BAB V
KESIMPULAN DAN SARAN

A. Kesimpulan

Pertama, HPMC K4M dengan berbagai variasi konsentrasi berpengaruh terhadap mutu fisik NLC resveratrol berbasis gel.

Kedua, Variasi konsentrasi HPMC dalam sediaan topikal berdasarkan studi deskriptif menghasilkan pelepasan yang semakin kecil dengan peningkatan konsentrasi HPMC.

Ketiga, Variasi konsentrasi HPMC dalam sediaan topikal berdasarkan studi deskriptif menghasilkan akivitas antioksidan semakin kecil dengan peningkatan konsentrasi HPMC.

B. Saran

Pertama, perlu dilakukan studi lanjut uji pelepasan dengan menggunakan membran kulit hewan.

Kedua, perlu dilakukan uji antioksidan NLC resveratrol berbasis gel menggunakan metode DPPH

Ketiga, dapat dilakukan optimasi terhadap NLC resveratrol berbasis gel.

DAFTAR PUSTAKA

Adhyatmika, Martien R. Rochmadi, Ismail H. 2017. Preparasi nanopartikel senyawa pentagamavunon-0 menggunakan matriks polimer kitosan rantai sedang dan pengait silang natrium tripolifosfat melalui mekanisme gelasi ionic sebagai kandidat obat antiinflamasi. *Majalah Farmasetik Vol. 13 No. 2: 65-78.*

Afandi, F.A. (2014). Pengaruh Nanoenkapsulasi terhadap Mutu Sensori, Fisikokimia, dan Fisiologiaktif Minuman Fungsional Berbasis Kumis Kucing (Orthosiphon aristatus BI. Miq). Tesis. Fakultas Teknologi Pertanian. Institut Pertanian Bogor. Bogor, Indonesia.

Afianti, H.P dan Murrukmihadi, M. 2015. Pengaruh Variasi Kadar *Gelling Agent* HPMC Terhadap Sifat Fisik dan Aktivitas Antibakteri Sediaan Gel Ekstrak Etanolik Daun Kemangi. Fakultas Farmasi Universitas Gadjah Mad

Agoes G. 2012. *Sediaan Farmasi Likuida-Semisolida (SFI-7)*. Bandung: Penerbit ITB.

Aisiyah S, Harjanti R, Nopiyanti V. 2019. Pengaruh Panjang Rantai Karbon Lipid Padat Terhadap Karakteristik Nanostructured Lipid Carrier Resveratrol. *Journal of Pharmaceutical and Clinical Research*, 2019, 02, 69-81.

Anggresani, L., Yuliawati, & Desriyanti, E. (2017). Uji Total Kandungan Flavonoid dan Aktivitas Antioksidan Ekstrak Daun Kembang Bulan. *Riset Informasi Kesehatan, Vol. 6 No.1 Juni 2017*.

Ansel, H. C. 2013. *Bentuk Sediaan Farmasetika & Sistem Penghantar Obat*, diterjemahkan oleh Hendriati Lucia & Foe Kuncoro. Edisi IX, 310-318. Jakarta: EGC.

Alam MN, Bristi NJ, & Rafiquzzaman M. 2013. Review on in vivo and in vitro methods evaluation of antioxidant activity. *Saudi Pharmaceutical Journal* 21(2): 143-152.

Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter, P. 2008. *Molecular Biology of The Cell fifth edition.* New York: Garland Science.

Annisa, R, Hendradi, E, Melani, D. 2016. Pengembangan Sistem *Nanostructured Lipid Carriers* (NLC) Meloxicam Dengan Lipid Monostearin Dan Miglyol 808 Menggunakan Metode Emulsifikasi. *J. Trop. Pharm. Chem.* 2016. Vol 3. No. 3.

Ardana, M, Aeyni, A, Ibrahim, A. 2015. Formulasi dan Optimasi Basis Gel HPMC (*Hydroxy Propyl Methyl Cellulose)* dengan Berbagai Variasi Konsentrasi. *J. Trop. Pharm. Chem.* 2015. Vol. 3. No. 2

Asra, R., Rivai, H., & Astuty, W. (2017). Pengembangan dan Validasi Metode Analisis Betametason Tablet dengan Metode Absorbansi dan Luas Daerah di Bawah Kurva Secara Spektrofotometri Ultraviolet . *Jurnal Farmasi Higea*, Vol. 9, No. 2, 2017 .

Chan, C.C, Herman L, Lee YC, Zhang XM. 2004. *Analitical Method Validation and Instrument Performance Verification*. New Jersey: Inc Publication.

Chen, C.C., Tsai T. H., Huang, Z. R., & Fang, J. Y. 2010. Effects of Lipophilic Emulsifiers on The Oral Administration of Lovastatin from Nanostructured Lipid Carriers : Physicochemical Characterization and Pharmacokinetics. *Eurpean Journal of Pharmaceutics and Biopharmaceutics vol. 74*, p. 472-482.

Clarkson PM. Thompson HS. 2000. Antioxidant: what role do they play in physical activity and health, J. Clin Nutr. Biochem, 72: 637S-46.

Dehpour AA, Seyed MN, Ebrahimazadeh MA, & Seyed FN. 2009. Antioxidant activity of the methanol extract of Ferula assafoetida and its essential oil composition. *Grasasy Aceites* 60(4): 405-412.

Eid, A. M. M., Elmarzugi, N. A., & El-Enshasy, H.A. (2013). Preparation and evaluation of olive oil nanoemulsion using sucrose monoester. *International Journal of Pharmacy Pharmaceutics Science.* 5, 434-440.

Elfasyari T.Y, Putri L.R, Wulandari S. 2019. Formulation and evaluation of antioxidant gel formulated from jujube (*Ziziphus jujube* Mill.) leaves extract. Pharmaceutical Journal of Indonesia Vol. 16 No. 02 Desember 2019:278-285.

Elmitra. 2017. *Dasar-Dasar Farmasetika dan Sediaan Semi Solid Ed. 1, Cet. 1*. Yogyakarta: Deepublish.

Gambini, J, Ingles M, Olaso G, Lopez-Grueso R, Bonet-Costa V, Gimeno-Mallench LBC. 2015. Properties of resveratrol:in vitroandin vivostudies about metabolism, bioavailability, and biological effects in animal models and humans. *Oxidative Medicine and Cellular Longevity.* 1-3.

Gandjar, I.G & Rohman, A. 2012. Analisis obat secara spektroskopi dan kromatografi. *315-317. Pustaka Pelajar. Yogyakarta.*

Garg AD, Aggarwal S, Garg, A. K.Sigla. 2012. Spreading of Semisolid Formulation. *An Update. Pharmaceutical Tecnology* 4(78):84-102.

Gerszon Joanna, Aleksandra Rodacka, Mieczysław Puchala, 2014. *Antioxidant properties of resveratrol and its protective effects in neurodegenerative diseases* .Department of Radiobiology, Faculty of Biology and Environmental Protection, University ofŁódz advances in cell biology vol.4, ISSUE 2/2014 (97–117).

Guleri KT dan Preet KL. 2013. Formulation and Evaluation of Topical Gel of Aceclofenac. *Journal of Drug Delivery & Therapeutics*; 2013, 3(6), 51-53

Hao J, Gao Y, Zhao J, Li Z, Zhao Z and Liu J. 2014. Preparation and Optimization of Resveratrol Nanosuspensions by Antisolvent Precipitation Using Box-Behnken Design. *AAPS PharmaSciTech*, Vol. 16, No. 1

Hawilla A. 2019. Pengaruh *Enhancer* dan Viskositas Terhadap Profil Difusi dan Aktivitas Antioksidan Nano-Emulgel Resveratrol [Skripsi]. Surakarta: Fakultas Farmasi, Universitas Setia Budi.

Hernani dan Rahardjo M. 2006. *Tanaman Berkhasiat Antioksidan.* Jakarta: Penebar Swadaya.

Ismail, Isriany. Formulasi Kosmetik (Produk Perawatan Kulit dan Rambut). Makassar: Alauddin University Press. 2013.

Kuncari SE, Iskandarsyah, & Praptiwi. 2014. Evaluasi, uji stabilitas fisik dan sineresis sediaan gel yang mengandung mioksidil, apigenin, dan perasan herba seledri (*Apium graveolens L.*). Bul. Peneliti. Kesehat 42(4), 213-222.

Khurana S, Jain N.K, and Bedi P.M.S. 2014. Nanostructured lipid carriers based nanogel for meloxicam delivery: mechanistic, in-vitro and stability evaluation. Michigan University

Kovacevic, A., Savic, S., Vuleta, G., Keck, C. M., & Muller, R. H. 2011. Polyhydroxy Surfactans for The Formulation Of Lipid Nanoparticles (SLN and NLC): Effect on size, Physical Stability and Particle Matrix Structure. *International Journal of Pharmaceutics*, P. 163-172

Leuner C dan Dressman J. 2000. Improving drug solubility for oral delivery using solid dispersion. *Eur. J. Pharm. Biophar.* 50(9): 47-60.

Lung, Destiani. 2015. *Uji Aktivitas Antioksidan Vitamin A, C, E dengan metode DPPH*. Universitas Padjadjaran.

Luo, Y., Wang, T.T.Y., Teng, Z., Chen, P., Sun, J. dan Wang, Q. (2013). Encapsulation of indole-3-carbonil and 3,3-diindolymethane inzein/carboxymethly chitosan nanoparticles with controlled release property and improved stability. *Journal Food Chemistry* 139: 224– 230.

Li Qianwen, Tiange Cai, Yinghong Huang, Xi Xia, Susan P. C. Cole 4 and Yu Cai, 2017.*A Review of the Structure, Preparation, and Application of NLCs, PNPs, and PLNs*. Nanomaterials 2017, 7, 122; doi:10.3390/nano7060122.

Liu Y, Ma W, Zhang P, He S, & Huang D.2015. Effect of resveratrol on blood pressure: A meta-analysis of randomized controlled trils. *Clinical Nutrition* 34(1): 27-34.

Mader, K. 2006. Solid Lipid Nanoparticles as Drug Carriers. In V. P. Torchilin, *Nanoparticulate as Drug Carrier* (pp. 187-205). London: Imperial Colllege Press.

Mappamasing F, Anwar E & Mun'im A. 2015. Formulasi, Karakterisasi dan Uji Penetrasi In Vitro Resveratrol Solid Lipid Nanopartikel dalam Krim Topikal. *Jurnal Ilmu Kefarmasian Indonesia.* Universitas Indonesia, hlm. 137-144.

Molyneux P. 2004. The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity. *Songklanakarin Journal of Science and Technology*. 26 (211-219).

Mulhaquddin. 2014. Validation Method. Dipresentasikan pada Diklat Validasi Metode, Baristand Industri Ambon 10 - 13 Juni 2014.

Muller, R. H., K., Mader, K., & Gohla, S. 2000. Solid Lipid Nanoparticles (SLN) for Controlled Drug Delivery-A Review of The State of The Art. *European journal of Pharmaceutics and Biopharmaceutics,* p. 161-177.

Murwanto dan Santosa. 2012. Uji Aktivitas Antioksidan Tumbuhan *Cynara Scolimus* L., *Artemisia China* L., *Borreria Repensdc*.,*Polygala Paniculata* L. Hasil Koleksi Dari Taman Nasional Gunung Merapi Dengan Metode Penangkapan Radikal Dpph (2,2-Difenil-1-Pikrilhidrazil). Department of Pharmaceutical Biology, Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, Indonesia.

Noor SU, Laksmitawati DR, Sumaryono W. 2020. Uji Aktivitas Antihialuronidase In Vitro dan Karakteristik Fisik *Nanostructured Lipid Carrier* Ekstrak Rimpang Langkuas laki-laki (*Alpinia zerumbet*). *Jurnal Ilmu Kefarmasian Indonesia*, Vol. 18, No. 1 hlm. 48-52.

Nurrahmanto D, Mahrifah IR, Azis RFNI, & Rosyidi VA. 2017. Formulasi Sediaan Gel Dispersi Padat Ibuprofen. Jurnal Ilmiah Manuntung, 3(1), 96-105.

Padusitrada. 2019. Formulasi *Nanostructured Lipid Carrier* (NLC) Resveratrol dengan Variasi Rasio Lipid Cair dan Surfaktan Menggunakan Metode

Emulsifikasi-Sonikasi [Skripsi]. Surakarta: Fakultas Farmasi, Universitas Setia Budi.

Pang, X., Cui, F., Tian, J., Zhou, J., Zhou, W. 2009. Preparation and Characterization of Magnetic Solid Lipid Nanoparticles Loaded with Ibuprofen. *Asian Journal of Pharmaceutical Science*4:132-137.

Pardeshi *et al.* 2012. Solid lipid based nanocarriers. *Acta Pharm* 62: 433-472

Parwata IMOA, Wiwik SR, & Raditya Y. 2009. Isolasi dan uji antiradikal bebas minyak atsiri pada daun sirih (*Piper betle, Linn*) secara spektroskopi ultra violet-tampak. *Jurnal Kimia* 3(1): 7-13.

Pertiwi RD, Djajadisastra J, Mutalib A, Pujiyanto A. 2018. Pembuatan, Karakterisasi dan Uji In Vitro Nanopartikel Emas Berbasis Konjugat Gom Arab-Vinkristin. *Jurnal Ilmu Kefarmasian Indonesia*, Vol. 16, No. 1, Hlm. 6-11

Rahmawan, T. G., Rosita, N., & Erawati, T. (2012). Characterisation of Solid Lipid Nanoparticles P-Methoxycinnamic Acid (SLN-PMCA) Formulated With Different Lipid Component : Stearic Acid and Cethtyl Alcohol. *PharmaScientia, Vol.1, No.1, Juli 2012*.

Rivai *et al.* 2017. Pengembangan dan Validasi Metode Analisis Betametason dalam Tablet dengan Metode Absorbansi dan Luas Daerah di Bawah Kurva Secara Spektrofotometri Ultraviolet. *Jurnal Sains dan Teknologi Farmasi* Vol. 19 Suplemen 1.

Robinson Keila, Mock Charlotta and Liang Dong. 2014. Pre-formulation studies of resveratrol. *Drug Development and Industrial Pharmacy*. Texas Southem University, Houston, TX, USA. online 1-6.

Rohmah, M, Raharjo, S, Hidayat, C, Martien, R. 2019. Formulasi Dan Stabilitas *Nanostructured Lipid Carrier* Dari Campuran Fraksi Stearin Dan Olein Minyak Kelapa Sawit. Aplikasi teknologi pangan 8 (1)

Ropita. 2019. Pengaruh Konsentrasi Asam Oleat dan Panjang Rantai Lipid Padat Terhadap Karakterisasi Fisik *Nanostructured Lipid Caiers* (NLC) Resveratrol dengan Metode Emulsifikasi-Sonikasi [Skripsi]. Surakarta: Fakultas Farmasi Universitas Setia Budi.

Rowe RC, Sheskey PJ, uiqnn ME. 2009. *Handbook of Pharmaceutical Excipient, 6th edition*. Washington DC: Pharmaceutical Press and American Pharmacits Association.

Rusdiana IA, Hambali E, dan Rahayuningsih M. 2018. Pengaruh Sonikasi Terhadap Sifat Fisik Formula Herbisida yang Ditambahkan Surfaktan Dietanolamida. *Agroradix* Vol. 1 No.2

Saraung V, Yamlean PV, Citraningtyas G. 2018. Pengaruh Variasi Babis Karbopol Dan Hpmc Pada Formulasi Gel Ekstrak Etanol Daun Tapak Kuda (*Ipomoea Pes-Caprae* (L.) R. Br. Dan Uji Aktivitas Antibakteri Terhadap *Staphylococcus Aureus.* FMIPA UNSRAT Manado.

Septiani, S., N. Wathoni, dan S. R. Mita. 2011. Formulasi Sediaan Masker Gel Antioksidan dari Ekstrak Etanol Biji Melinjo (Gnetum gnemon Linn.). *Jurnal Unpad*. 1(1): 4-24.

Sethuraman N *et al*. 2018. Design, Development and Characterization of Nano Structured Lipid Carrier for Topical Delivery of Aceclofenac.

Shahidulla, S., Khan, M., & Jayaveera, K. N. (2015). Formulation of fast disintegrating domperidone tablets using Plantago ovata mucilage by 32 full factorial design . *International Current Pharmaceutical Journal, July 2015, 4(8): 415-419* .

Singhal, G. B., Patel, R. P., Prajapati, B., & Patel, N. A. (2011). Solid Lipid Nnoparticles and Nano lipid Carriers : as novel Solid Lipid based drug Carriers. *journal of pharmacy 2011 40-52* .

Souto EB, Muller RH. 2007. Lipid Nanoparticles (Solid Lipid Nanopartocles and Nanostructured Lipid Carriers) for cosmetic, Dermal, and Transdermal Aplication. In D. Thassu, M. Deleers, & Y. Payhak, *Nanoparticulate Drug Delivery System* (pp. 213-229). New York: Informa Healthcare USA, Inc.

Suprobo G dan Rahmi D. 2015. Pengaruh Kecepatan Homogenisasi Terhadap Sifat Fisika dan Kimia Krim Nanopartikel dengan Metode High Speed Homogenization (HSH). *Jurnal Litbang Industri* 1: 1-12.

Sriarumtias FrismaFramesti, Sasanti Tarini, Sophi Damayanti, 2017. Formulasi dan uji potensi antioksidan nanostructured lipid carriers (NLC) retinil palmitat. *Acta Pharmaceutica Indonesia*2017/ Vol. 42 / No. 1/ hlm. (25-31).

Tanwar, Y. S., & Jain, A. K. (2012). Formulation and evaluation of topical diclofenac sodium gel using different gelling agent. *Asian Journal Of Pharmaceutical Research And Health Care,* 4(1).

Tranggono RI, Latifah F. 2007. *Buku Pegangan Ilmu Pengetahuan Kosmetik.* Jakarta: Gramedia Pustaka Utama.

Verma, A., Singh, S., Kaur, R., and Jain, U. K.. (2013). Formulation and Evaluation of Clobetasol Propionate Gel. *Asian Journal of Pharmaceutical and Clinical Research,* 6(5).

Widodo FM, Maria IR, Tri WA. 2014. Pengaruh ekstrak kasar buah mahkota dewa (*Phaleria macrocarpa*) sebagai antioksidan pada fillet ikan bandeng

(*Chanos chanos Forsk*) segar. *Jurnal Pengolahan dan Bioteknologi Hasil Perikanan* 3(2): 34-43.

Wikarsa, S dan Valentina, L. M. 2011. *Formulasi Tablet Lepas Lambat Dipiridamol dengan System Mengapung*. Makara Kesehatan Vol. 15. No. 1.

Wu, Y., Luo, Y. dan Wang, Q. (2012). Antioxidant and antimicrobial properties of essensial oils encapsulated in zein nanoparticles prepared by liquid-liquid dispersion method. *Journal Food Science and Technology* 48: 283–290.

Yuan H *et al*. 2007. Preparation and characteristics of nanostructured lipid carriers for control-releasing progesterone by melt-emulsification. *Colloids and Surfaces B: Biointerfaces* 60 (2007) 174–179.

Zhang, X, P. Le, Y. Wang, J, X. Zhao, H. Chen, J, F. 2013. Resveratrol Nanodispersion With High Stability And Dissolution Rate. Food Science and Technology 50 622-628

Zhuang, C. Y., Li, N., Wang, M., Zhang, M. N., Pan, W. S., Peng, J. J., *et al.* 2010. Preparation and Characterization of Vinopacetine Loaded Nanostructured Lipid Carriers (NLC) for Improved Oral Bioavailability. *International Journal Of Pharmacy* Vol. 394, p. 179-185.

Zini R, Morin C, Bertelli A, Bertelli AA, Tillement JP. Effects of resveratrol on the rat brain respiratory chain. Drugs Exp Clin Res. 2000;25:87-97.

L A M P I R A N

Lampiran 1. Certificate Of Analysis (COA)

a. COA resveratrol

泽世化学 THANEN CHEMICALS
THANEN CHEMICALS(CHANGZHOU)CO.,LTD
ADDRESS: RM2705, BLDG 5, CHANGFA, 101-1# TAIHU ROAD, 213022, P.R.CHINA
TEL: +86 519 89880626 FAX: +86-519-89880629

Certificate Of Analysis

Product name：Resveratrol

Batch NO.：200101H Producing date：2019.12.29

CAS NO.:501-36-0 Analysis date：2020.01.08

Quantity：10G Retest date ：2020.12.28

Item	Specification	Result
Description	White or almost white	Passed
Clarity of Solution	The solution should be	Passed
Identification	IR	Passed
LOD	NMT0.3%	0.15%
ROI	NMT0.1%	0.04%
Melting point	252-262℃	257.3-259.2℃
Single impurity	NMT0.1%	0.07%
Purity	99.0%up	99.88%

Conclusion：It is up to the enterprise standard.

For and on behalf of 常州泽世化学有限公司 THANEN CHEMICALS(CHANGZHOU)CO.,LTD
Authorized Signature(s)

b. COA HPMC K4M

Colorcon®

Product Name:	METHOCEL™ ID138425
Product Number:	ID138425
Material Description:	METHOCEL K4M PREMIUM HYDROXYPROPYL METHYLCELLULOSE
Lot No:	PD440821
VBN:	D180G2D002
Quantity Supplied:	1 KG
Ship To:	Universitas Gadjah Mada, Fakultas Farmasi ID
Bill To:	Universitas Gadjah Mada, Fakultas Farmasi ID
Sales Order No:	TSCN1323501

Shanghai Colorcon Coating Technology Ltd
No. 588 Chundong Road Shanghai 201108 China Tel: 86-21-6198-2300 Fax: 86-21-5442-2229 www.colorcon.com

Date 2016-03-09 (YYYY-MM-DD) Time 20:41:28 (Greenwich Mean Time) Page 1 of 2

DOW CHEMICAL PACIFIC LIMITED

COLORCON SHANGHAI TRADING
COMPANY LIMITED
NO. 588, CHUNDONG ROAD,
201108 SHANGHAI
CHINA

Ship From: BAY CITY Whse
BAY CITY
Michigan, United States

Certificate of Analysis

Product Number	00000138425
Product Name	METHOCEL™ K4M Premium Hydroxypropyl Methylcellulose
Delivery No.	807252154 /000010
Order Number	104604138
Shipping Units	150.000 KG
Date Shipped	2016-03-09 (YYYY-MM-DD)
Shipment No.	27011696

Customer Information

Customer Name	COLORCON SHANGHAI TRADING
Customer PO number	UDO-703427-COLORCON
Container ID	bdp 244227742

Batch Number	D180G2D002
Retest Date	2021-02-11 (YYYY-MM-DD)
Manufacturing Date	2016-02-13 (YYYY-MM-DD)
Quantity	150.000 KG
Net Weight	150.000 KG
Manufacturing Plant	MIDLAND Methocel
Country of Origin	US
Country of Origin Name	United States

It is hereby certified the material indicated above has been manufactured in accordance with the FDA cGMPs, Kosher guidelines, was inspected and tested in accordance with the conditions and the requirements of current USP, EP and JP for Hypromellose as well as the current specific purity criteria for the food additive Hydroxypropyl Methyl Cellulose (E464) and unless agreed otherwise conforms in all respects to the specification relevant thereto.

Test	Unit	Lower Limit	Upper Limit	Value	Method
Apparent Viscosity BROOKFIELD 2% IN WATER, @ 20DEGC	**mPa.s**	**2663**	**4970**	**3669**	**Current USP/EP/JP**
Loss on Drying	**%**		**5.0**	**1.2**	**Current USP/EP/JP**
Residue on Ignition	**%**		**1.5**	**0.7**	**Current USP/JP**
Ash, Sulfated	**%**		**1.5**	**0.7**	**Current EP**
pH, 2% in Water		**5.0**	**8.0**	**7.6**	**Current USP/EP/JP**
Assay, Methoxyl	**%**	**19.0**	**24.0**	**22.9**	**Current USP/EP/JP**
Assay, Hydroxypropoxyl	**%**	**7.0**	**12.0**	**10.9**	**Current USP/EP/JP**
Appearance Opalescence		-	-	**Pass**	**Current EP**
Appearance Solution Color		-	-	**Pass**	**Current EP**

This batch, based on audit testing and process control, is certified to

DOW CHEMICAL PACIFIC LIMITED	COLORCON SHANGHAI TRADING COMPANY LIMITED NO. 588, CHUNDONG ROAD, 201108 SHANGHAI CHINA Ship From: BAY CITY Whse BAY CITY Michigan, United States

be NMT 20 ppm heavy metals (as Pb) and also meets all specification requirements for harmonized identification tests, residual solvents and microbiological limits.

Shari Workentine

Shari Workentine
Dow Pharma & Food Solutions Quality System Specialist

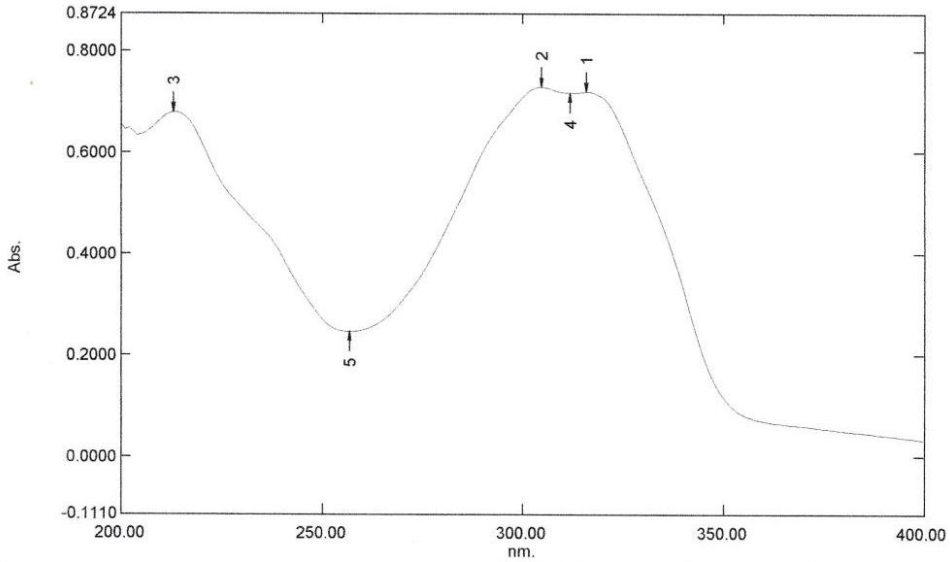
For inquiries please contact Customer Service or local sales

Lampiran 2. Panjang gelombang resveratrol dalam medium dapar fosfat *p*H 7,4

Spectrum Peak Pick Report

03/09/2020 03:11:22 PM

Data Set: File_200309_151002 - RawData



[Measurement Properties]
Wavelength Range (nm.): 200.00 to 400.00
Scan Speed: Medium
Sampling Interval: 1.0
Auto Sampling Interval: Disabled
Scan Mode: Single

[Instrument Properties]
Instrument Type: UV-1800 Series
Measuring Mode: Absorbance
Slit Width: 1.0 nm
Light Source Change Wavelength: 340.0 nm
S/R Exchange: Normal

[Attachment Properties]
Attachment: None

[Operation]
Threshold: 0.0010000
Points: 4
InterPolate: Disabled
Average: Disabled

[Sample Preparation Properties]
Weight:
Volume:
Dilution:
Path Length:
Additional Information:

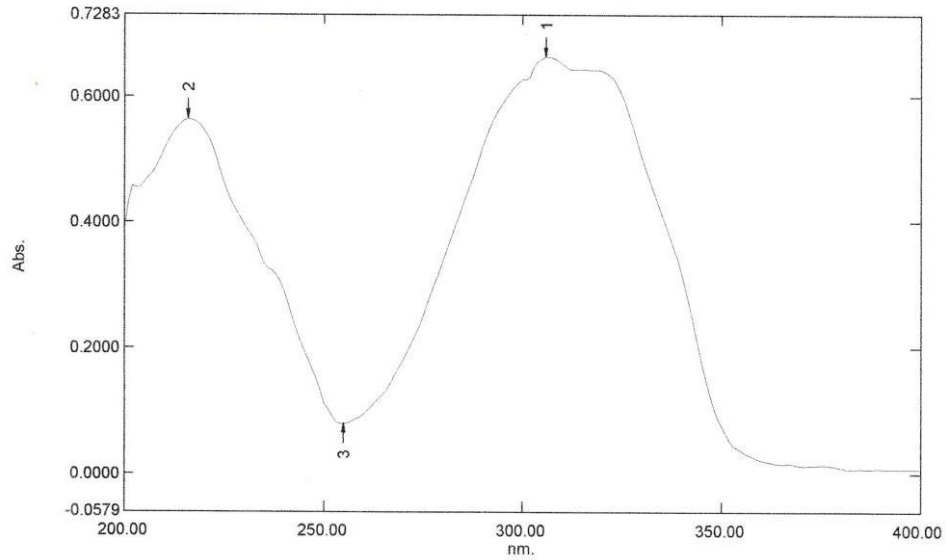
No.	P/V	Wavelength	Abs.	Description
1	↑	316.00	0.7189	
2	↑	305.00	0.7281	
3	↑	213.00	0.6794	
4	↓	312.00	0.7169	
5	↓	257.00	0.2463	

Lampiran 3. Panjang gelombang resveratrol dalam medium methanol

Spectrum Peak Pick Report

03/11/2020 07:52:50 AM

Data Set: File_200311_075105 - RawData



[Measurement Properties]

Wavelength Range (nm.):	200.00 to 400.00
Scan Speed:	Medium
Sampling Interval:	1.0
Auto Sampling Interval:	Disabled
Scan Mode:	Single

No.	P/V	Wavelength	Abs.	Description
1	↑	306.00	0.6628	
2	↑	216.00	0.5632	
3	↓	255.00	0.0802	

[Instrument Properties]

Instrument Type:	UV-1800 Series
Measuring Mode:	Absorbance
Slit Width:	1.0 nm
Light Source Change Wavelength:	340.0 nm
S/R Exchange:	Normal

[Attachment Properties]

Attachment:	None

[Operation]

Threshold:	0.0010000
Points:	4
InterPolate:	Disabled
Average:	Disabled

[Sample Preparation Properties]

Weight:	
Volume:	
Dilution:	
Path Length:	
Additional Information:	

Lampiran 4. Kurva kalibrasi dan verifikasi metode analisis

A. Kurva kalibrasi resveratrol dalam methanol

1. Perhitungan larutam induk resveratrol

Berat penimbangan = 0,049 gram = 49 mg

$$\frac{49 \text{ mg}}{10 \text{ mL}} = \frac{490 \text{ mg}}{1000 \text{ mL}} = 4900 \text{ ppm}$$

2. Pembuatan larutan stok resveratrol

$V_1 \times C_1 = V_2 \times C_2$

$V_1 \times 4900 \text{ ppm} = 10000 \text{ µL} \times 98 \text{ ppm}$

$V_1 = 200 \text{ µL}$

3. Pembuatan larutan penentuan panjang gelombang maksimum

$V_1 \times C_1 = V_2 \times C_2$

$V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 9,8 \text{ ppm}$

$V_1 = 1000 \text{ µL}$

Panjang gelombang maksimum:

Wavelength	Abs
306.00	0.6628

Hasil verifikasi metode analisis

Linearitas

Larutan baku resveratrol 98 ppm dibuat 5 seri pengenceran yaitu 1,96 ppm; 2,94 ppm; 3,92 ppm; 4,9 ppm; dan 5,88 ppm.

Konsentrasi (ppm)	Vol. yang diambil (µL)	Vol. yang dibuat (µL)
1,96	200	10000
2,94	300	10000
3,92	400	10000
4,9	500	10000
5,88	600	10000

Perhitungan kurva baku resveratrol dalam methanol

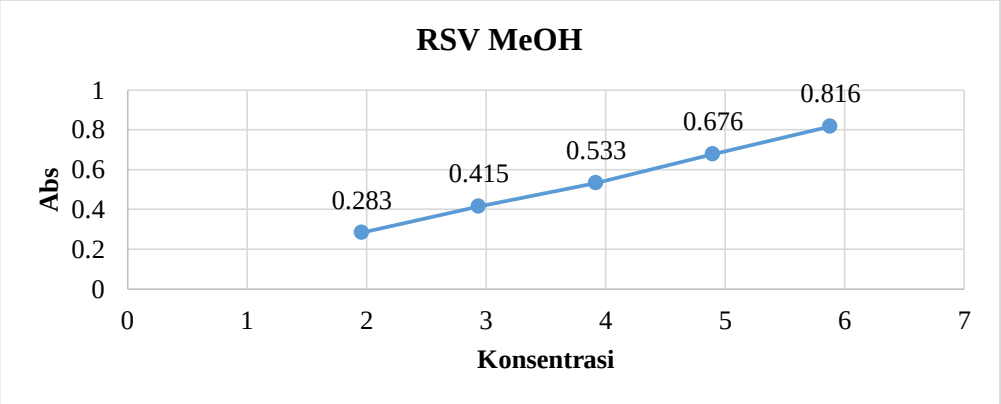
1,96 ppm = $V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 1,96 \text{ ppm} = 200 \text{ µL}$

2,94 ppm = $V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 2,94 \text{ ppm} = 300 \text{ µL}$

3,92 ppm = $V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 3,92 \text{ ppm} = 400 \text{ µL}$

4,9 ppm = V_1 x 98 ppm = 10000 µL x 4,9 ppm = 500 µL

5,88 ppm = V_1 x 98 ppm = 10000 µL x 5,88 ppm = 600 µL



Nilai linieritas pada kurva kalibrasi resveratrol dalam methanol yaitu:

Intercept (a) = 0.0138

Slope (b) = 0.1354082

Koefisien korelasi (r) = 0.9994431

Akurasi

Konsentrasi	Replikasi	Abs	Konsentrasi	Sebenarnya	%		Rata-rata
80%	1	0.411	2.933353429	2.94	99.77%	99.94%	
	2	0.411	2.933353429	2.94	99.77%		
	3	0.413	2.948123587	2.94	100.28%		
100%	1	0.503	3.612780708	3.92	92.16%	101.33%	100.34%
	2	0.574	4.137121326	3.92	105.54%		
	3	0.578	4.166661643	3.92	106.29%		
120%	1	0.655	4.735312735	4.9	96.64%	99.75%	
	2	0.682	4.934709872	4.9	100.71%		
	3	0.69	4.993790505	4.9	101.91%		

Presisi

Konsentrasi (ppm)	Abs	Konsentrasi
3.92	0.562	4.0485
3.92	0.544	3.9156
3.92	0.552	3.9746
3.92	0.503	3.6128
3.92	0.532	3.8269
3.92	0.506	3.6349
3.92	0.512	3.6792
3.92	0.532	3.8269
3.92	0.508	3.6497
	Rata-rata	3.7966
	SD	0.160634
	CV	0.04231

Perhitungan % RSD = $\frac{S}{X}$ X 100%

$$= \frac{0.160634}{3.7966} \times 100\% = 0{,}04231\%$$

LOD & LOQ

X (ppm)	Y (abs)	y'	y-y'	(y-y')2
1.96	0.283	0.2792	0.0038	1.444E-05
2.94	0.415	0.4119	0.0031	9.61E-06
3.92	0.533	0.5446	-0.0116	0.00013456
4.9	0.676	0.6773	-0.0013	1.69E-06
5.88	0.816	0.81	0.006	3.6E-05

Jumlah = 0.0001963

Sy/x = 0.007005355

$$\text{LOD} = \frac{3 \text{ sy/x}}{\text{b}} \quad \text{LOQ} = \frac{10 \text{ sy/x}}{\text{b}}$$

$$\text{LOD} = \frac{3.3 \text{ x } 0.007005355}{0.135408} = 0.170725836$$

$$\text{LOQ} = \frac{10 \text{ x } 0.007005355}{0.135408} = 0.517351017$$

B. Kurva kalibrasi resveratrol dalam dapar posfat *p*H 7,4

1. Perhitungan larutam induk resveratrol

Berat penimbangan = 0,049 gram = 49 mg

$$\frac{49 \text{ mg}}{10 \text{ mL}} = \frac{490 \text{ mg}}{1000 \text{ mL}} = 4900 \text{ ppm}$$

2. Pembuatan larutan stok resveratrol

$V_1 \times C_1 = V_2 \times C_2$

$V_1 \times 4900 \text{ ppm} = 10000 \text{ µL} \times 98 \text{ ppm}$

$V_1 = 200 \text{ µL}$

3. Penentuan panjang gelombang maksimum

$V_1 \times C_1 = V_2 \times C_2$

$V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 4{,}9 \text{ ppm}$

$V_1 = 500 \text{ µL}$

Panjang gelombang maksimum:

Wavelength	Abs
316.00	0.7189

Hasil verifikasi metode analisis

Linearitas

Larutan baku resveratrol 98 ppm dibuat 5 seri pengenceran yaitu 1,96 ppm; 2,94 ppm; 3,92 ppm; 4,9 ppm; dan 5,88 ppm.

Konsentrasi (ppm)	Vol. yang diambil (µL)	Vol. yang dibuat (µL)
1,96	200	10000
2,94	300	10000
3,92	400	10000
4,9	500	10000
5,88	600	10000

Perhitungan kurva baku resveratrol dalam dapar posfat *p*H 7,4

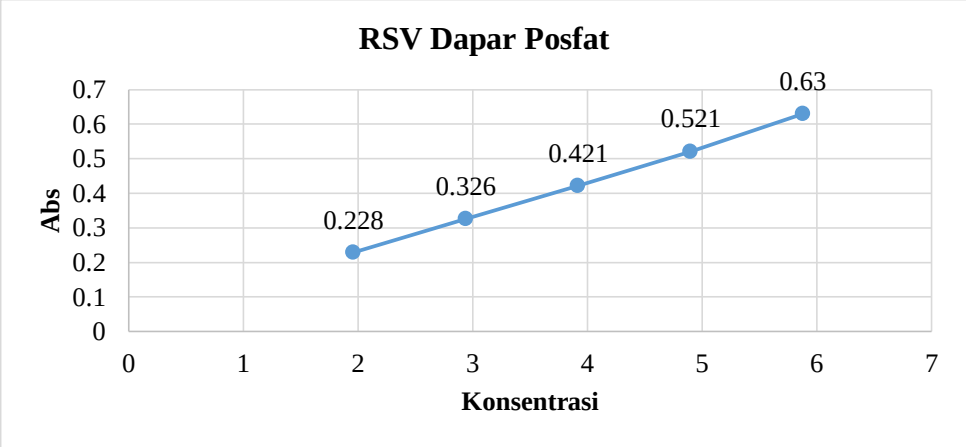
1,96 ppm = $V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 1{,}96 \text{ ppm} = 200 \text{ µL}$

2,94 ppm = $V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 2{,}94 \text{ ppm} = 300 \text{ µL}$

3,92 ppm = $V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 3{,}92 \text{ ppm} = 400 \text{ µL}$

4,9 ppm = $V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 4{,}9 \text{ ppm} = 500 \text{ µL}$

5,88 ppm = $V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 5{,}88 \text{ ppm} = 600 \text{ µL}$



Nilai linieritas pada kurva kalibrasi resveratrol dalam dapar posfat yaitu:

Intercept (a) = 0.0256

Slope (b) = 0.101939

Koefisien korelasi (r) = 0.999666

Akurasi

Konsentrasi	Replikasi	Abs	Konsentrasi	Sebenarnya	%		Rata-rata
80%	1	0.332	3.005725726	2.94	102.24%	101.68%	
	2	0.326	2.946866867	2.94	100.23%		
	3	0.333	3.015535536	2.94	102.57%		
100%	1	0.426	3.927847848	3.92	100.20%	101.12%	101.57%
	2	0.429	3.957277277	3.92	100.95%		
	3	0.434	4.006326326	3.92	102.20%		
120%	1	0.535	4.997117117	4.9	101.98%	101.92%	
	2	0.535	4.997117117	4.9	101.98%		
	3	0.534	4.987307307	4.9	101.78%		

Presisi

Konsentrasi (ppm)	Abs	Konsentrasi
3.92	0.426	3.9278
3.92	0.429	3.9573
3.92	0.434	4.0063
3.92	0.498	4.6342
3.92	0.488	4.5361
3.92	0.489	4.5459
3.92	0.497	4.6243
3.92	0.497	4.6243
3.92	0.49	4.5557
	Rata-rata	4.3791
	SD	0.314144
	CV	0.071737

Perhitungan % RSD = $\frac{S}{X}$ X 100%

$$= \frac{0.314144}{4.3791} \times 100\% = 0{,}071737\%$$

LOD & LOQ

X (ppm)	Y (abs)	y'	y-y'	(y-y')2
1.96	0.228	0.2254	0.0026	6.76E-06
2.94	0.326	0.3253	0.0007	4.9E-07
3.92	0.421	0.4252	-0.0042	1.764E-05
4.9	0.521	0.5251	-0.0041	1.681E-05
5.88	0.63	0.625	0.005	2.5E-05

Jumlah = 6.67E-05

Sy/x = 0.004083503

$$\text{LOD} = \frac{3\ sy/x}{b} \quad \text{LOQ} = \frac{10\ sy/x}{b}$$

$$\text{LOD} = \frac{3.3 \times 0.004083503}{0.101939} = 0.132192693$$

$$\text{LOQ} = \frac{10 \times 0.004083503}{0.101939} = 0.400583917$$

Lampiran 5. Efisiensi penjerapan

Rep.	Formula 2
1	0,336
Perhitungan % EP	99,95%

Perhitungan

Rep.1

$y = a + bx$

$y = 0{,}0138 + 0{,}1354x$

$0{,}336 = 0{,}0138 + 0{,}1354x$

$$x = \frac{0{,}336-0{,}0138}{0{,}1354}$$

$x = 2{,}3796 \times 10$

$x = 23{,}796 \text{ mg} / 1000 \text{ Ml}$

$x = 0{,}023796$

$$\%EP = \frac{Wa-Ws}{Wa} \times 100\%$$

$$= \frac{50-0{,}023796}{50} \times 100\%$$

$= 99{,}95\%$

Lampiran 6. Hasil karakteristik NLC rsv berbasis gel

Formula	Replikasi	pH	Viskositas	Daya lekat
F 1	1	5.79	15	0.57
	2	5.81	15	0.35
	3	5.8	16	0.47
	Rata-rata±SD	**5.8±0.01**	**15.33±0.58**	**0.46±0.11**
F4	1	4.96	500	1.45
	2	4.51	450	1.04
	3	4.84	490	1.5
	Rata-rata±SD	**4.77±0.23**	**480±26.46**	**1.33±0.25**

Replikasi	Daya sebar									
	0 g		50 g		100 g		150 g		200 g	
	F1	F4	F1	F4	F1	F4	F1	F4	F1	F4
1	4.5	3.3	5	4.1	6	4.4	6.4	4.6	6.5	4.8
	4.5	3.5	5.5	4	5.9	4.4	6.1	4.5	6.1	4.9
	4.6	3.5	5.7	3.9	5.9	4.3	6	4.5	6.7	4.7
	4.8	3.5	5.8	4	6	4.2	6.5	4.5	6.9	4.6
Rata-rata	**4.6**	**3.45**	**5.5**	**4**	**5.95**	**4.32**	**6.25**	**4.52**	**6.55**	**4.75**
2	4.5	3	5.2	3.9	5.7	4.3	6	4.7	6.4	5
	4.5	3.2	5	4	5.8	4.3	6.1	4.6	6.2	5
	4.5	3.2	5.1	3.9	5.8	4.2	6.2	4.6	6.6	4.9
	4.5	3.2	5.2	3.8	6	4.3	6.3	4.6	6.7	5
Rata-rata	**4.5**	**3.15**	**5.12**	**3.9**	**5.82**	**4.27**	**6.15**	**4.62**	**6.47**	**4.97**
3	4.7	3	5.4	3.6	6	4.2	6.4	4.6	6.7	4.9
	4.5	3	5.4	3.7	5.9	4	6.2	4.6	6.7	4.9
	4.5	3.1	5.5	3.9	6	4.2	6.2	4.8	6.8	5
	5	3.1	5.6	3.9	6	4.3	6.5	4.6	6.9	5
Rata-rata	**4.67**	**3.05**	**5.47**	**3.775**	**5.97**	**4.17**	**6.32**	**4.65**	**6.77**	**4.95**
Rata-rata±SD	**4.59± 0.08**	**3.22± 0.21**	**5.37± 0.21**	**3.89± 0.11**	**5.92± 0.08**	**4.26± 0.08**	**6.32± 0.08**	**4.6± 0.07**	**6.6± 0.16**	**4.89± 0.12**

Lampiran 7. Gambar Alat Penelitian

No	Gambar	Keterangan
1		**Alat mikropipet**
2		**Alat viskositas**
3		**Alat *p*H meter**
4		**Alat *Qonic sonicators***