016/j.drudis.2017.01.005.

Hernández-Hernández, C., Aguilar, C. N., Rodríguez-Herrera, R., Flores-Gallegos, A. C., Morlett-Chávez, J., Govea-Salas, M., & Ascacio-Valdés, J. A., (2019). hairy tropical fruit (*Nephelium lappaceum* L.): Nutritional and functional properties. *Trends in Food Science and Technology.* 85, 201–210. https://doi.org/10.1016/j.tifs.2019.01.018.

Jahurul, M. H. A., Azzatul, F. S., Sharifudin, M. S., Norliza, M. J., Hasmadi, M., Lee, J. S. & Zaidul, I. S. M. (2020). Functional and nutritional properties of hairy tropical fruit (*Nephelium lappaceum* L.) seed and it's industrial application: A review. *Trends in Food Science & Technology,* 99, 367-374.

Jing, D., Wan Deguang, Huang Linfang, Chen Shilin, & Qin Minjian., (2006). Application of chemometric sinquality evaluation of medicinal plants. *Journal of Medicinal Plants Research.* Vol. 5(17), pp. 4001-4008.

Karnjanawipagul, P., W. Nittayanuntawech, P. Rojsanga & L. Suntornsuk., (2010). Analysis of β-Carotene in Carrot by Spectrophotometry. *Journal of Pharmaceutical Science.* 37 (1-2): 8 – 16.

Kementerian Kesehatan RI. (2017). *Farmakope Herbal Indonesia Edisi II*. Jakarta: Kementerian Kesehatan RI.

Lavine, J.B., Workman, (2010). *Chemometrics.* Anal.Chem. Buku. 82: 4699–4711.

Leba, Maria Aloisia Uron., (2017). *Ekstraksi dan Real Kromatografi*. Yogyakarta: Deepublish. Hal 1-3.

Li, W., Zeng, J., & Shao, Y., (2018). Hairy Tropical Fruit— *Nephelium lappaceum. Exotic Fruits*, 369–375. https://doi.org/10.1016/b978-0-12-803138-4.00048-4.

Li, Y., Li, Z., Hou, H., Zhuang, Y., & Sun, L. (2018). Metal chelating, inhibitory DNA damage, and anti-inflammatory activities of phenolics from hairy tropical fruit (nephelium lappaceum) peel and the quantifications of geraniin and corilagin. *Molecules*, *23*(9). https://doi.org/10.3390/molecules23092263.

Mahmood, K., Kamilah, H., Alias, A. K., & Ariffin, F. (2018). Nutritional and therapeutic potentials of hairy tropical fruit (*Nephelium lappaceum* L.) and the by-products: a review. *Journal of Food Measurement and Characterization,* 12, 1556-1571.

Majid, Fajrawati., (2019). Analisis Kemometrik Ekstrak Daun Sukun *(Atrocarpus altilis* (Parkinson) Fosberg) Berdasarkan KLT-Densitometri dan Spektroskopi Infra Red (FTIR). *Jurnal Farmasi Herbal*. Universitas Hasanuddin Makassar.

Mendez-Flores, Adriana[1]; Hérnandez-Almanza, Ayerim[1]; Sáenz-Galindo, Aidé[2]; Morlett-Chávez, Jesús[3]; Aguilar, Cristóbal N[1]; Ascacio-Valdés, Juan[1,], (2018). *Ultrasound-assisted extraction of antioxidant polyphenolic*

compounds from Nephelium lappaceum L. (Mexican variety) husk. Asian Pacific Journal of Tropical Medicine 11(12):p 676-681, December 2018. DOI: 10.4103/1995-7645.248339.

Munawar, A. A., (2020). *Analisis Data Multivariat Menggunakan The Unscrambler X*. Syiah Kuala University Press.

Najib, A. (2018). *Ekstraksi Senyawa Bahan Alami.* Buku. Yogyakarta: Deepublish.

National Museum of Natural History, Smithsonian Institution (2023). Integrated Taxonomic Information System (ITIS). Checklist dataset https://doi.org/10.5066/f7kh0kbk accessed via GBIF.org.

Ondagau, D. C., Ridhay, A., & Nurakhirawati, N. (2019). KARAKTERISASI PIGMEN HASIL EKSTRAKSI AIR-ETANOL DARI BUAH SENGGANI (Melastoma malabathricum). *KOVALEN: Jurnal Riset Kimia*, *4*(3), 228–236. https://doi.org/10.22487/kovalen.2018.v4.i3.11848.

Pellegrini, M., Zoghi, M., & Jaberzadeh, S., (2018). *Cluster Analysis and Subgrouping to Investigate Inter-Individual Variability to Non-Invasive Brain Stimulation: A systematic review.* Reviews in the Neurosciences, 29(6), 675–697. https://doi.org/10.1515/revneuro-2017-0083.

Perumal, A., AlSalhi, M. S., Kanakarajan, S., Devanesan, S., Selvaraj, R., & Tamizhazhagan, V. (2021). Phytochemical evaluation and anticancer activity of hairy tropical fruit (*Nephelium lappaceum*) endocarp extracts against human hepatocellular carcinoma (HepG-2) cells. *Saudi Journal of Biological Sciences*, *28*(3), 1816–1825. https://doi.org/10.1016/j.sjbs.2020.12.027.

Rahmat, S., & Suwarno, S. (2020). Analisa Spektroskopi Inframerah Transformasi Fourier dan Gas Terlarut Terhadap Perubahan Gugus Fungsi Komposisi Minyak Ester. *Infotekmesin*, *11*(1), 14–23. https://doi.org/10.35970/infotekmesin.v11i1.63.

Ramos, L. S., Beebe, W. P., Carey. (1986). *Chemometrics*. Analysis Chemometric. 58: 294–315.

Rana, A. C., & Gulliya, B. (2019). Chemistry and pharmacology of flavonoids-a review. *Indian Journal of Pharmaceutical Education and Research*, *53*(1), 8–20. https://doi.org/10.5530/ijper.53.1.3.

Rengganis Ayu Pramudya W, Renggan, & Supartono, (2015). *Uji Aktivitas Antibakteri Kulit Buah Rambutan (Nephelium lappacheum) Pada Bakteri.* Indonesian Journal of Chemical Science. Universitas Negeri Semarang. http://journal.unnes.ac.id/sju/index.php/ijcs.

Risal, Y. (2020). Analisis Kemometrik Senyawa Inhibitor Tirosinase Menggunakan Spektrofotometer IR (FTIR). *Majalah Farmasi Dan Farmakologi*, *24*(2), 59–62. https://doi.org/10.20956/mff.24i2.10610.

Rohman, A., Irnawati & Florentinus Dika Octa Riswanto, (2021). *Kemometrika.* Buku. Yogyakarta: Gadja Madah University Press. ISBN: 978-602-386-936-7.

Salehi, B., Venditti, A., Sharifi-Rad, M., Kręgiel, D., Sharifi-Rad, J., Durazzo, A., Lucarini, M., Santini, A., Souto, E. B., Novellino, E., Antolak, H., Azzini, E., Setzer, W. N., & Martins, N., (2019). The therapeutic potential of Apigenin.

International Journal of Molecular Sciences. 20(6). https://doi.org/10.3390/ijms20061305.

Sari, D. Y., R, W., & AN, T. (2021). Penentuan Kadar Flavonoid Total Ekstrak Etanol Jamur Susu Harimau (Lignosus rhinocerus). *Jurnal Farmasi Udayana*, *10*(1), 23. https://doi.org/10.24843/jfu.2021.v10.i01.p03.

Suhandy, D. & Yulia, M. (2019). Tutorial Analisis Data Spektra Menggunakan the Unscrambler: Bagian 1 Klasifikasi. Yogyakarta: Graha Ilmu.

Santos, Marfran C. D., Yasmin M. Nascimento, Joelma D. Monteiro, Brenda E. B. Alves, Marília F. Melo, Anne A.P. Paiva, Hannaly W. B. Pereira, et al. (2018). "ATR-FTIR Spectroscopy with Chemometric Algorithms of Multivariate Classification in the Discrimination between Healthy vs. Dengue vs. Chikungunya vs. Zika Clinical Samples." *Analytical Methods* 10 (10): 1280–85. https://doi.org/10.1039/C7AY02784B.

Singh, P., Arif, Y., Bajguz, A., & Hayat, S. (2021). The role of quercetin in plants. *Plant Physiology and Biochemistry*, *166*, 10–19. https://doi.org/10.1016/j.plaphy.2021.05.023.

Sudarsono, Indah Purwantini, (2021). Standarisasi Obat Herbal. Gadja Mada University Press.

Sukmandari, N. S., Dash, G. K., Jusof, W. H. W., & Hanafi, M. (2017). A Review on *Nephelium lappaceum* L. *Research Journal of Pharmacy and Technology*, *10*(8), 2819-2822.

Suhendi, A., Muhtadi, M., & Sutrisna, E. (2019). Anti-inflammatory and antidiabetic of Channa striata powder and *Nephelium lappaceum* fruit peel ethanolic extracts on albino Wistar mice. *Drug Invention Today*, *12*(11), 2472–2476.

Sun, J., Peng, H., Su, W., Yao, J., Long, X., & Wang, J., (2011). Anthocyanins extracted from hairy tropical fruit (*Nephelium lappaceum* l.) pericarp tissues as potential natural antioxidants. *Journal of Food Biochemistry*, *35*(5), 1461–1467. https://doi.org/10.1111/j.1745-4514.2010.00467.x.

Tanaka, Y., Sasaki, N., Ohmiya, A., (2008). *Biosintesis pigmen tumbuhan:* Antosianin, Betalain dan Karotenoid. Jurnal Farmasi. 54, 733–749.

Tejamukti, E. P., Setyaningsih, W., Irnawati, Yasir, B., Alam, G., & Rohman, A. (2020). Application of FTIR spectroscopy and HPLC combined with multivariate calibration for analysis of xanthones in mangosteen extracts. *Scientia Pharmaceutica*, *88*(3), 35.

Tjitrosoepomo, Gembong. (2013). Taksonomi Tumbuhan (Spermatophyta). Yogyakarta : Gadjah Mada University Press.

Tsong, J. L., Poh, L., Goh, W., Gansau, J. A., & How, S. (2021). *Hairy tropical fruit-Ake : A High Potential Supplement*. https://doi.org/doi.org/10.3390/molecules26227005.

Tingting, Z., Xiuli, Z., Kun, W., Liping, S., & Yongliang, Z. (2022). A review: extraction, phytochemicals, and biological activities on *Nephelium lappaceum* L. peel extract. Heliyon. https://doi.org/10.1016/j.

Wang, T. yang, Li, Q., & Bi, K. shun. (2018). Bioactive flavonoids in medicinal plants: Structure, activity and biological fate. *Asian Journal of*

Pharmaceutical Sciences, *13*(1), 12–23. https://doi.org/10.1016/j.ajps.2017.08.004.

Widyaningrum, H., (2011). *Kitab Tanaman Obat Nusantara*. Med Press (Anggota IKAPI): Yogyakarta.

Winingsih, W.-, Ulfa, M.-, & Suprijana, O.-. (2018). PENGGUNAAN FTIR-ATR ZnSe (FOURIER TRANSFORM INFRA RED) UNTUK PENETAPAN KADAR KUERSETIN DALAM TEH HITAM (Camellia sinensis L.). *Jurnal Sains Dan Teknologi Farmasi Indonesia*, *5*(1), 47–53. https://doi.org/10.58327/jstfi.v5i1.53

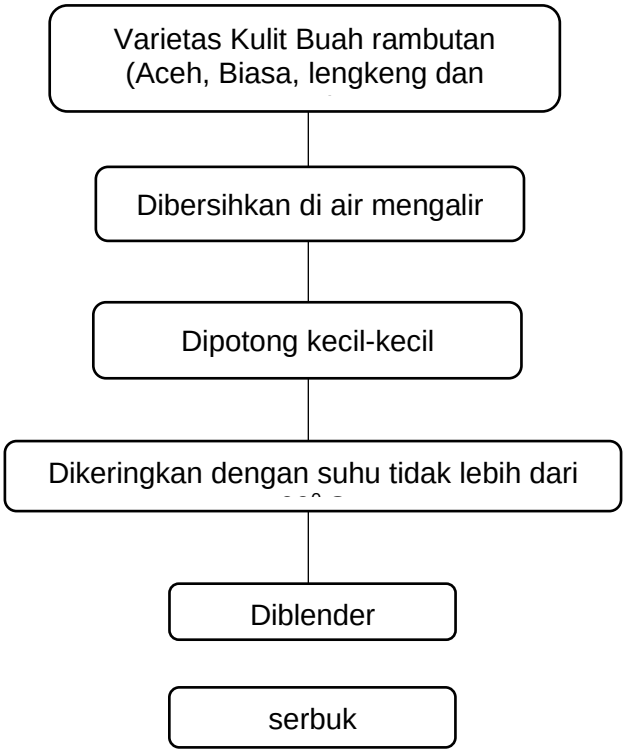
Yassir, M., & Asnah, A. (2019). Pemanfaatan Jenis Tumbuhan Obat Tradisional Di Desa Batu Hamparan Kabupaten Aceh Tenggara. BIOTIK: *Jurnal Ilmiah Biologi Teknologi Dan Kependidikan,* 6 (1), 17. https://doi.org/10.22373/biotik.v6i1.4039.

Zou, H.B., Yang, G.S., Qin, Z.R., Jiang, W.Q., Du, A.Q. dan Aboul-Enein, H.Y., (2005). *Progress in Quality Control of Herbal Medicine With IR Fingerprint Spectra.* Analitical Letters 38: 1457-1475.

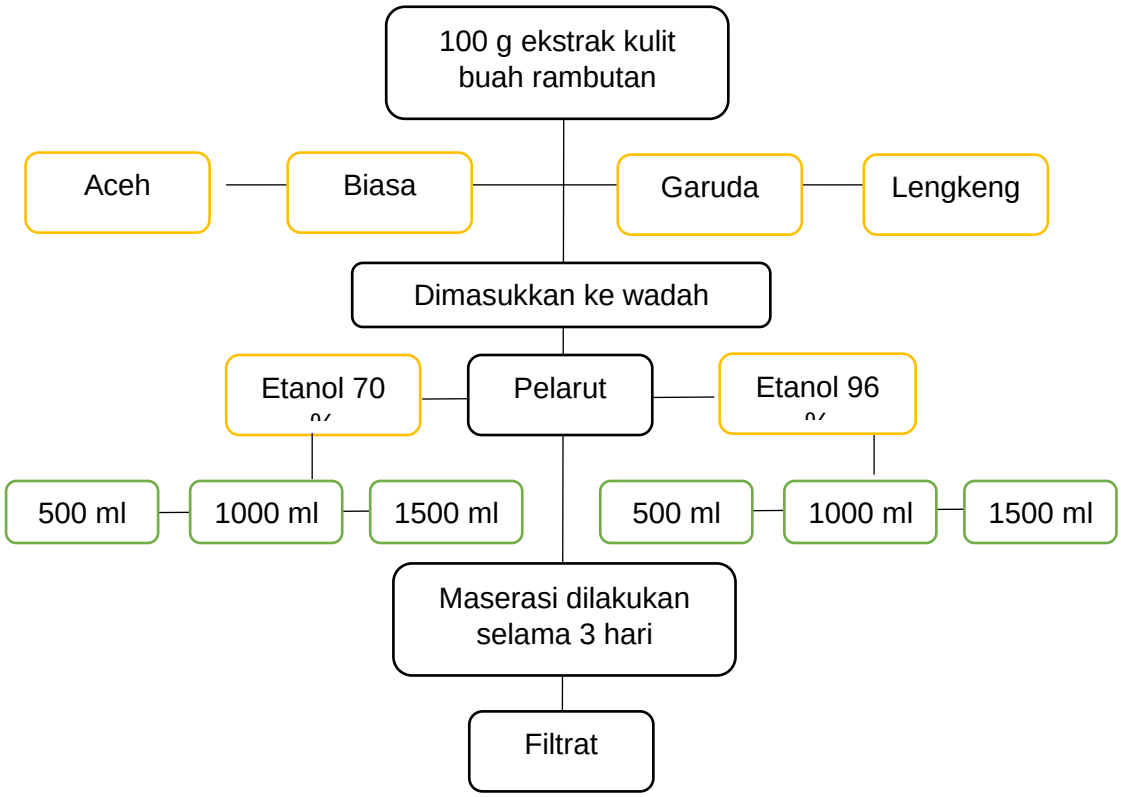
LAMPIRAN

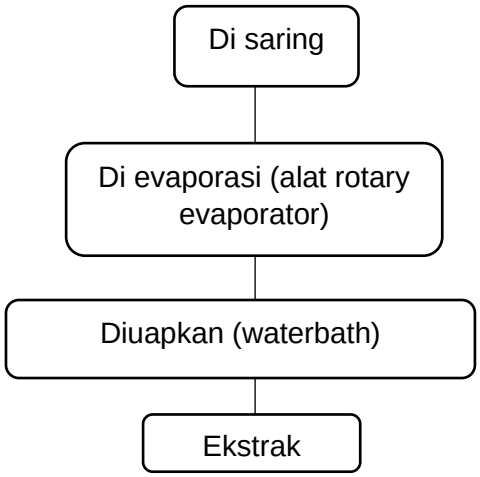
Lampiran 1. Skema Kerja

1.1 Pengumpulan dan penyiapan Sampel

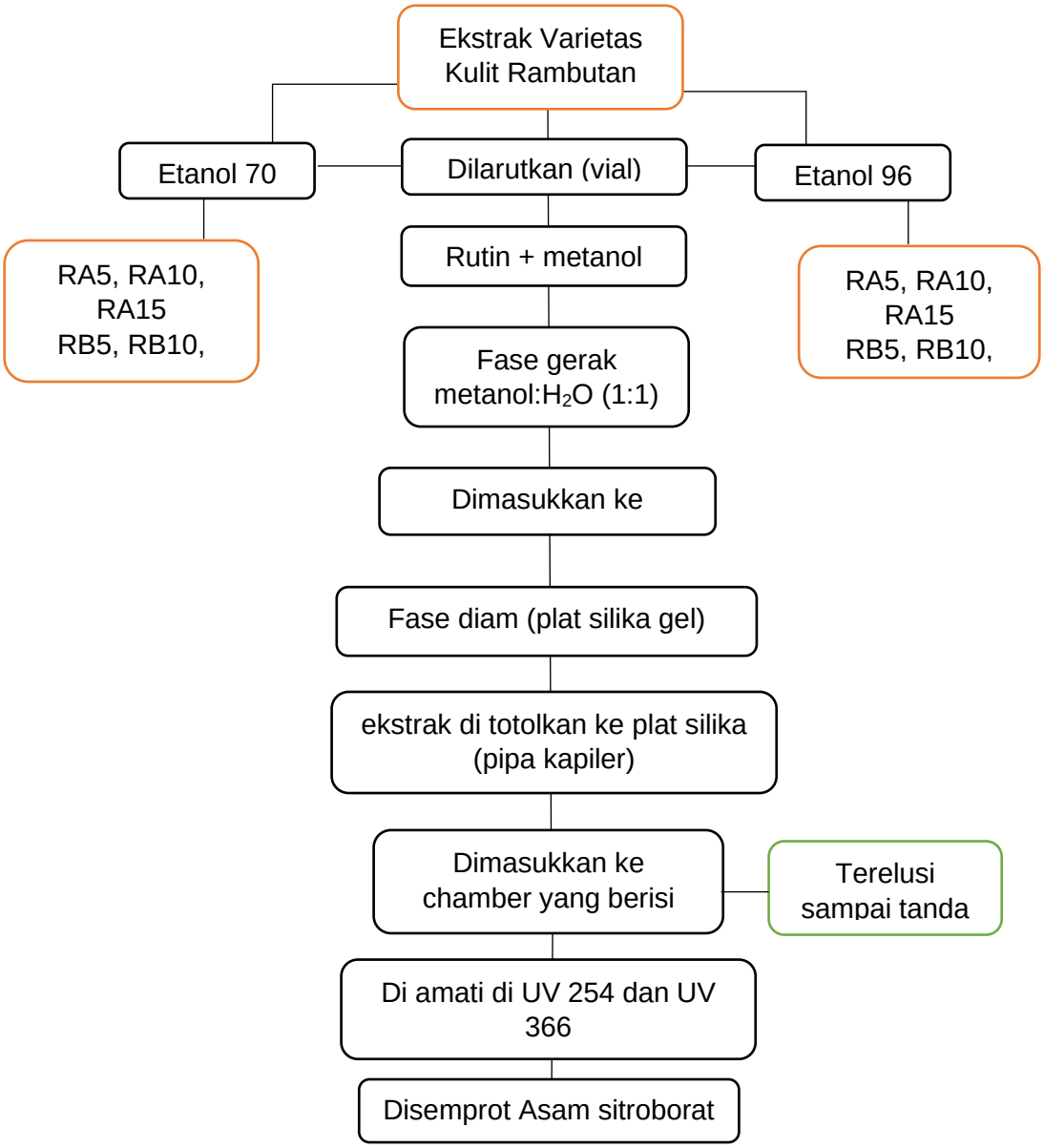


1.2 Pembuatan Ekstrak



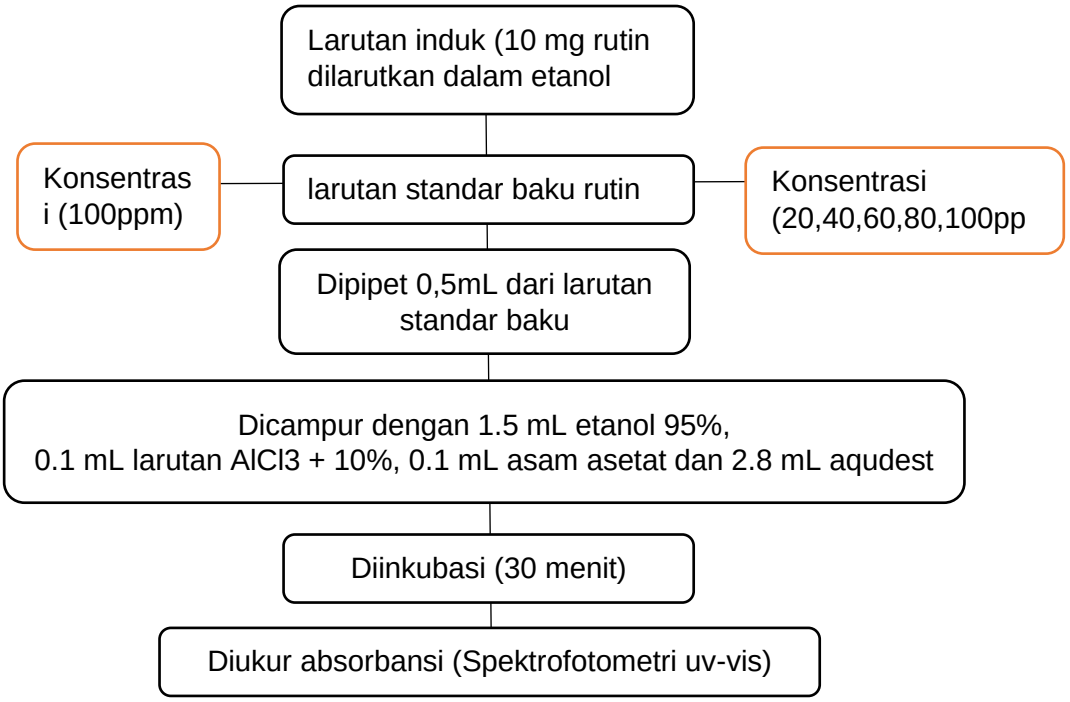


1.3 Kromatografi Lapis Tipis

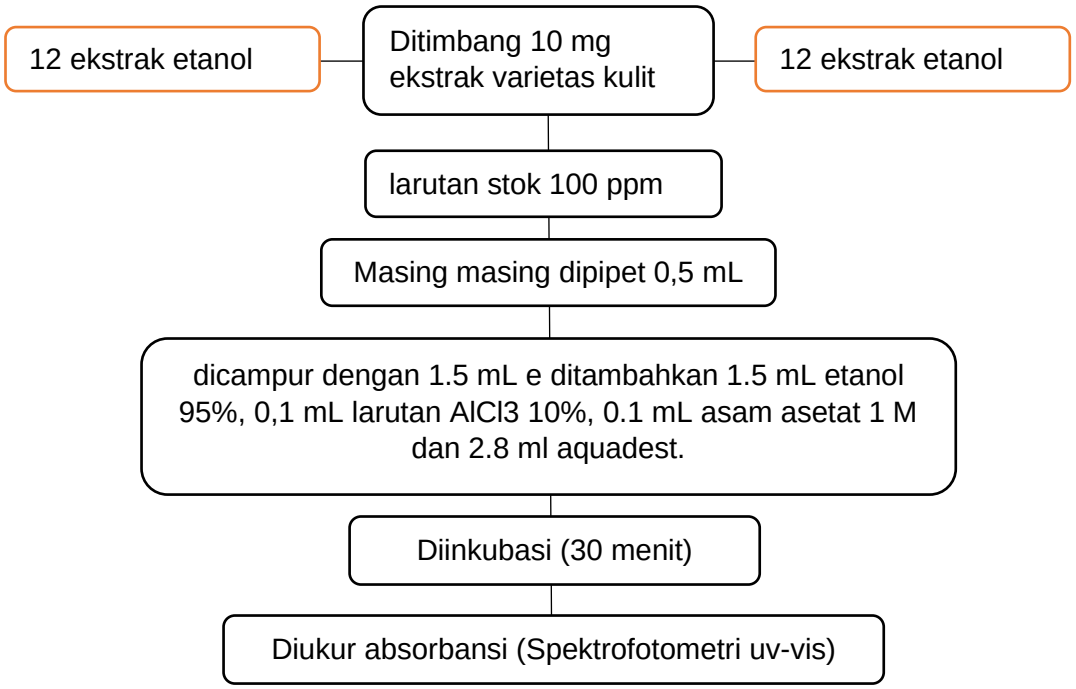


1.4 Pengukuran Kadar Flavonoid Total

a. Penentuan panjang gelombang maks dan kurva standar rutin



b. Penentuan Kadar Flavonoid Total Ekstrak kulit buah rambutan



Lampiran 2. Gambar

2.1 Sampel

 Rambutan Aceh	 Rambutan Biasa
 Rambutan Garuda	 Rambutan Lengkeng

2.2 Pengumpulan dan Penyiapan Sampel

 Masing-masing kulit buah rambutan di bersihkan dengan air mengalir hingga bersih	 Sampel kulit buah rambutan Dipotong-potong kecil
 Dikeringkan dibawah sinar matahari	 Selanjutnya di oven suhu tidak lebih 60^0

 Simplisia Kulit Rambutan Aceh	 Simplisia Kulit Rambutan Biasa
 Simplisia Kulit Rambutan Lengkeng	 Simplisia Kulit Rambutan Garuda
 Ditimbang simplisia kering	 Diblender hingga diperoleh serbuk

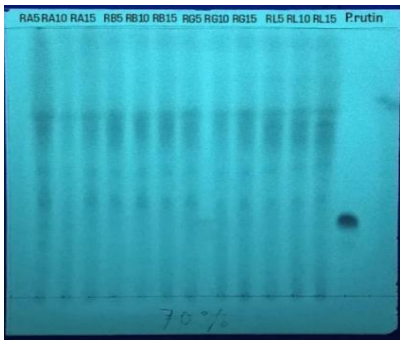
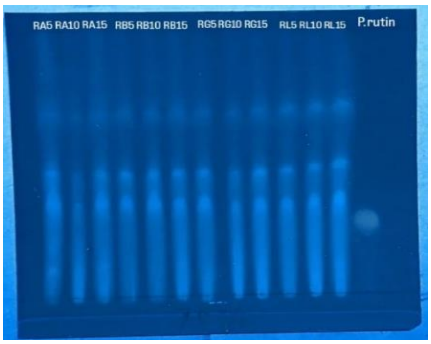
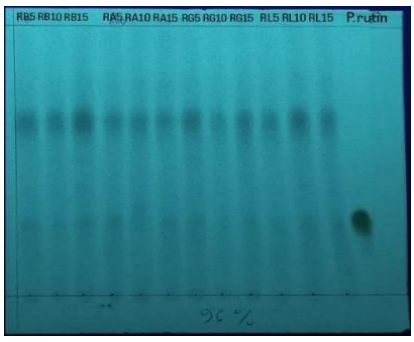
2.3 Ekstraksi

2.3.1 Maserasi

 Ditimbang serbuk simplisia 100 g	 Dimaserasi menggunakan pelarut etanol 70% dan etanol 96% dengan menvariasikan rasio (1:5, 1:10, dan 1:15)
 Dilakukan pengadukan setiap 24 jam	 Pelarut disaring pada hari ke-3
 Dievaporasi menggunakan rotary evaporator	 Diperoleh ekstrak kental dan di angina-anginkan di waterbath suhu 60^0C

2.4 Uji kualitatif

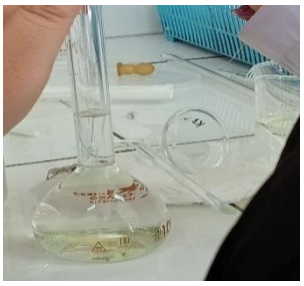
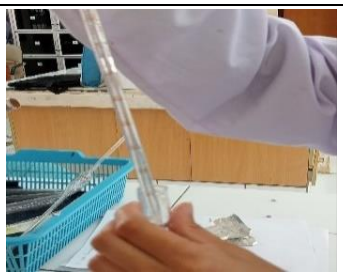
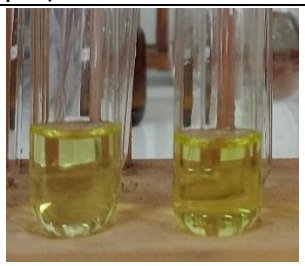
2.4.1 Kromatografi Lapis Tipis

 Disiapkan alat dan bahan : metanol p.a , water one, chamber, plat KLT RP-18, pipa kapiler, pipet tetes, gelas ukur, gegep dan pinset	 Masing-masing ekstrak diambil dan dilarutkan diwadah vial menggunakan pelarut etanol 70% dan etanol 96%
 Ditotolkan pada lempeng silika gel. Setelah totolan mengering lempeng KLT dimasukkan ke chamber yang sudah jenuh dengan fase gerak (eluen)	 Terjadi proses eludasi sampai tanda batas.
 Ekstrak etanol 70% UV 254 nm	 Ekstrak etanol 70% UV 366 nm
 Ekstrak etanol 96% UV 254 nm	 Ekstrak etanol 96% UV 366 nm

2.5 Uji kuantitatif

2.5.1 Pengukuran Kadar Flavonoid Total

a. Penentuan larutan standar Rutin

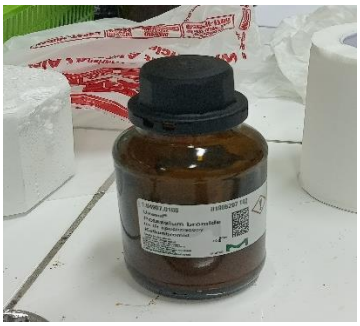
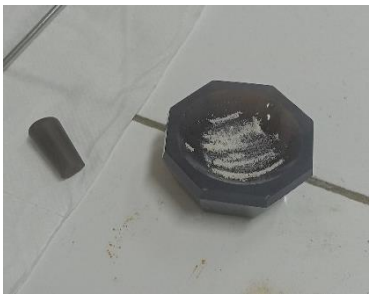
 Ditimbang rutin 10 mg	 Larutan induk rutin 1000 ppm
 Dibuat larutan standar (20ppm, 40ppm, 60 ppm, 80ppm dan 100ppm)	 Dari larutan standar di pipet 0,5 ml
 Ditambah 1.5 ml etanol 95% dan 0,1 ml $AlCl_3$ 10%	 Ditambahkan 0,1 Asam asetat 1 M, 2.8 ml aquadest dan inkubasi selama 30 menit
 Absorbansi diukur dengan spektrofotometer UV-Vis pada λ maksimum rutin.	

b. Penentuan Kadar Total Flavonoid Ekstrak Kulit Buah Rambutan

 Ditimbang ekstrak 10 mg	 Dilarutkan hingga 10 mL dengan metanol pa.
 Ekstrak di vortex	 Ekstrak dipipet sebanyak 1 ml
 Ditambahkan 3 ml metanol pa	 0,2 AlCl3 10 %, 0,2 Asam asetat 1 M dan diinkubasi selama 30 menit

 Absorbansi diukur dengan spektrofotometer UV-Vis pada λ maksimum rutin.	

2.6 *Spektroskopi Fourier Transform Infra Red* (FTIR)

 Ekstrak kulit buah rambutan	 Kalium Bromida (KBr)
 KBr digerus dimortir+campurkan sampel ekstrak dan Kbr	 Dimasukkan ke dalam wadah dan lakukan pengoperasian pada komputer

Lampiran 3. Perhitungan

3.1 Perhitungan Rendemen (%)

$$\text{Rumus : Rendemen} = \frac{\text{Berat Ekstrak Etanol}}{\text{Berat Simplisia}} \times 100\%$$

1. $\%\ \text{Rendemen} = \frac{11.26\ \text{gr}}{100\ \text{gr}} = 11.26\ \%$
2. $\%\ \text{Rendemen} = \frac{12.99\ \text{gr}}{100\ \text{gr}} = 12.99\ \%$
3. $\%\ \text{Rendemen} = \frac{11.18\ \text{gr}}{100\ \text{gr}} = 11.18\ \%$
4. $\%\ \text{Rendemen} = \frac{13.28\ \text{gr}}{100\ \text{gr}} = 13.28\ \%$
5. $\%\ \text{Rendemen} = \frac{15.02\ \text{gr}}{100\ \text{gr}} = 15.02\ \%$
6. $\%\ \text{Rendemen} = \frac{15.13\ \text{gr}}{100\ \text{gr}} = 15.13\ \%$
7. $\%\ \text{Rendemen} = \frac{18.23\ \text{gr}}{100\ \text{gr}} = 18.23\ \%$
8. $\%\ \text{Rendemen} = \frac{20.13\ \text{gr}}{100\ \text{gr}} = 12.13\ \%$
9. $\%\ \text{Rendemen} = \frac{16.09\ \text{gr}}{100\ \text{gr}} = 16.09\ \%$
10. $\%\ \text{Rendemen} = \frac{22.06\ \text{gr}}{100\ \text{gr}} = 12.06\ \%$
11. $\%\ \text{Rendemen} = \frac{22.26\ \text{gr}}{100\ \text{gr}} = 12.26\ \%$

12. % Rendemen $= \frac{12.41\ \text{gr}}{100\ \text{gr}} = 12.41\ \%$

13. % Rendemen $= \frac{20.06\ \text{gr}}{100\ \text{gr}} = 13.06\ \%$

14. % Rendemen $= \frac{20.64\ \text{gr}}{100\ \text{gr}} = 16.64\ \%$

15. % Rendemen $= \frac{17.57\ \text{gr}}{100\ \text{gr}} = 17.57\ \%$

16. % Rendemen $= \frac{19.57\ \text{gr}}{100\ \text{gr}} = 15.57\ \%$

17. % Rendemen $= \frac{21.28\ \text{gr}}{100\ \text{gr}} = 14.28\ \%$

18. % Rendemen $= \frac{15.23\ \text{gr}}{100\ \text{gr}} = 15.23\ \%$

19. % Rendemen $= \frac{21.36\ \text{gr}}{100\ \text{gr}} = 15.36\ \%$

20. % Rendemen $= \frac{23.51\ \text{gr}}{100\ \text{gr}} = 13.51\ \%$

21. % Rendemen $= \frac{16.33\ \text{gr}}{100\ \text{gr}} = 16.33\ \%$

22. % Rendemen $= \frac{17.01\ \text{gr}}{100\ \text{gr}} = 17.01\ \%$

23. % Rendemen $= \frac{18.18\ \text{gr}}{100\ \text{gr}} = 18.18\ \%$

3.2 Perhitungan Kromatografi Lapis Tipis

$$\textit{Rumus} : \mathrm{R_f} = \frac{\text{Jarak yang ditempuh noda}}{\text{Jarak yang ditempuh eluen}}$$

1. $\mathrm{RA_5}$ (Ekstrak Etanol 70 %)

$$\mathrm{R_f} = \frac{2}{6.5} = 0{,}30,\ \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

2. $\mathrm{RA_{10}}$

$$\mathrm{R_f} = \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

3. $\mathrm{RA_{15}}$

$$\mathrm{R_f} = \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

4. $\mathrm{RB_5}$

$$\mathrm{R_f} = \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

5. $\mathrm{RB_{10}}$

$$\mathrm{R_f} = \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

6. $\mathrm{RB_{15}}$

$$\mathrm{R_f} = \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

7. $\mathrm{RG_5}$

$$\mathrm{R_f} = \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

8. $\mathrm{RG_{10}}$

$$\mathrm{R_f} = \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

9. $\mathrm{RG_{15}}$

$$\mathrm{R_f} = \frac{2.5}{6.5} = 0.38,\quad \frac{3}{6.5} = 0.46,\quad \frac{4.5}{6.5} = 0.7$$

10. RL_5

$$R_f = \frac{2.5}{6.5} = 0.38, \quad \frac{3}{6.5} = 0.46, \quad \frac{4.5}{6.5} = 0.7$$

11. RL_{10}

$$R_f = \frac{2.5}{6.5} = 0.38, \quad \frac{3}{6.5} = 0.46, \quad \frac{4.5}{6.5} = 0.7$$

12. RL_{15}

$$R_f = \frac{2.5}{6.5} = 0.38, \quad \frac{3}{6.5} = 0.46, \quad \frac{4.5}{6.5} = 0.7$$

13. RA_5 (Ekstrak Etanol 96 %)

$$R_f = \frac{2}{6.5} = 0.3, \quad \frac{2}{6.5} = 0.3 \quad \frac{4.5}{6.5} = 0.7$$

14. RA_{10}

$$R_f = \frac{2.3}{6.5} = 0.35, \quad \frac{4.5}{6.5} = 0.7$$

15. RA_{15}

$$R_f = \frac{2}{6.5} = 0.3, \quad \frac{4.5}{6.5} = 0.7$$

16. RB_5

$$R_f = \frac{2}{6.5} = 0.3, \quad \frac{4.5}{6.5} = 0.7$$

17. RB_{10}

$$R_f = \frac{2}{6.5} = 0.3, \quad \frac{4.5}{6.5} = 0.7$$

18. RB_{15}

$$R_f = \frac{2}{6.5} = 0.3, \quad \frac{4.5}{6.5} = 0.7$$

19. RG_5

$$R_f = \frac{2}{6.5} = 0.3, \quad \frac{4.5}{6.5} = 0.7$$

20. RG_{10}

$$R_f = \frac{2}{6.5} = 0.3, \quad \frac{4.5}{6.5} = 0.7$$

21. RG_{15}

$$R_f = \frac{2.3}{6.5} = 0.35, \qquad \frac{4.5}{6.5} = 0.7$$

22. RL_5

$$R_f = \frac{2}{6.5} = 0.3, \qquad \frac{4.5}{6.5} = 0.7$$

23. RL_{10}

$$R_f = \frac{2}{6.5} = 0.3, \qquad \frac{4.5}{6.5} = 0.7$$

24. RL_{15}

$$R_f = \frac{2}{6.5} = 0.3, \qquad \frac{4.5}{6.5} = 0.7$$

3.4 Perhitungan Kadar Flavonoid Total

3.4.1 Pembuatan larutan

a. Asam Asetat (1M)

$$\mathrm{M} = \frac{\text{Massa Jenis} \times 10 \times 100\%}{13\ \mathrm{M}}$$

$$= \frac{1.05 \times 10 \times 100\%}{60.05} = 17.5$$

$$\mathrm{M_1} \times \mathrm{V_1} = \mathrm{M_2} \times \mathrm{V_2}$$

$$17.5 \times \mathrm{V_1} = 1 \times 250\ \mathrm{ml}$$

$$\mathrm{V_1} = 1 \times 100\ \mathrm{ml}$$

$$= \frac{100}{17.5} = 5.71\ \mathrm{ml}$$

b. $\mathrm{AlCl_3}$ (10 %)

$$\mathrm{M_1} \times \mathrm{V_1} = \mathrm{M_2} \times \mathrm{V_1}$$

$$100\% \times \mathrm{V_1} = 10\% \times 50\ \mathrm{ml}$$

$$= 5\ \mathrm{gram}$$

c. Etanol 80% $\mathrm{M_1} \times \mathrm{V_1} = \mathrm{M_2} \times \mathrm{V_2}$

$$100\% \times \mathrm{V_1} = 80\% \times 100\ \mathrm{ml}$$

$$1 \times \mathrm{V_1} = 0.8 \times 100\ \mathrm{ml}$$

$$\mathrm{V_1} = \frac{80}{1} = 80$$

3.4.2 Konsentrasi ppm (Larutan standar)

a. 20ppm $= \ M_1 \times V_1 = M_2 \times V_2$

$$1000\text{ppm} \times V_1 = 20\text{ppm} \times 10\text{ ml}$$

$$= \frac{200}{1000} = 0.2\text{ ml}$$

b. 40ppm $= \ M_1 \times V_1 = M_2 \times V_2$

$$1000\text{ppm} \times V_1 = 40\text{ppm} \times 10\text{ ml}$$

$$= \frac{400}{1000} = 0.4\text{ ml}$$

c. 60ppm $= \ M_1 \times V_1 = M_2 \times V_2$

$$1000\text{ppm} \times V_1 = 60\text{ppm} \times 10\text{ ml}$$

$$= \frac{600}{1000} = 0.6\text{ ml}$$

d. 80ppm $= \ M_1 \times V_1 = M_2 \times V_2$

$$1000\text{ppm} \times V_1 = 80\text{ppm} \times 10\text{ ml}$$

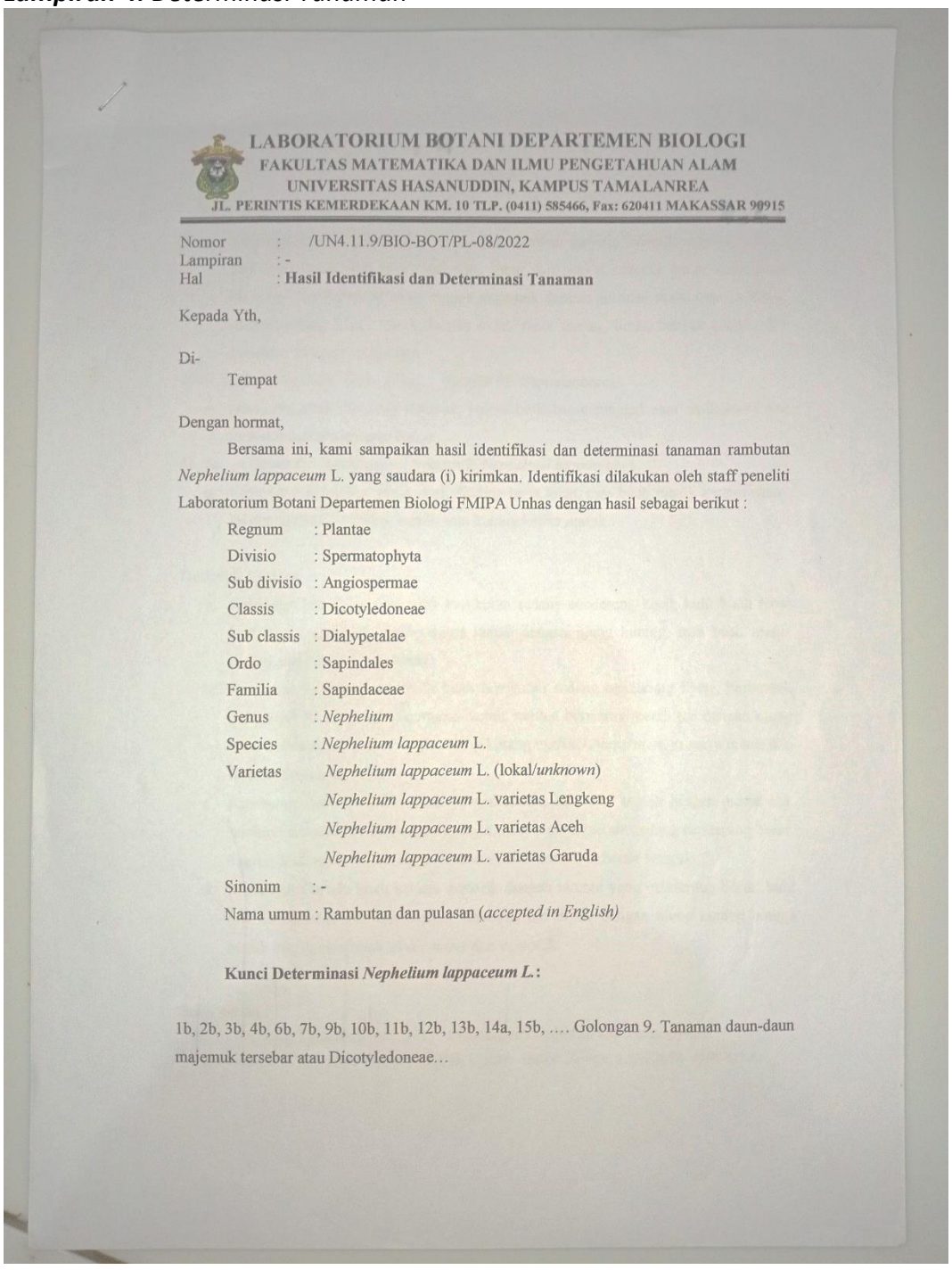
$$= \frac{800}{1000} = 0.8\text{ ml}$$

e. 100ppm $= \ M_1 \times V_1 = M_2 \times V_2$

$$1000\text{ppm} \times V_1 = 10\text{ ml}$$

$$= \frac{1000}{1000} = 1\text{ ml}$$

Lampiran 4. *Determinasi Tanaman*



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UNIVERSITAS HASANUDDIN, KAMPUS TAMALANREA
JL. PERINTIS KEMERDEKAAN KM. 10 TLP. (0411) 585466, Fax: 620411 MAKASSAR 90915

Nomor : /UN4.11.9/BIO-BOT/PL-08/2022
Lampiran : -
Hal : **Hasil Identifikasi dan Determinasi Tanaman**

Kepada Yth,

Di-
Tempat

Dengan hormat,

Bersama ini, kami sampaikan hasil identifikasi dan determinasi tanaman rambutan *Nephelium lappaceum* L. yang saudara (i) kirimkan. Identifikasi dilakukan oleh staff peneliti Laboratorium Botani Departemen Biologi FMIPA Unhas dengan hasil sebagai berikut :

Regnum : Plantae
Divisio : Spermatophyta
Sub divisio : Angiospermae
Classis : Dicotyledoneae
Sub classis : Dialypetalae
Ordo : Sapindales
Familia : Sapindaceae
Genus : *Nephelium*
Species : *Nephelium lappaceum* L.
Varietas *Nephelium lappaceum* L. (lokal/*unknown*)
Nephelium lappaceum L. varietas Lengkeng
Nephelium lappaceum L. varietas Aceh
Nephelium lappaceum L. varietas Garuda
Sinonim : -
Nama umum : Rambutan dan pulasan (*accepted in English)*

Kunci Determinasi *Nephelium lappaceum L.*:

1b, 2b, 3b, 4b, 6b, 7b, 9b, 10b, 11b, 12b, 13b, 14a, 15b, …. Golongan 9. Tanaman daun-daun majemuk tersebar atau Dicotyledoneae…

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a. Tanaman memiliki daun tersebar dengan susunan meyirip beranak, masing-masing daun berbentuk bulat telur, tepi rata, ujung dan pagkal runcing, pertulangan daun menyirip dan berwarna hijau. Bunga majemuk dengan susunan malai atau panicula, ukuran sedang 12-25 meter, batang bulat/ tidak teratur, lurus, banyak cabang dan berwarna kelabu kecokelatan.

197b, 208b, 219b, 220a, 221b, 222a, … Familia 69. Sapindacceae…

a. Daun majemuk menyirip beranak, bunga berkelamin tunggal atau aktinomorf dan tersusun dalam karangan bunga.

1b, 5a, … Genus 5. *Nephelium* … Spesies 2. *Nephelium lappaceum* L.

a. Kulit buah berambut, tanpa duri, dinding buah tebal, rasa buah manis sampai asam, tekstur lembut dan halus, merah atau kuning ketika masak.

Deskripsi varietas :

a. Rambutan lokal memiliki buah berukuran sedang cenderung kecil, kulit buah tebal berwarna merah, rambut berwarna merah dengan ujung kuning, rasa buah manis sedikit asam dan kurang berair.
b. Rambutan Lengkeng memiliki buah berukuran sedang cenderung besar, berbentuk bulat agak lonjong, kulit berwarna merah, rambut berwarna merah tua dengan ujung hijau kekuningan, daging buah sedang kurang ngelotok/terkelupas, rasanya manis dan mengandung banyak air.
c. Rambutan Aceh memiliki buah yang menarik, berwarna merah hingga merah tua, rambut berwarna merah dengan ujung kuning hingga merah, sedang cenderung besar, daging buah ngelotok/tekelupas, manis sedikit asam dan berair banyak.
d. Rambutan Garuda buah beruah menarik dengan ukuran yang cenderung besar, kulit buh berwarna merah tua, rambut berwarna merah tua dengan ujung kuning hingga merah tua, daging buah tebal, manis dan ngelotok.

Buku Acuan :

1. Gembong Tjitrosoepomo. 2013. Taksonomi Tumbuhan (Spermatopyhta).
2. National Plant Data Center, NRCB, USDA, Baton Rouge, LA 70874-4490 USA.

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3. Dr. c. g. g. j. Van Steenis, dkk. 2013. FLORA.
4. International Taxonomic Information System.

Demikian hasil identifikasi kami untuk diketahui dan dipergunakan sebagaimana mestinya.

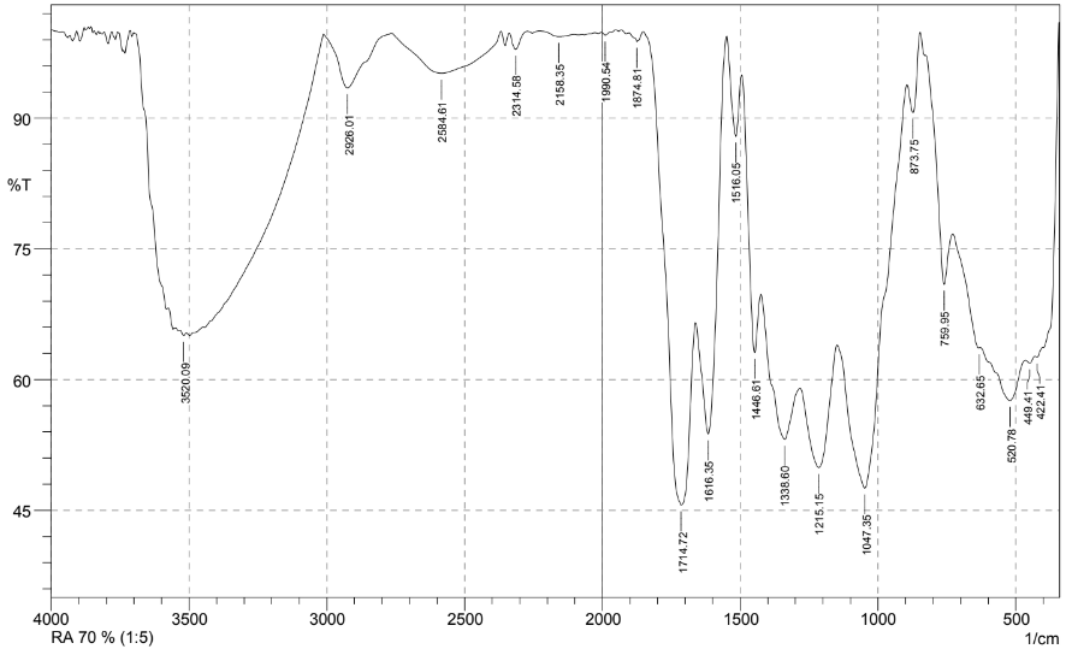
Makassar, 02 Agustus 2022

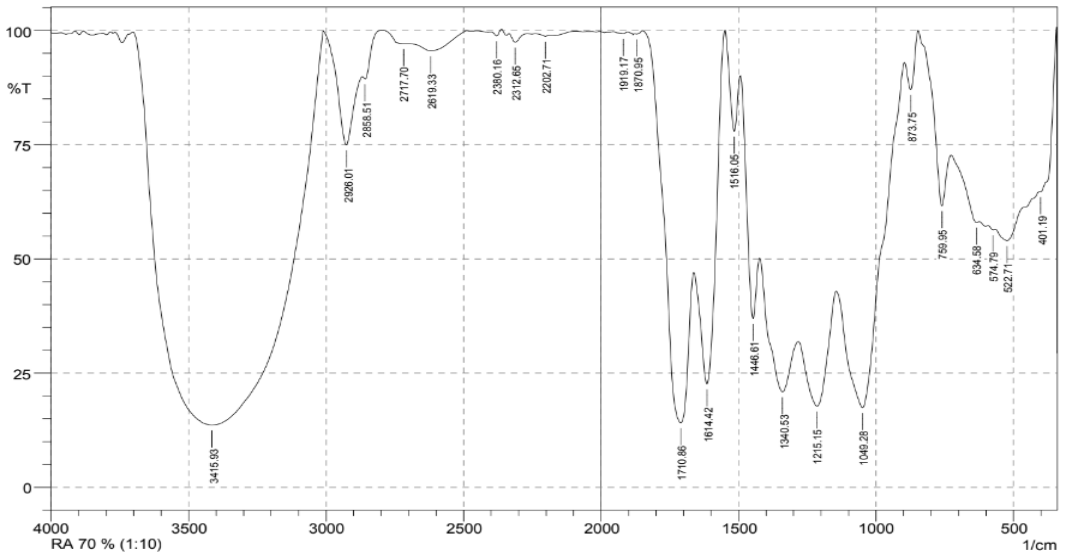
Kepala Laboratorium

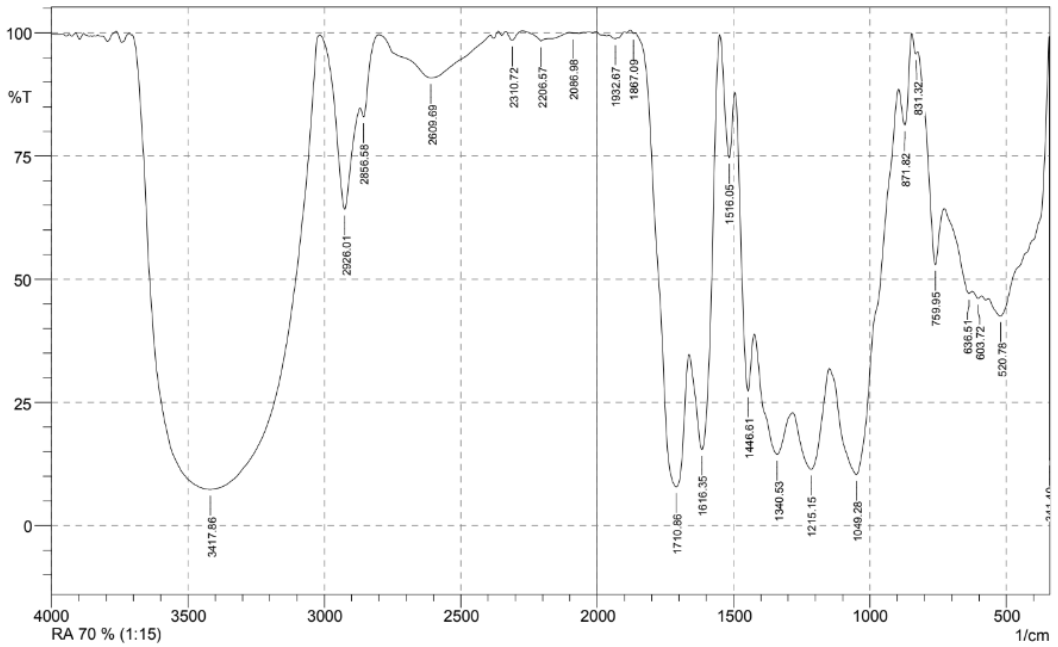
Dr. Andi Ilham Latunra, M.Si
NIP 19670207 199203 1 001

Lampiran 5. *Data spektrum IR ekstrak kulit rambutan*

Data spektrum ekstrak etanol Rambutan Aceh (RA)



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75
50
25
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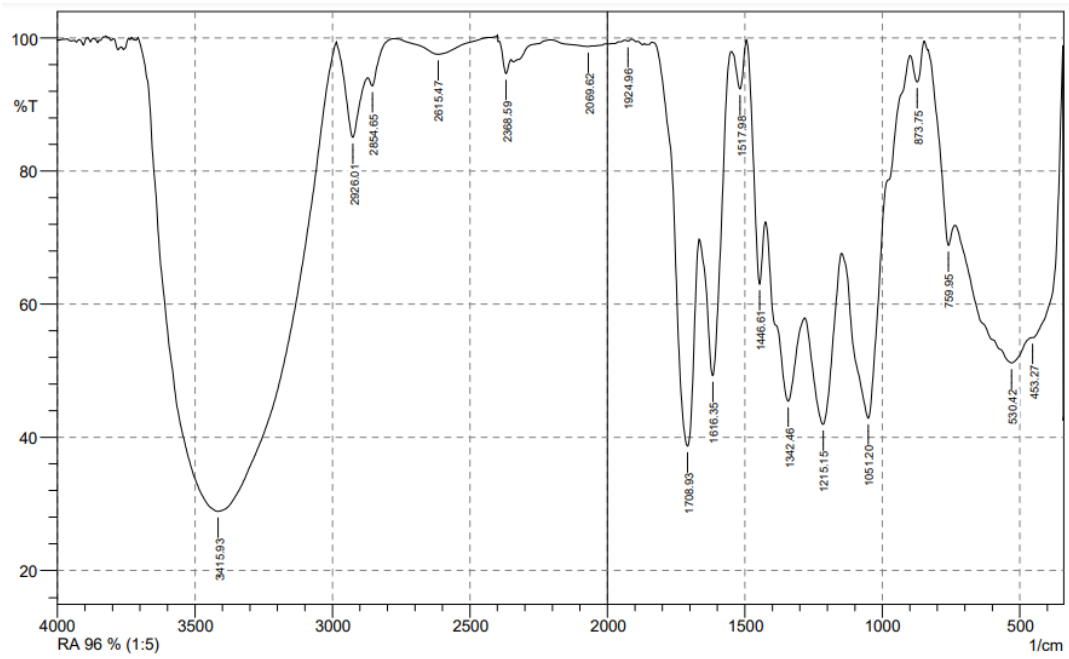
2926.01
2856.58
2609.69
2310.72
2206.57
2086.98
1932.67
1867.09
1710.86
1616.35
1516.05
1446.61
1340.53
1215.15
1049.28
871.82
831.32
759.95
636.51
603.72
520.78
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RA 70 % (1:15)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60
40
20
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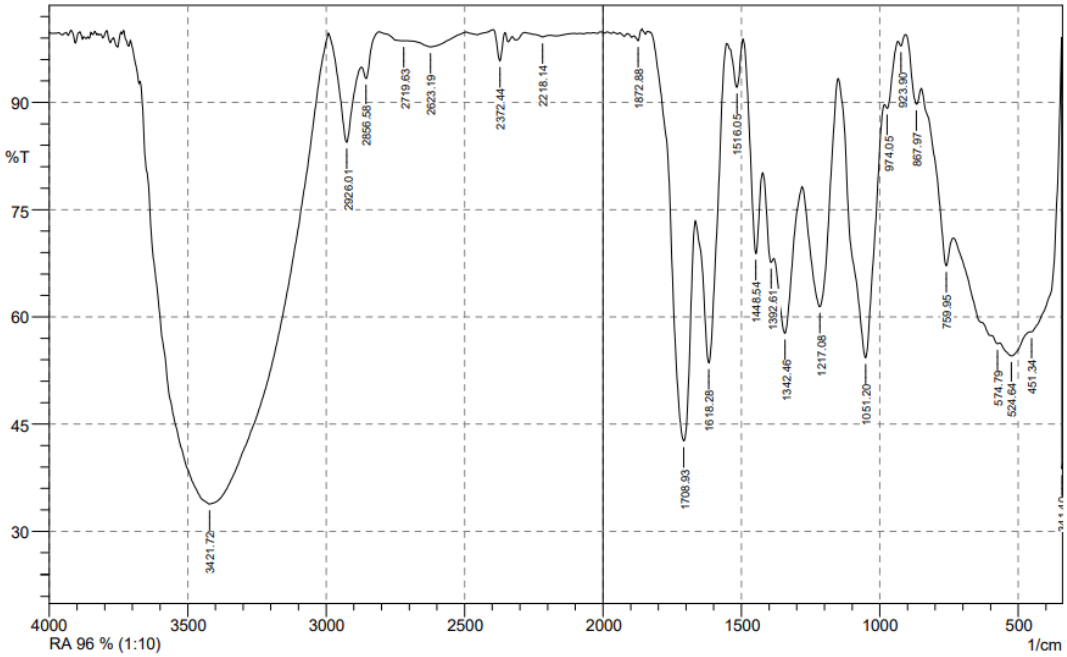
2615.47
2368.59
2069.62
1924.96
1708.93
1616.35
1517.98
1446.61
1342.46
1215.15
1051.20
873.75
759.95
530.42
453.27
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RA 96 % (1:5)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90
75
60
45
30
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RA 96 % (1:10)
3421.72
2926.01
2856.58
2719.63
2623.19
2372.44
2218.14
1872.88
1708.93
1618.28
1516.05
1448.54
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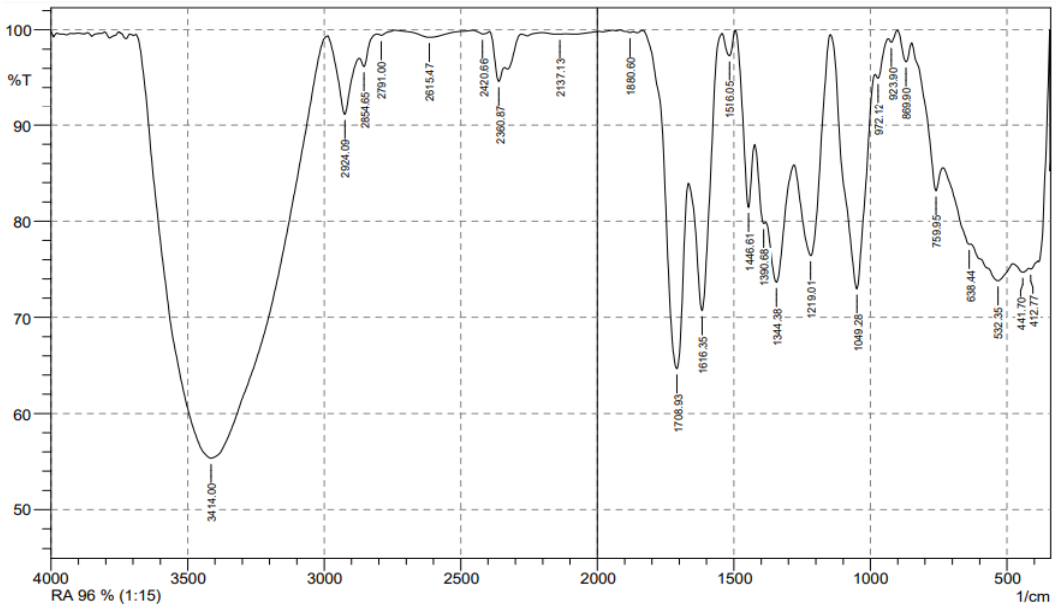
759.95
574.79
524.64
451.34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100
90
80
70
60
50
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RA 96 % (1:15)
3414.00
2924.09
2854.65
2791.00
2615.47
2420.66
2360.87
2137.13
1880.60
1708.93
1616.35
1516.05
1446.61
1390.08
1344.38
1219.01
1049.28
972.12
923.90
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759.95
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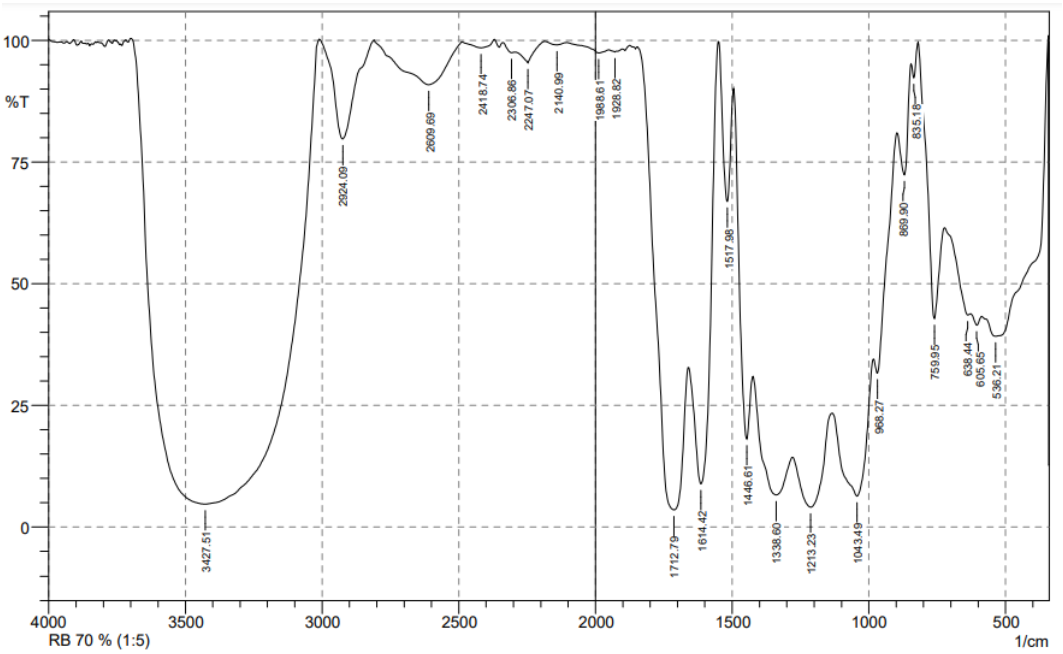
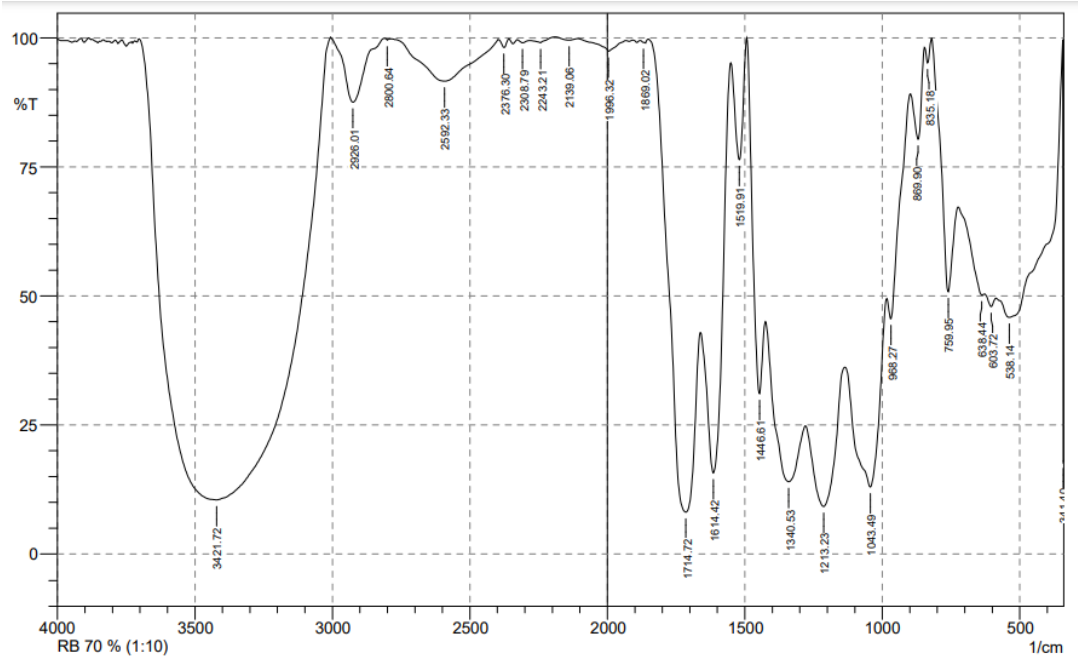
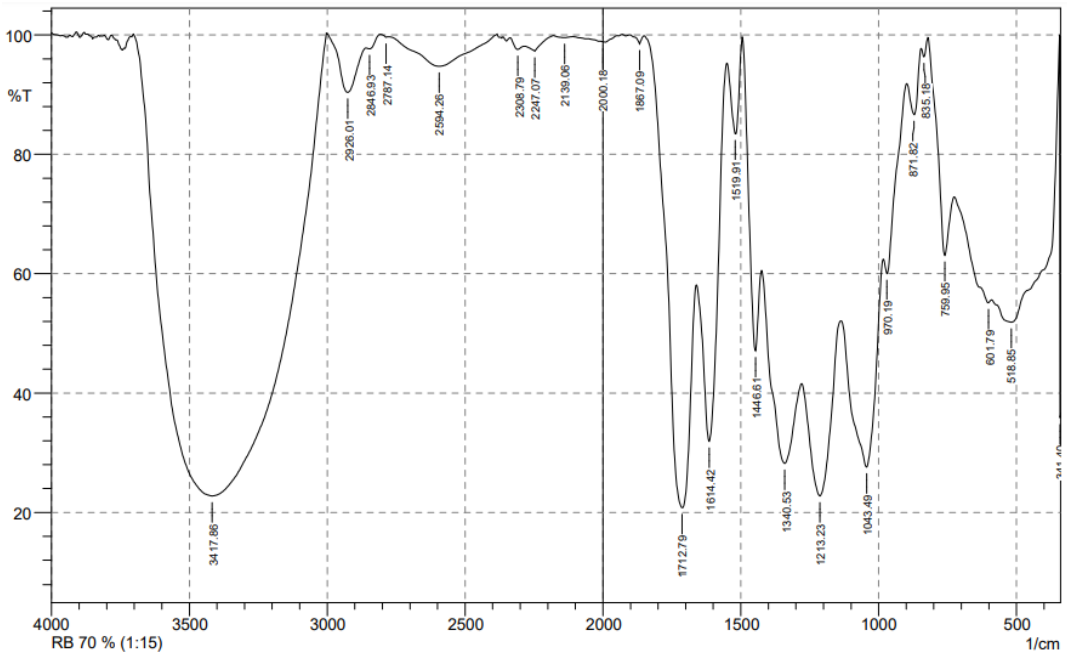
532.35
441.70
412.77

Data spektrum ekstrak etanol Rambutan Biasa (RB)



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2247.07
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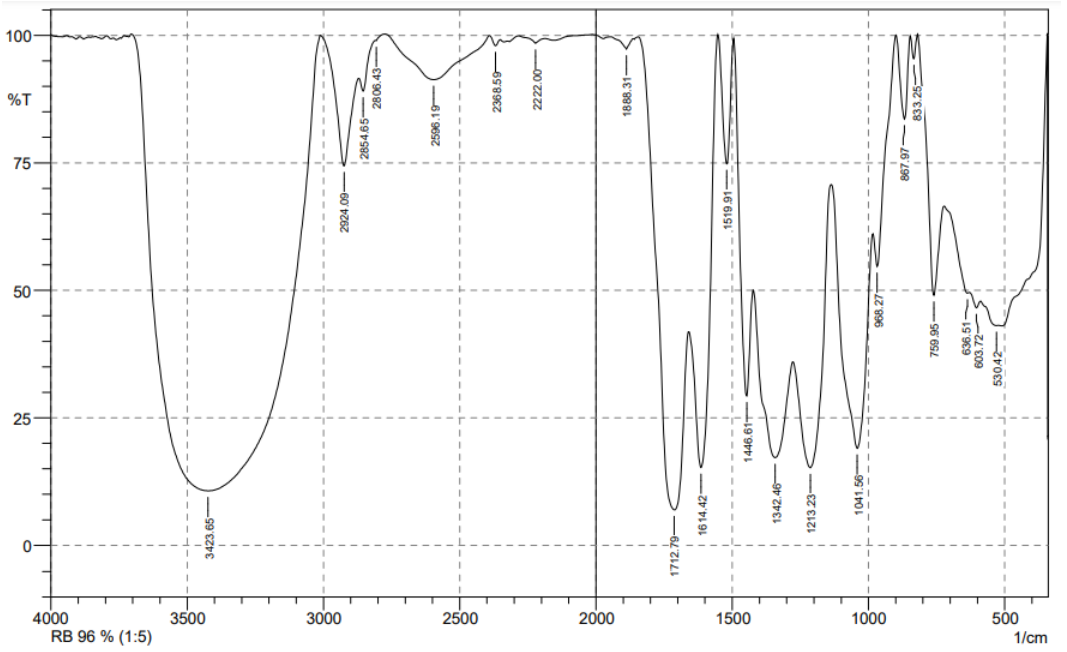
2000.18
1867.09
1519.91
1446.61
1340.53
1213.23
1043.49
970.19
871.82
835.18
759.95
601.79
518.85
3417.86
1712.79
1614.42
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RB 70 % (1:15)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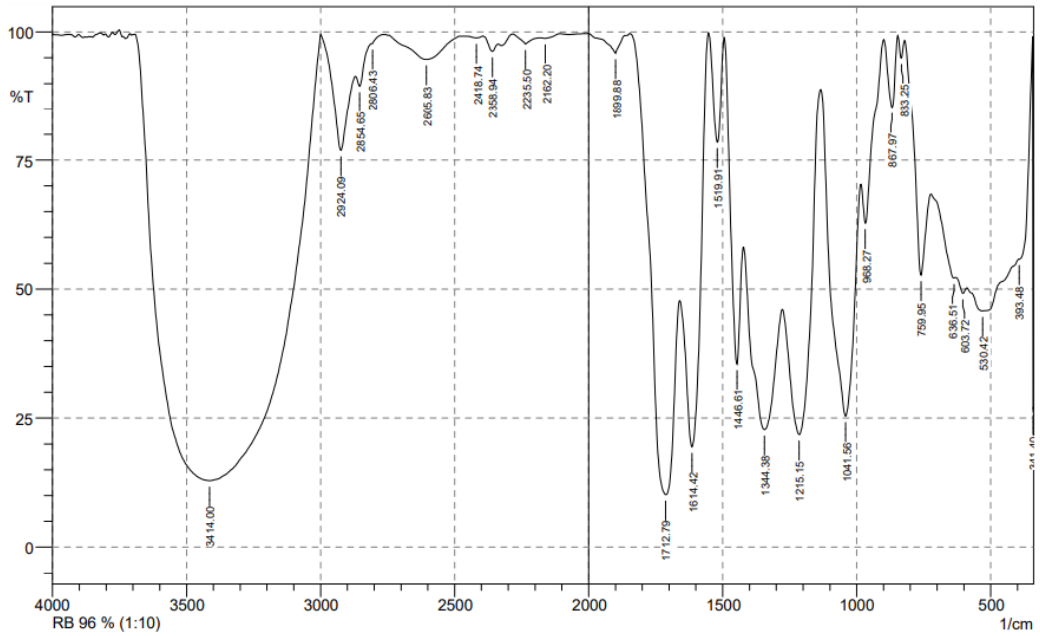
2366.59
2222.00
1888.31
1519.91
1446.61
1342.46
1213.23
1041.56
968.27
867.97
853.25
759.95
636.51
603.72
530.42
3423.65
1712.79
1614.42
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RB 96 % (1:5)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%T
75
50
25
0
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RB 96 % (1:10)
3414.00
2924.09
2854.65
2806.43
2665.83
2418.74
2358.94
2235.50
2162.20
1899.88
1712.79
1614.42
1519.91
1446.61
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1041.56
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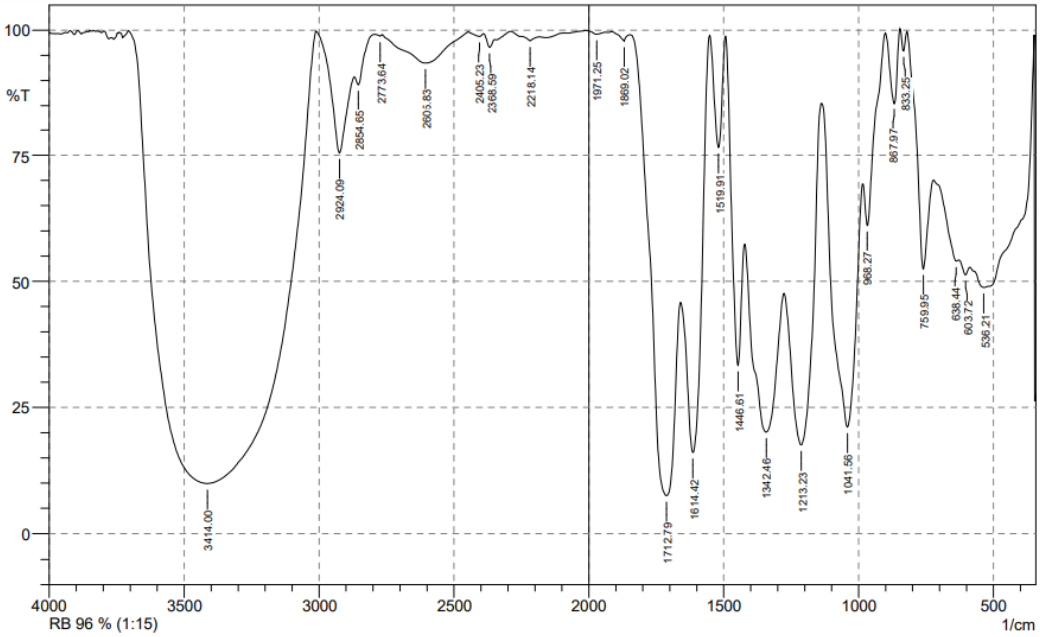
833.25
759.95
636.51
603.72
530.42
393.48


100
%T
75
50
25
0
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RB 96 % (1:15)
3414.00
2924.09
2854.65
2773.64
2665.83
2405.23
2368.59
2218.14
1971.25
1869.02
1712.79
1614.42
1519.91
1446.61
1342.46
1213.23
1041.56
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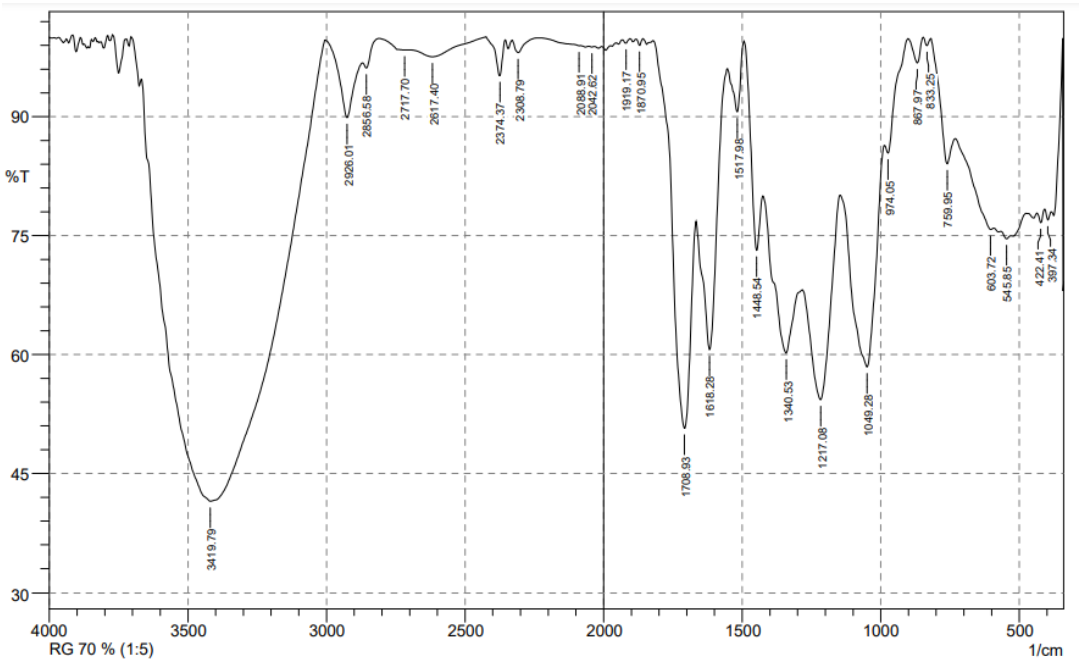
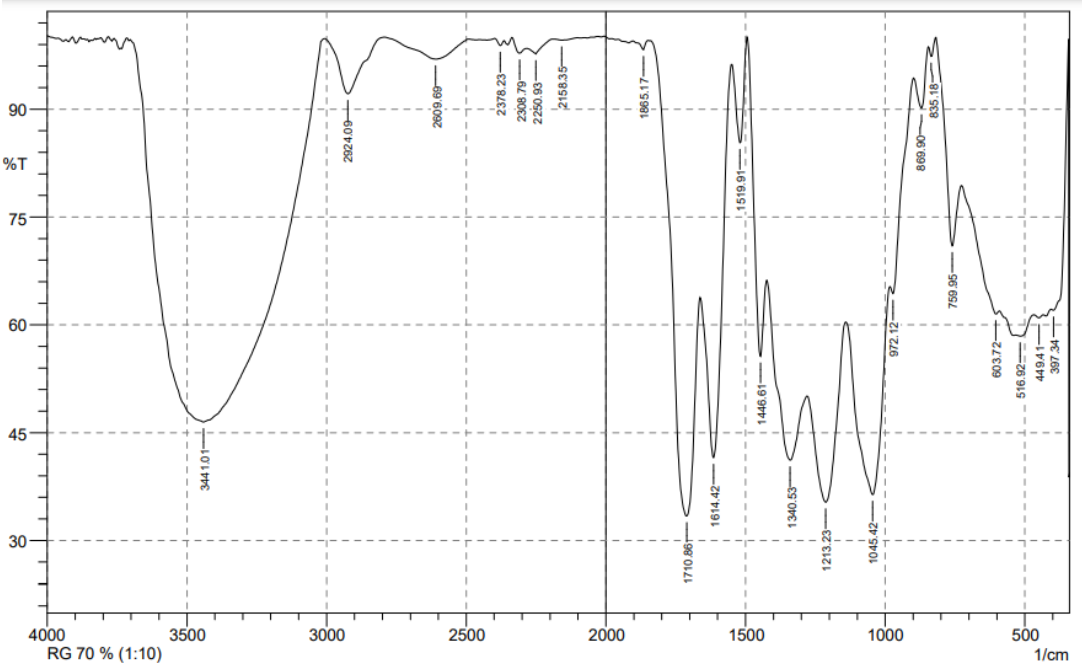
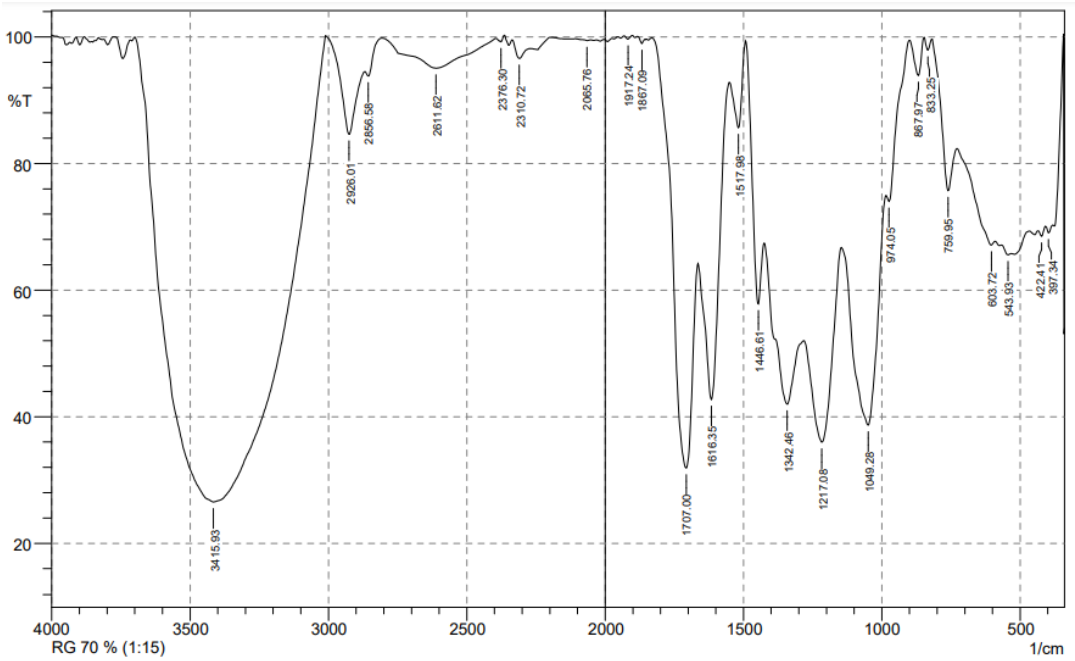
638.44
603.72
536.21

Data spektrum ekstrak etanol Rambutan Garuda (RG)



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1867.09
1707.00
1616.35
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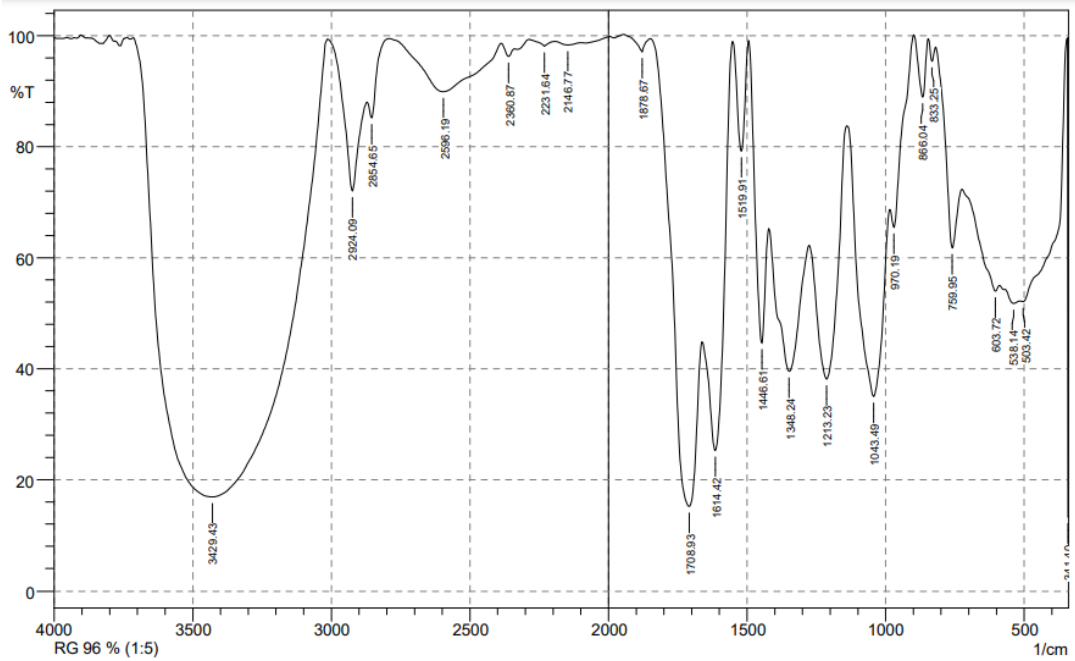
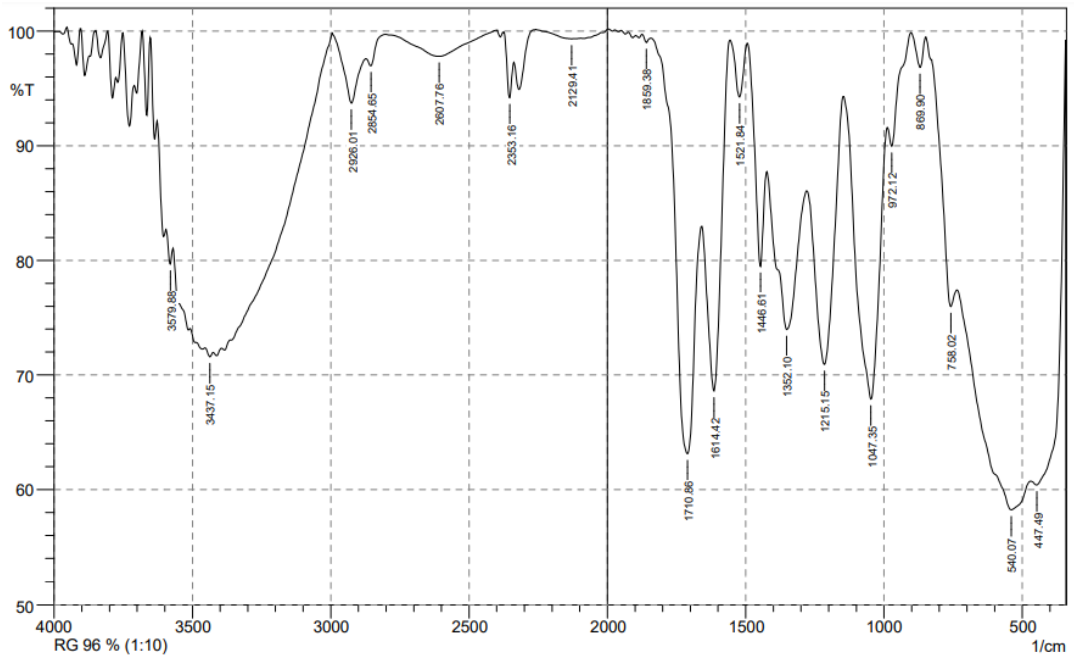
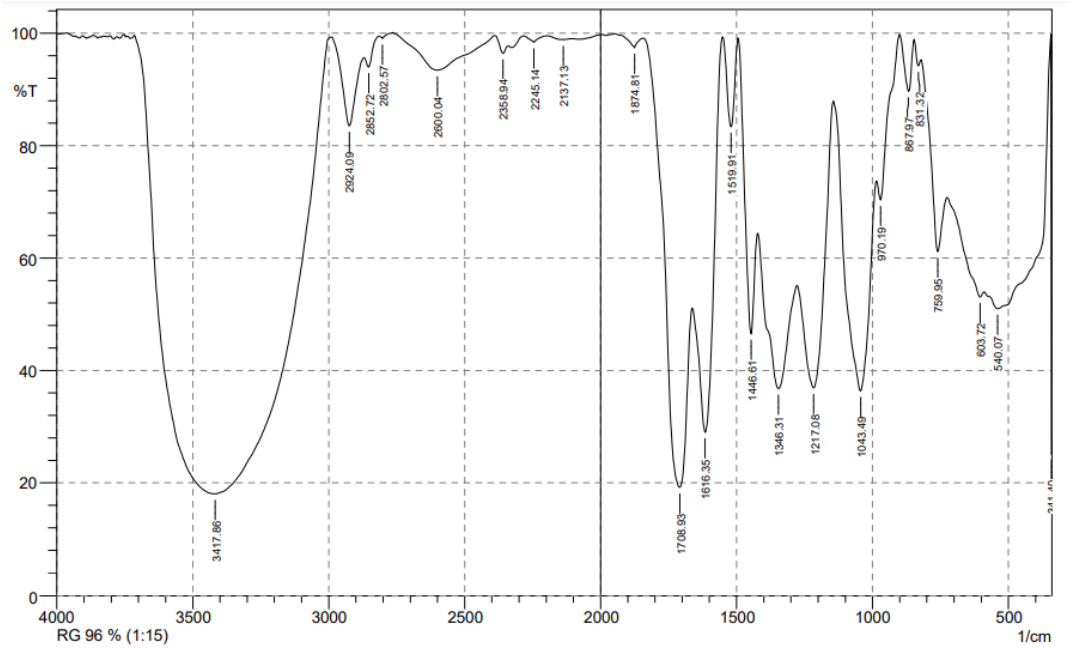
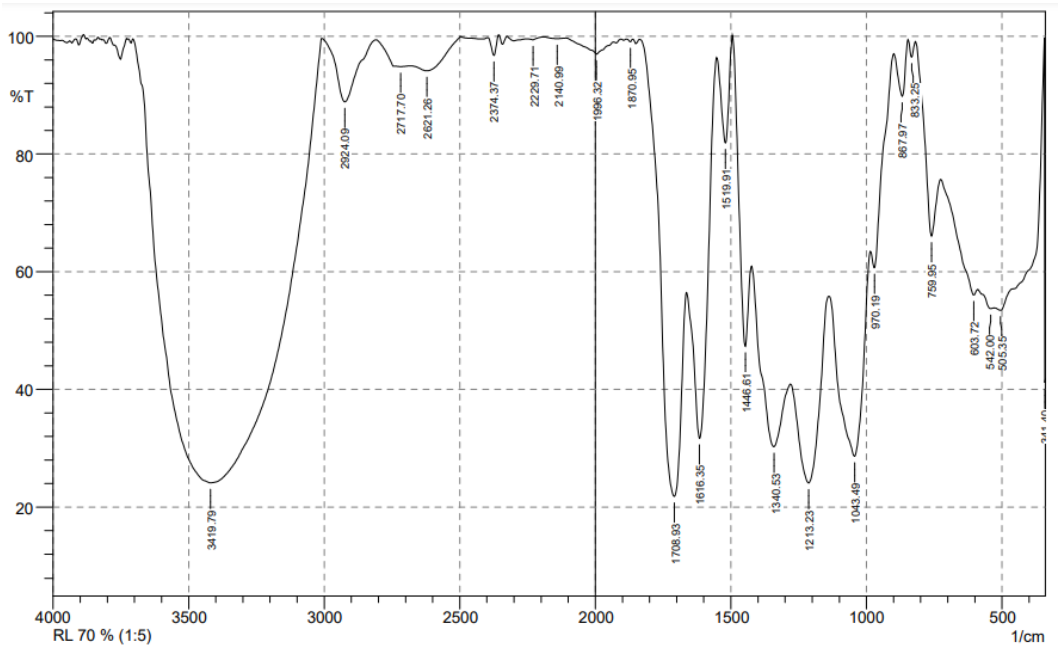
1446.61
1342.46
1217.08
1049.28
974.05
867.97
833.25
759.95
603.72
543.93
422.41
397.34
4000
3500
3000
2500
2000
1500
1000
500
RG 70 % (1:15)
1/cm

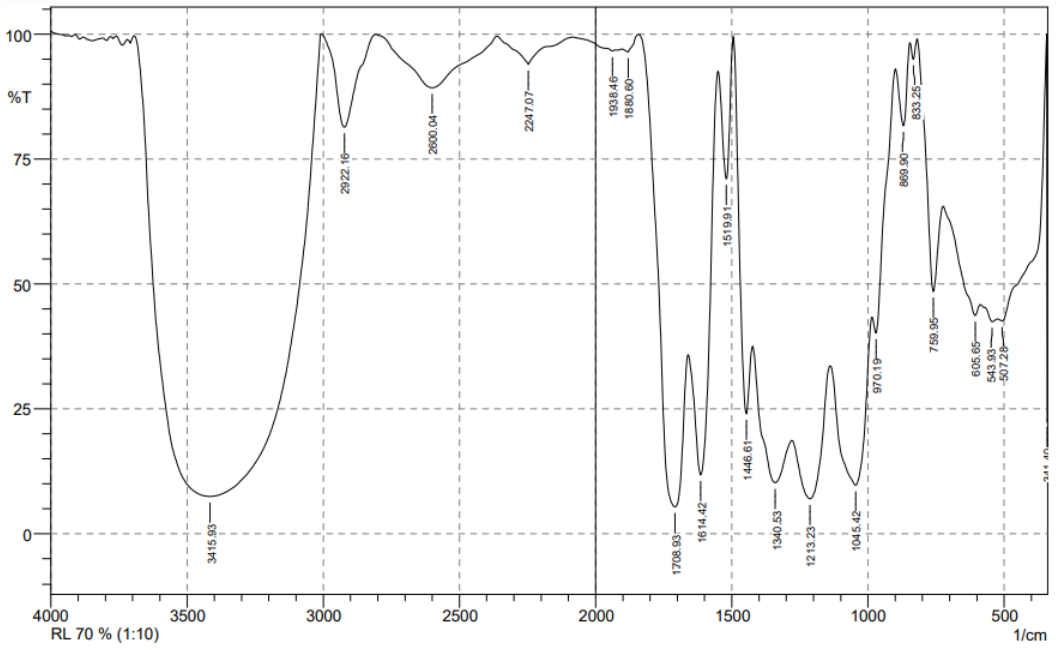

100
%T
80
60
40
20
0
3429.43
2924.09
2854.65
2596.19
2360.87
2231.64
2146.77
1878.67
1708.93
1614.42
1519.91
1446.61
1348.24
1213.23
1043.49
970.19
866.04
833.25
759.95
603.72
538.14
503.42
4000
3500
3000
2500
2000
1500
1000
500
RG 96 % (1:5)
1/cm

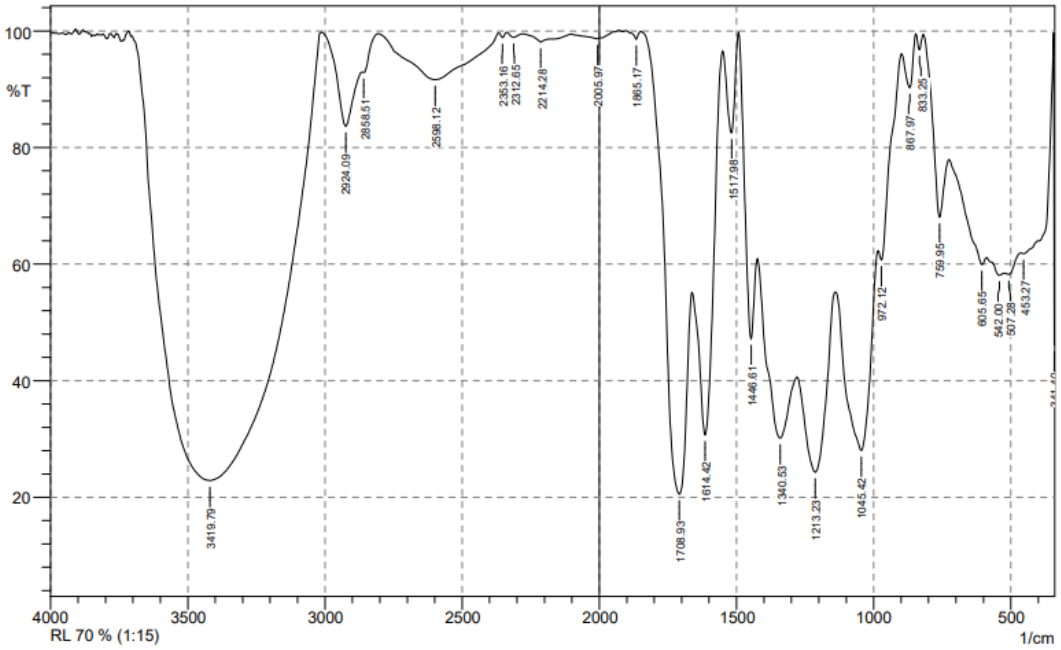

100
%T
90
80
70
60
50
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RG 96 % (1:10)
3579.88
3437.15
2926.01
2854.65
2607.76
2353.16
2129.41
1859.38
1710.86
1614.42
1521.84
1446.61
1352.10
1215.15
1047.35
972.12
869.90
758.02
540.07
447.49

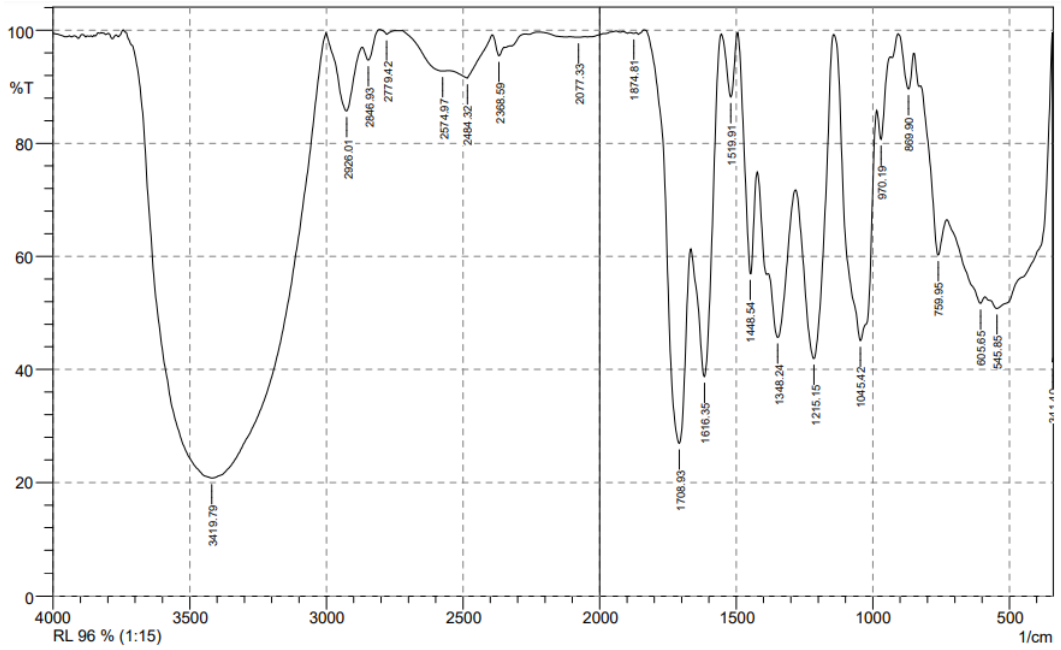

100
%T
80
60
40
20
0
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RG 96 % (1:15)
3417.86
2924.09
2852.72
2802.57
2600.04
2358.94
2245.14
2137.13
1874.81
1708.93
1616.35
1519.91
1446.61
1346.31
1217.08
1043.49
970.19
867.97
831.32
759.95
603.72
540.07

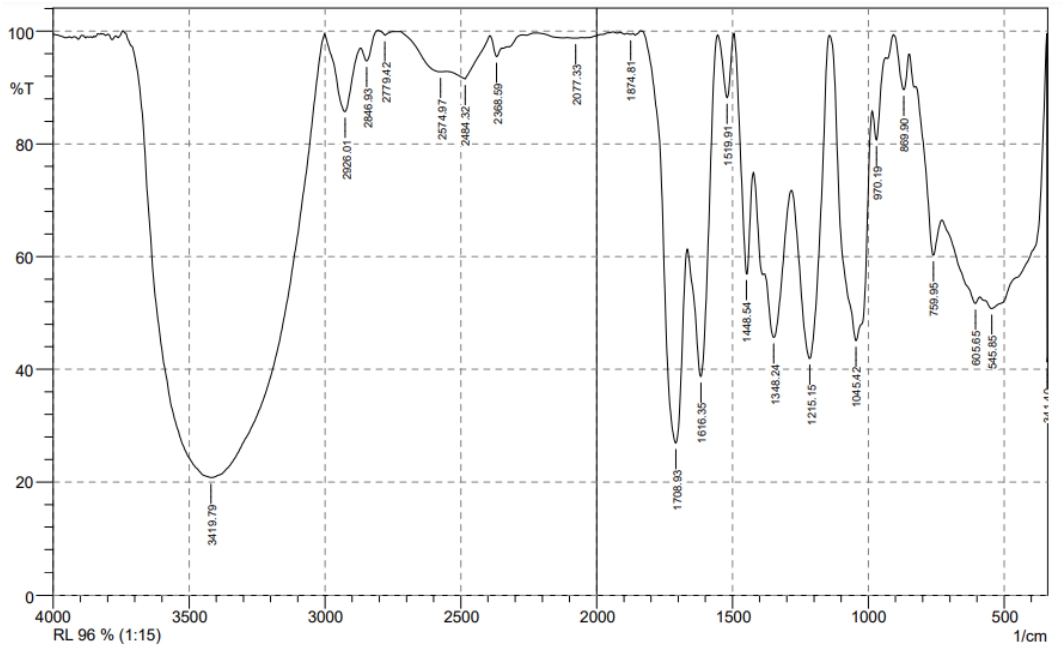
Data spektrum ekstrak etanol Rambutan Lengkeng (RL)

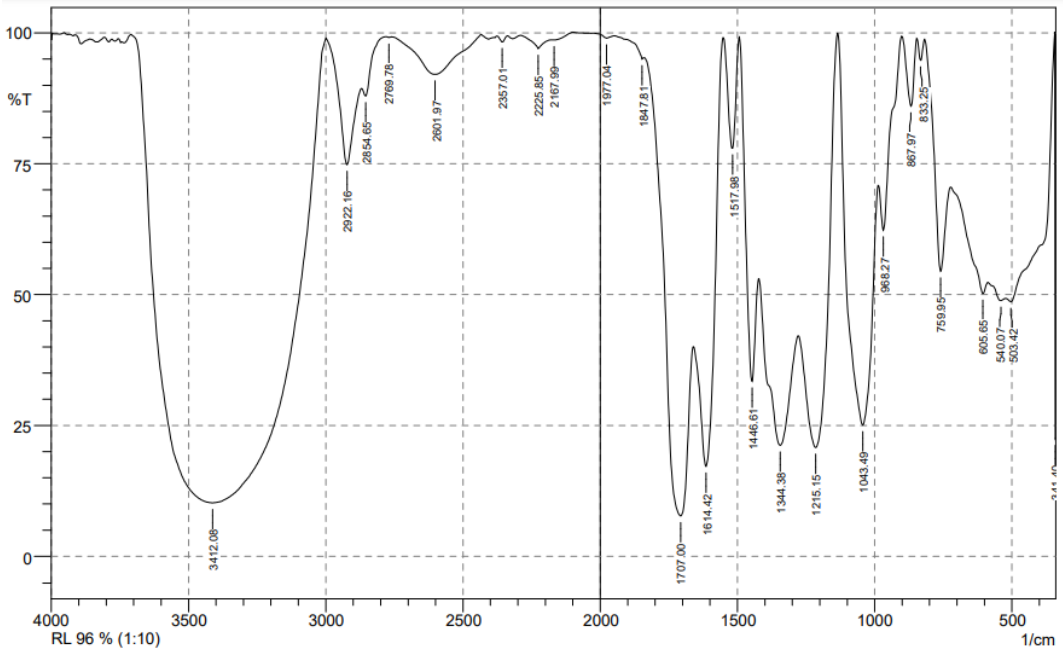


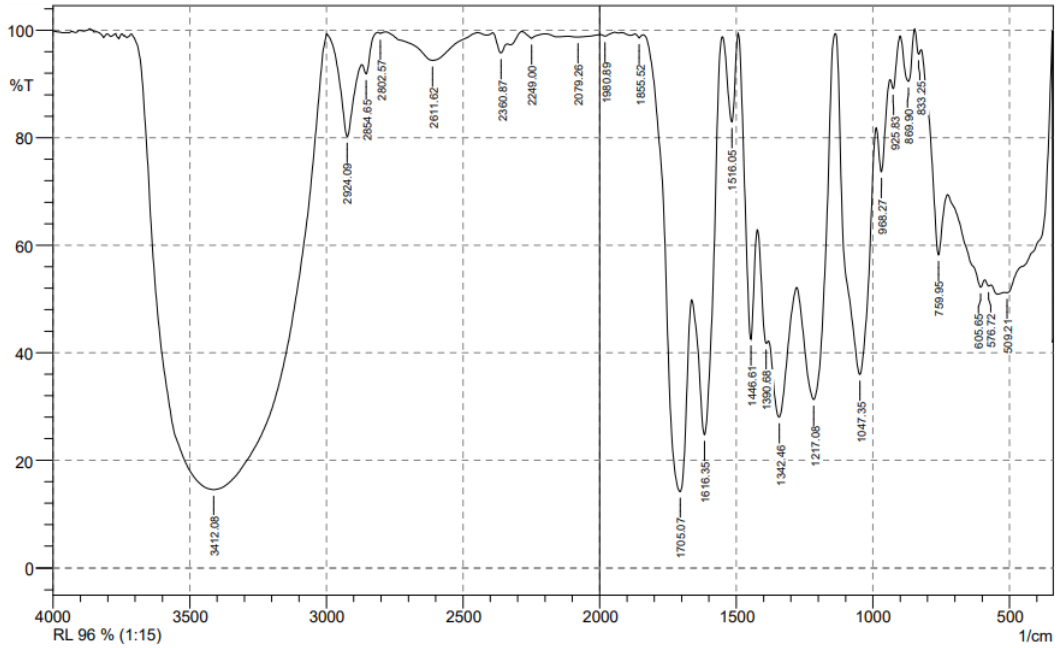



100
%T
80
60
40
20
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RL 70 % (1:15)
3419.79
2924.09
2858.51
2598.12
2353.16
2312.65
2214.28
2005.97
1865.17
1708.93
1614.42
1517.98
1446.61
1340.53
1213.23
1045.42
972.12
867.97
833.25
759.95
605.65
542.00
507.28
453.27

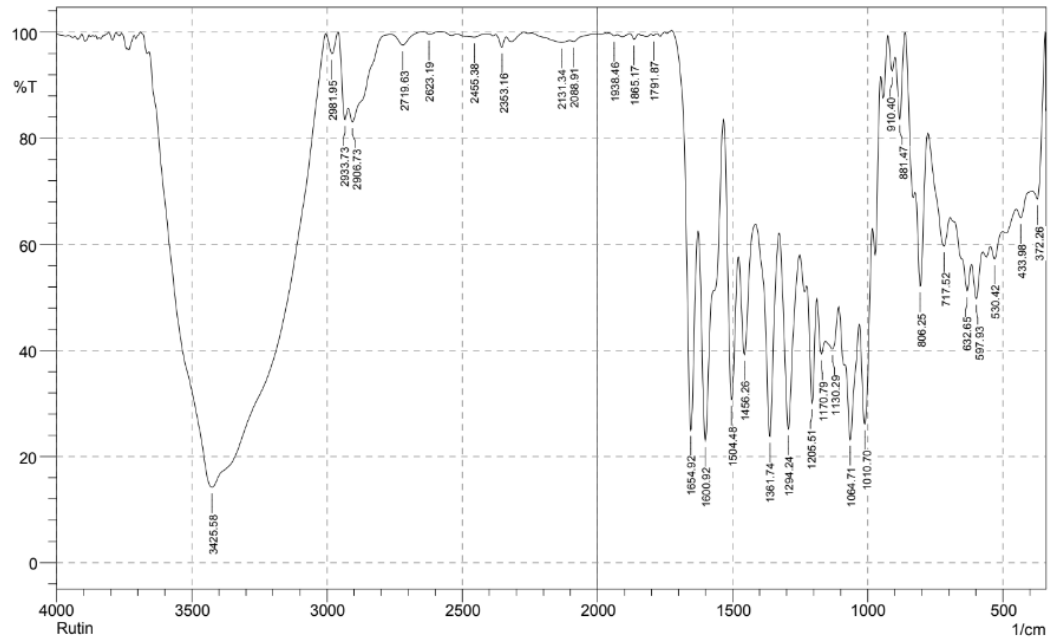

100
%T
80
60
40
20
0
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RL 96 % (1:15)
3419.79
2926.01
2846.93
2779.42
2574.97
2484.32
2368.59
2077.33
1874.81
1708.93
1616.35
1519.91
1448.54
1348.24
1215.15
1045.42
970.19
869.90
759.95
605.65
545.85


100
%T
80
60
40
20
0
2926.01
2846.93
2779.42
2574.97
2484.32
2368.59
2077.33
1874.81
1519.91
1448.54
1348.24
1215.15
1045.42
970.19
869.90
759.95
605.65
545.85
3419.79
1708.93
1616.35
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RL 96 % (1:15)

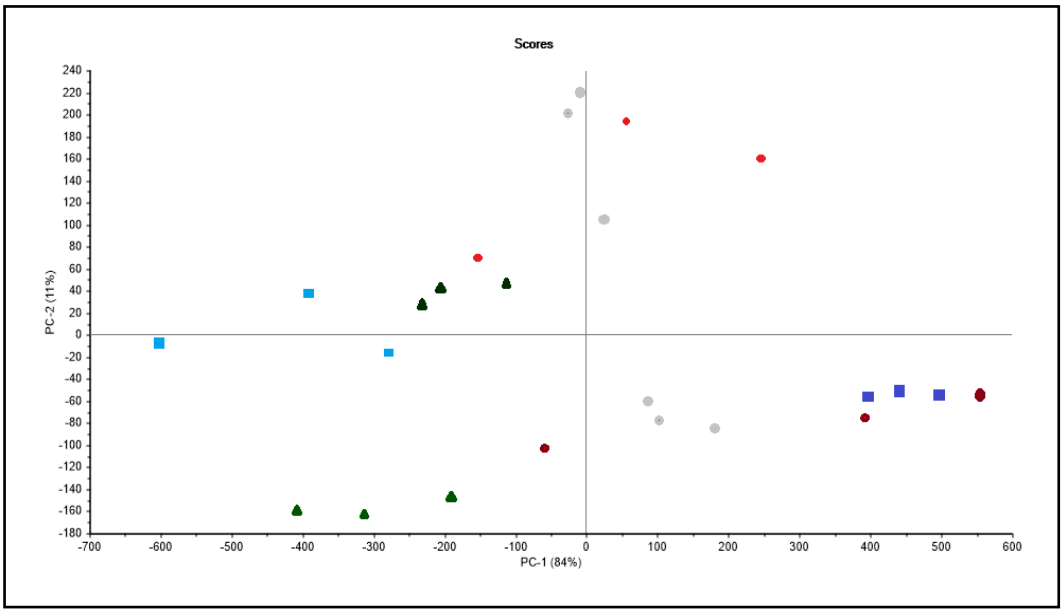

100
%T
75
50
25
0
2922.16
2854.65
2769.78
2601.97
2357.01
2225.85
2167.89
1977.04
1847.81
1517.98
1446.61
1344.38
1215.15
1043.49
968.27
867.97
833.25
759.95
605.65
540.07
503.42
3412.08
1707.00
1614.42
4000
3500
3000
2500
2000
1500
1000
500
1/cm
RL 96 % (1:10)

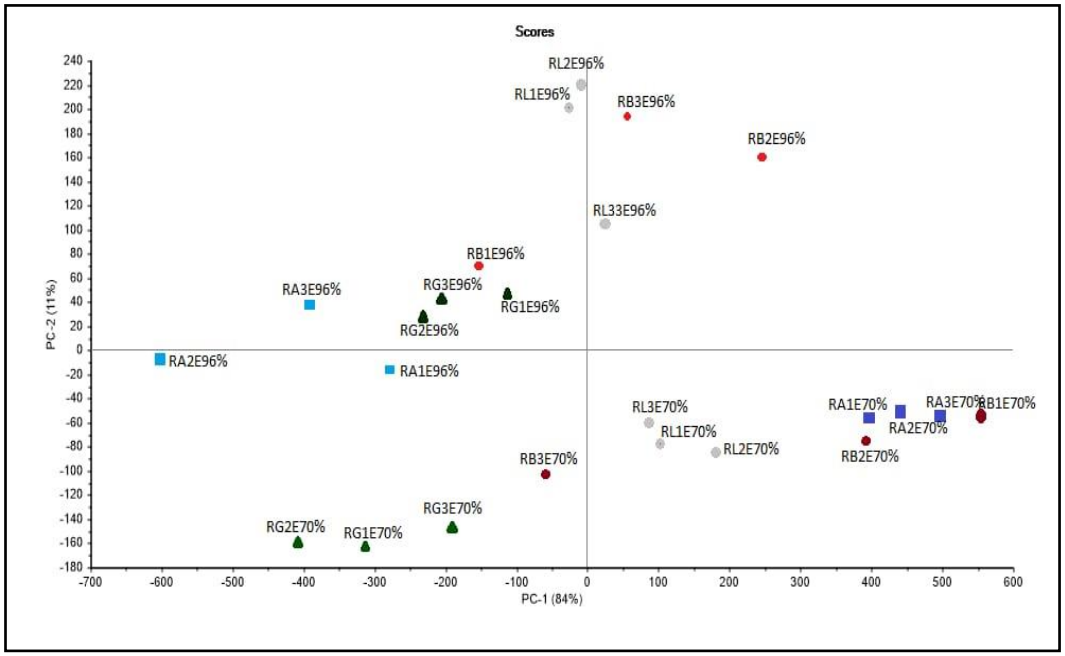


Data spektrum Rutin

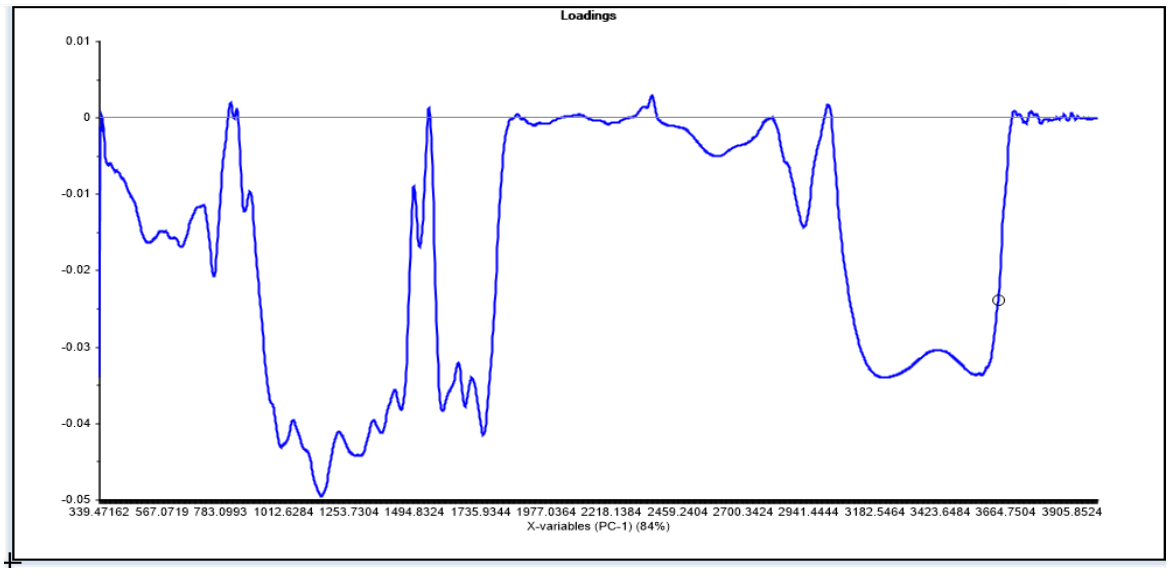


Lampiran 6. Data Analisis Komponen Utama (PCA)

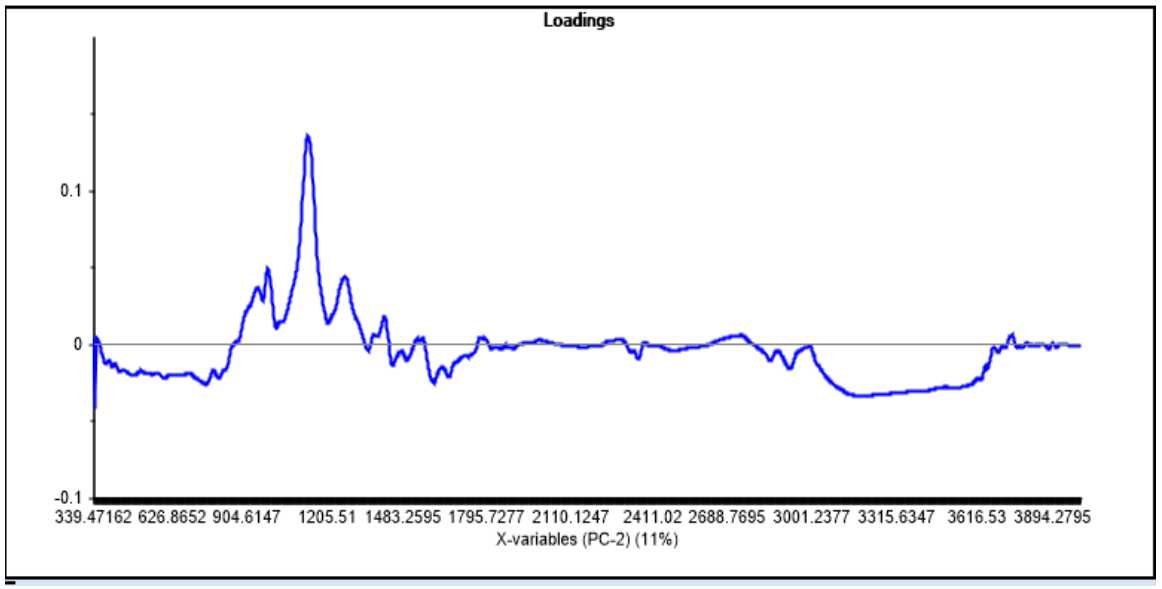




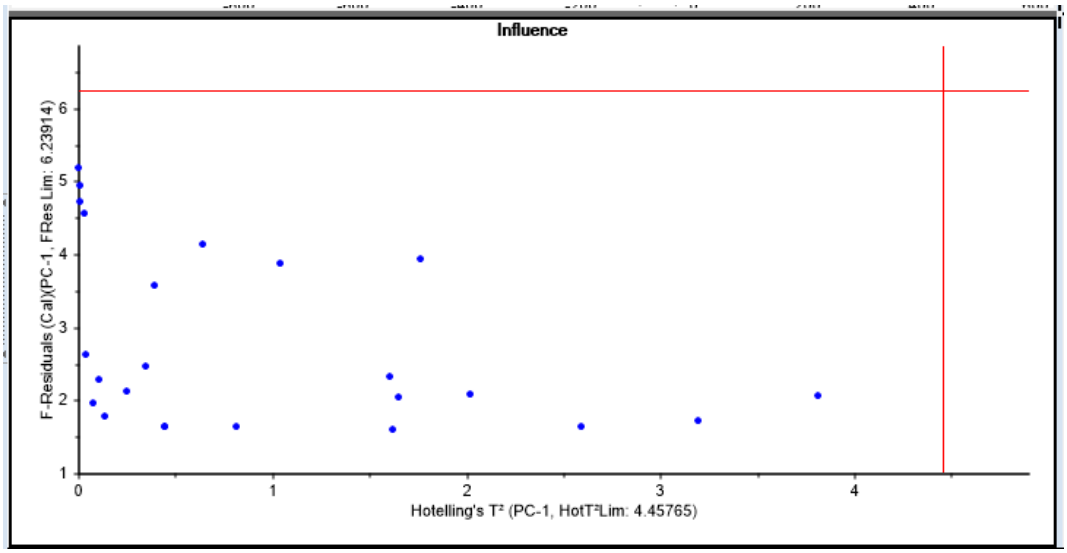
(Score plot)



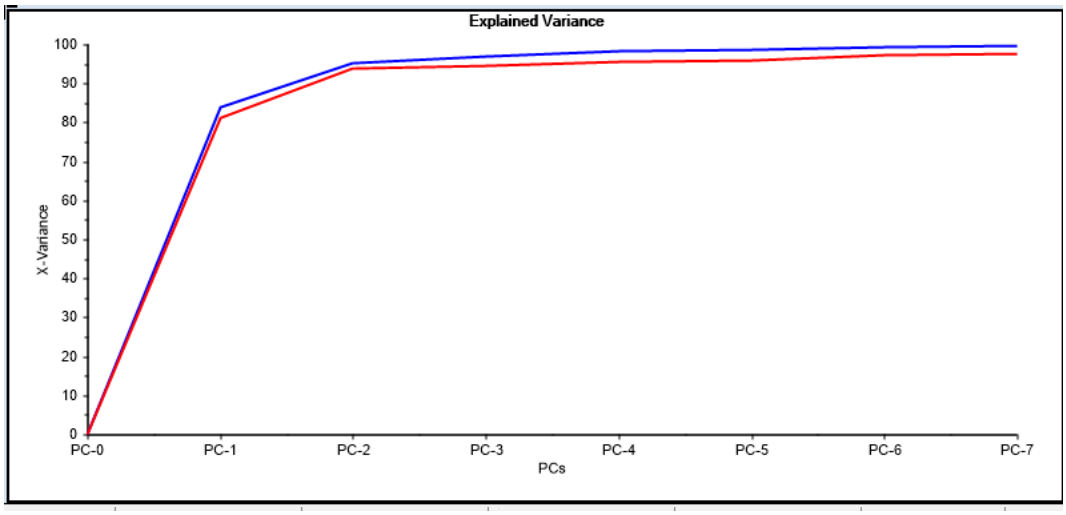
(Loading plot PC-1=84%)



(Loading plot PC-2=11%)



(Influence plot)



(Expleined varience)