

## REFERENCES

- Abu, M., Nyeem, B., Mannan, A., Kamrujjaman, K.M., Das, S.K., 2017. Indigenous king of bitter (*Andrographis paniculata*): a review 5: 318–324.
- Ahamad, J., Tariq, E., Bayrakdar, A., Uthirapathy, S., 2019. Qualitative and quantitative standardization of *Andrographis paniculata* by TLC technique and UV method. *Adv. Medical, Dent. Heal. Sci.* 2: 29–32. doi:10.5530/amdhs.2019.3.9
- Ahuja, S., Dong, M.W., 2005. Handbook of pharmaceutical analysis by HPLC. Elsevier Academic Press, Amsterdam, Boston, USA, London.
- Ahuja, S., Rasmussen, H., 2007. HPLC method development for pharmaceuticals. Academic Press Elsevier, London, Amsterdam, Oxford, Burlington, San Diego.
- Akbar, S., 2011. *Andrographis paniculata* : a review of pharmacological activities and clinical effects. *Altern. Med. Rev.* 16: 66–77.
- Akokuwah, G.A., Zhari, I., Norhayati, I., Mariam, A., 2006. HPLC and HPTLC densitometric determination of andrographolides and antioxidant potential of *Andrographis paniculata*. *J. Food Compos. Anal.* 19: 118–126. doi:10.1016/j.jfca.2005.04.007
- Amit, Jamwal, R., Kumari, S., Dhaulaniya, A.S., Balan, B., Kelly, S., Cannavan, A., Singh, D.K., 2020. Utilizing ATR-FTIR spectroscopy combined with multivariate chemometric modelling for the swift detection of mustard oil adulteration in virgin coconut oil. *Vib. Spectrosc.* 109. doi:10.1016/j.vibspec.2020.103066
- Balan, V., Mihai, C., Cojocaru, F., Uritu, C., Dodi, G., Botezat, D., Gardikiotis, I., 2019. Vibrational spectroscopy fingerprinting in medicine : from molecular to clinical practice. *Materials (Basel)*. 12: 1–40.
- Chotimah, C., Sudjadi, Riyanto, S., Rohman, A., 2015. Simultaneous determination of metamizole, thiamin and pyridoxin using UV-spectroscopy in combination with multivariate calibration. *Adv. Pharm. Bull.* 5: 593–598. doi:10.15171/apb.2015.080
- Das, C., Ghosh, G., Bose, A., Das, D., 2019. Analytical methods for standardization of Ayurvedic Asavas and Aristas ; a review. *Indian J. Pharm. Sci.* 81: 396–405.
- Depkes RI, 2008. Farmakope herbal Indonesia, I. ed. Departemen Kesehatan Republik Indonesia, Jakarta.
- Fringeli, U.P., 2016. ATR and reflectance IR spectroscopy, applications, in: Encyclopedia of Spectroscopy and Spectrometry. Academic Press, The Netherlands, pp. 58–75.

- Gandjar, I.G., Rohman, A., 2016. Kimia farmasi analisis, XV. ed. Pustaka Pelajar, Yogyakarta.
- Héberger, K., 2008. Chemoinformatics — multivariate mathematical – statistical methods, Medical Applications of Mass Spectrometry. Elsevier B.V., The Netherlands. doi:10.1016/B978-0-444-51980-1.50009-4
- Hossain, M.S., Urbi, Z., Sule, A., Rahman, K.M.H., 2014. *Andrographis paniculata* (Burm. f.) Wall. ex Nees: a review of ethnobotany, phytochemistry, and pharmacology. *Sci. World J.* 2014. doi:10.1155/2014/274905
- ICH, 2005. Validation of analytical procedures: text and methodology Q2(R1). *Int. Conf. Harmon. Tech. Requir. Regist. Pharm. For Human Use*.
- Indrati, O., Martien, R., Rohman, A., Nugroho, A.K., 2018. Employment of ATR-FTIR and HPLC-UV method for detection and quantification of andrographolide. *Int. J. Appl. Pharm.* 10: 4–7.
- Irnawati, Riyanto, S., Martono, S., Rohman, A., 2020a. The employment of FTIR spectroscopy and chemometrics for authentication of pumpkin seed oil from sesame oil. *Food Res.* 4: 42–48.
- Irnawati, Riyanto, S., Martono, S., Rohman, A., 2020b. Determination of sesame oil, rice bran oil and pumpkin seed oil in ternary mixtures using FTIR spectroscopy and multivariate calibrations. *Food Res.* 4: 135–142.
- Irnawati, Riyanto, S., Martono, S., Rohman, A., 2019. Analysis of palm oil as oil adulterant in olive and pumpkin seed oils in ternary mixture systems using ftir spectroscopy and chemometrics. *Int. J. Appl. Pharm.* 11: 210–215.
- Lee, L.C., Liong, C.Y., Jemain, A.A., 2017. A contemporary review on Data Preprocessing (DP) practice strategy in ATR-FTIR spectrum. *Chemom. Intell. Lab. Syst.* 163: 64–75. doi:10.1016/j.chemolab.2017.02.008
- Li, Y., He, S., Tang, J., Ding, N., Chu, X., Cheng, L., Ding, X., Liang, T., Feng, S., Rahman, S.U., Wang, X., Wu, J., 2017. Andrographolide inhibits inflammatory cytokines secretion in LPS-stimulated RAW264.7 cells through suppression of NF-κB/MAPK signaling pathway. *Evidence-based Complement. Altern. Med.* 2017. doi:10.1155/2017/8248142
- Liu, W., Liu, J., Yin, D., Zhao, X., 2015. Influence of ecological factors on the production of active substances in the anti-cancer plant *Sinopodophyllum hexandrum* (Royle) T.S. Ying. *PLoS One* 10: 1–22. doi:10.1371/journal.pone.0122981
- Liu, Y., Chen, P., Zhou, M., Wang, T., Fang, S., Shang, X., Fu, X., 2018. Geographic variation in the chemical composition and antioxidant properties of phenolic compounds from *Cyclocarya paliurus* (Batal) Iljinskaja leaves. *Molecules* 23. doi:10.3390/molecules23102440

- Maria, M.F.F., Ikhmal, W.M., Sabri, M., Ghazali, M., Adnan, A., 2018. Identification of functional group present in *Andrographis paniculata* (kalmegh) leaves by FTIR analysis. *IOP Conf. Ser.* 440. doi:10.1088/1757-899X/440/1/012035
- Miller, J.N., Miller, J.C., 2010. Statistics and chemometrics for analytical chemistry, sixth edit. ed. Pearson Education Limited, England.
- Mishra, S.K., Sangwan, N.S., Sangwan, R.S., 2007. *Andrographis paniculata* (Kalmegh): a review. *Pharmacogn. Rev.* 1: 283–298.
- Muchtaridi, M., Pratiwi, R., Alam, G., Rohman, A., 2019. Analysis of gartanin in extract of mangosteen pericarp fruit (*Garcinia mangostana* L.) using spectrophotometric fourier transform infrared (FTIR) method. *Rasayan J. Chem.* 12: 874–879. doi:10.31788/RJC.2019.1225216
- Niranjan, A., Tewari, S.K., Lehri, A., 2010. Biological activities of Kalmegh (*Andrographis paniculata* Nees) and its active principles-a review. *Indian J. Nat. Prod. Resour.* 1: 125–135.
- Nugroho, A., Rahardiningtyas, E., Wicaksono Putro, D.B., Wianto, R., 2016. Pengaruh ekstrak daun sambiloto (*Andrographis paniculata* Ness.) terhadap daya bunuh bakteri *Leptospira* sp. *Media Penelit. dan Pengemb. Kesehat.* 26: 77–84. doi:10.22435/mpk.v26i2.5444.77-84
- Rajalakshmi, G., Kanagavalli, U., Jegatheesan, K., 2015. Chemical fingerprinting of *Andrographis Paniculata* for quality control studies using HPLC Technique. *Int. J. Innov. Pharma Biosci. Res. Technol.* 1: 84–93.
- Ramírez-hernández, A., Aguilar-flores, C., Aparicio-saguilán, A., 2019. Fingerprint analysis of FTIR spectra of polymers containing vinyl análisis en la huella dactilar de espectros FTIR de polímeros que contienen etileno. *Rev. DYNA* 86: 198–205.
- Roggo, Y., Chalus, P., Maurer, L., Lema-Martinez, C., Edmond, A., Jent, N., 2007. A review of near infrared spectroscopy and chemometrics in pharmaceutical technologies. *J. Pharm. Biomed. Anal.* 44: 683–700. doi:10.1016/j.jpba.2007.03.023
- Rohman, A., 2014a. Statistika dan kemometrika dasar dalam analisis farmasi. Pustaka Pelajar, Yogyakarta.
- Rohman, A., 2014b. Spektroskopi inframerah dan kemometrika untuk analisis farmasi. Pustaka Pelajar, Yogyakarta.
- Rohman, A., Arifah, F.H., Alam, G., Muchtaridi, M., 2020. The application of FTIR spectroscopy and chemometrics for classification of Mangosteen extract and its correlation with alpha-mangostin. *J. Appl. Pharm. Sci.* 10: 149–154. doi:10.7324/japs.2020.104019

- Rohman, A., Sudjadi, Devi, Ramadhani, D., Nugroho, A., 2015. Analysis of curcumin in curcuma longa and Curcuma xanthorrhiza using FTIR spectroscopy and chemometrics. *Res. J. Med. Plant* 9: 179–186. doi:10.3923/rjmp.2015.179.186
- Rouessac, F., Rouessac, A., 2007. Chemical analysis : modern instrumentation methods and techniques, Second edi. ed. John Wiley & Sons Ltd., England.
- Royani, J.I., Hardianto, D., Wahyuni, S., 2014. Analisa kandungan andrographolide pada tanaman sambiloto (*Andrographis paniculata*) dari 12 lokasi di pulau Jawa. *J. Bioteknol. Biosains Indones.* 1: 15–20. doi:10.29122/jbbi.v1i1.547
- Sangeetha, S., Archit, R., SathiaVelu, A., 2014. Phytochemical testing, antioxidant activity, HPTLC and FTIR analysis of antidiabetic plants *Nigella sativa*, *Eugenia jambolana*, *Andrographis paniculata* and *Gymnema sylvestre*. *Res. J. Biotechnol.* 9: 65–72.
- Shivali, G., Praful, L., Vijay, G., 2012. A validated fourier transform infrared spectroscopy method for quantification of total lactones in *Inula racemosa* and *Andrographis paniculata* 171–176. doi:10.1002/pca.1339
- Singh, P.K., Hasan, T., Prasad, O., Sinha, L., Raj, K., 2006. FT-IR spectra and vibrational spectroscopy of andrographolide. *IOS Press Spectrosc.* 20: 275–283.
- Singh, S., 2016. Introduction to principal component analysis in applied research. *New Man Int. J. Multidiscip. Stud.* 1: 2348–1390.
- Stuart, B.H., 2004. Infrared spectroscopy: fundamentas and applications. John Wiley & Sons Ltd., Australia.
- Sukardiman, Harjotaruno, Widyawaruyanti, A., Sismindari, Aini, N.C., 2004. Apoptosis inducing effect of andrographolide on TD-47 human breast cancer cell line. *Afr. J. Tradit.* 4: 345–351.
- Syukri, Y., Martien, R., Lukitaningsih, E., Nugroho, A.E., 2016. Quantification of andrographolide isolated from *Andrographis paniculata* Nees obtained from traditional market in Yogyakarta using validated HPLC 16: 190–197.
- Tasumi, M., 2015. Introduction to experimental infrared spectroscopy: fundamentals and practical methods. John Wiley & Sons Ltd., UK.
- Teles, S., Pereira, J.A., Santos, C.H.B., Menezes, R. V., Malheiro, R., Lucchese, A.M., Silva, F., 2013. Effect of geographical origin on the essential oil content and composition of fresh and dried *Mentha×villosa* Hudson leaves. *Ind. Crops Prod.* 46: 1–7. doi:10.1016/j.indcrop.2012.12.009