BAB V

KESIMPULAN DAN SARAN

A. Kesimpulan

1. Komponen minyak, surfaktan, dan kosurfaktan yang terpilih yaitu Capryol, Kolliphor, dan PEG 400 dengan rasio minyak : Smix 4 : 6 dan rasio surfaktan : kosurfaktan 2 : 1.
2. Perubahan *enhancer* Transcutol CG dan viskositas mempengaruhi profil difusi dan aktivitas antioksidan. *Enhancher* Trancutol CG 8 % lebih meningkatkann difusi dibandingkan 2% sedangkan viskositas 300 dPas lebih menurunkan difusi dibandingkan 100 dPas. *Enhancer* menurunkan aktifitas antioksidan sedangkan viskositas meningkatkan aktivitas antioksidan.
3. *Enhancher* Trancutol CG 8 % dan viskositas 100 dPas menunjukkan formula yang paling bagus tertransport melewati membran difusi *sned snake skin*.

B. Saran

1. Perlu dilakukan penelitian lebih lanjut terhadap uji in vivo dan *transport modelling* untuk mengetahui kinetika transport secara perkutan.
2. Perlu dilakukan studi kadar resveratrol yang tertransport secara farmakokinetik.
3. Perlu dilakukan pengembangan formula berbasis optimasi dari kombinasi *enhancer* Transcutol CG dan viskositas *gel* HPMC K4M.

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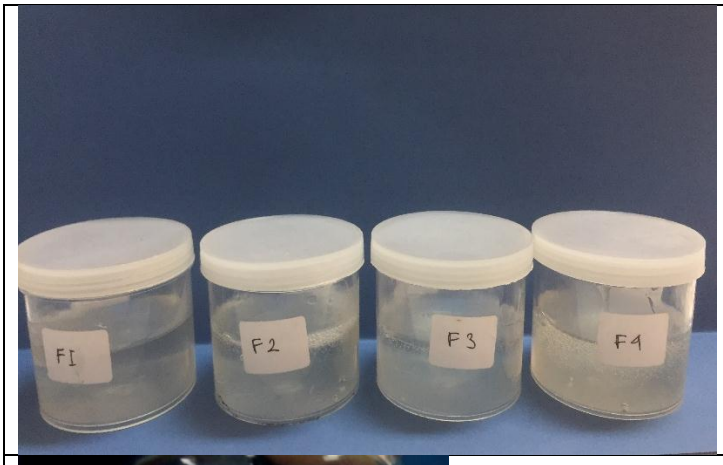
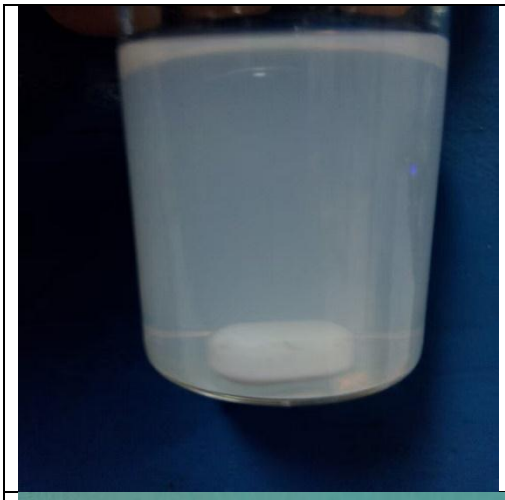
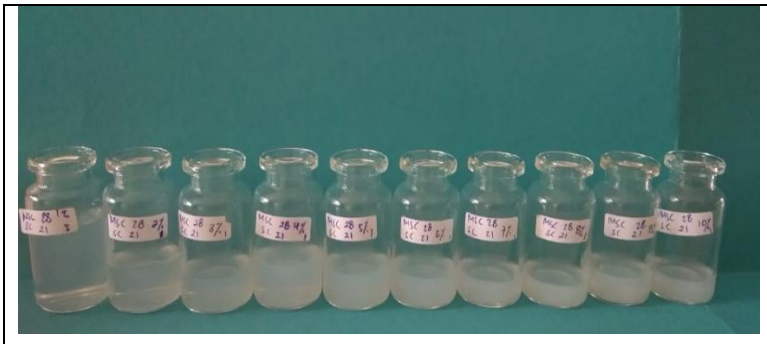
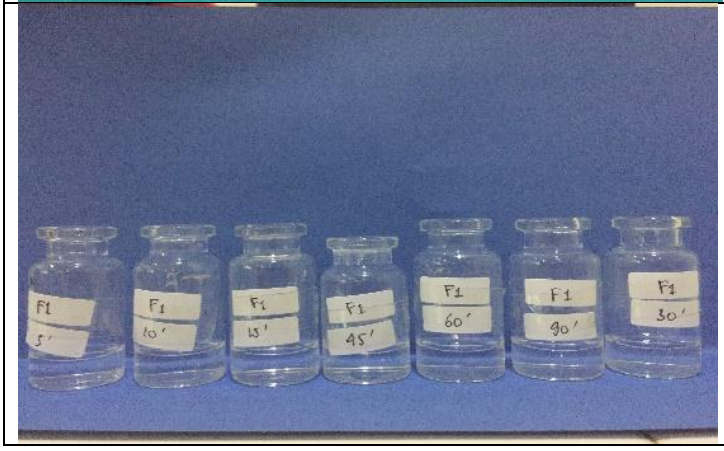
LAMPIRAN

Lampiran 1. Gambar penelitian

	**Gambar *gelling agent* HPMC K4M**
	**Gambar minyak, surfaktan, kosurfaktan (Capryol, Labrafil, PEG 400)**
	**Gambar minyak, surfaktan, kosurfaktan (Capryol, Labrasol, PEG 400)**

	**Gambar minyak, surfaktan, kosurfaktan (Labrafac Lipofil, Labrafil, PEG 400)**
	**Gambar minyak, surfaktan, kosurfaktan (Capryol, Kolliphor, PEG 400) minyak : Smix 4:6 surfaktan : kosurfaktan 1:1**
	**Gambar minyak, surfaktan, kosurfaktan (Capryol, Kolliphor, PEG 400) minyak : Smix 4:6 surfaktan : kosurfaktan 2:1**

	**Gambar minyak, surfaktan, kosurfaktan (Capryol, Kolliphor, PEG 400) minyak : Smix 2:8 surfaktan : kosurfaktan 2:1**
	**Gambar uji *drug loading***
	**Gambar sampel uji difusi *Franz***

	**Gambar nano-emul*gel* resveratrol sebelum uji *freeze thaw***
	**Gambar nano-emul*gel* resveratrol sesudah uji *freeze thaw***

Lampiran 2. Gambar COA resveratrol

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CERTIFICATE OF ANALYSIS

Product Name	Resveratrol	**Code**	BPBE-629-A
Botanical Source	Polygonum cuspidatum Sieb.Et Zucc	**Used Part**	Root
Batch No.	H020862918A	**Mfg. Date**	Aug. 10, 2018
Packing	25kg/Drum	**Retest Date**	Aug. 09, 2020
Quantity	10g	**Report Date**	Aug. 17, 2018
Specification	98%(HPLC)		

ITEM	SPECIFICATION	RESULT
Assay(HPLC)	≥98.0%	98.26%
Appearance	Milky - white powder	Complies
Odor	Characteristic	Complies
Taste	Characteristic	Complies
Particle Size	NLT 95% pass 80 mesh	Complies
Loss on Drying	≤0.5%	0.20%
Ash	≤0.5%	0.07%
Bulk Density	35-45g/100mL	40g/100mL
Heavy Metals	≤10ppm	Complies
-As	≤1.0ppm	Complies
-Pb	≤1.5ppm	Complies
-Cd	≤0.5ppm	Complies
-Hg	≤0.1ppm	Complies
Total Plate Count	≤1000cfu/g	Complies
-Yeast & Mold	≤100cfu/g	Complies
-E.Coli	Negative	Negative
-Salmonella	Negative	Negative
Conclusion	Comply with the specification.	
Storage	Preserve in tight containers, protected from strong light and high heat. Store in dry cool place.	

Analyst: QC Manager: QA:

Lampiran 3. Gambar uji ukuran partikel

Size Distribution Report by Intensity

v2.2

Malvern

Sample Details

Sample Name: sampel 1 2
SOP Name: mansettings.nano
General Notes:

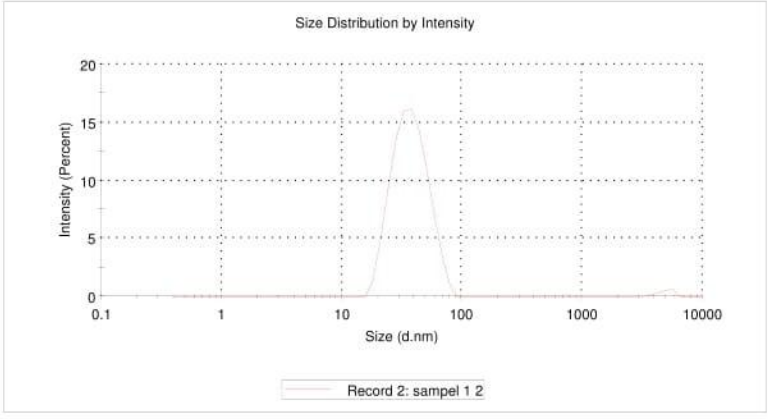
File Name:	Anisa Devi 2019.dts	**Dispersant Name:**	Water
Record Number:	2	**Dispersant RI:**	1.330
Material RI:	1.33	**Viscosity (mPa.s):**	0.8872
Material Absorbtion:	0.500	**Measurement Date and Time:**	Friday, June 28, 2019 8:30:...

System

Temperature (°C):	25.0	**Duration Used (s):**	60
Count Rate (kcps):	260.2	**Measurement Position (mm):**	1.05
Cell Description:	Disposable sizing cuvette	**Attenuator:**	5

Results

			Size (d.nm...	% Intensity:	St Dev (d.n...
Z-Average (d.nm):	36.04	**Peak 1:**	38.61	98.3	12.65
PdI:	0.159	**Peak 2:**	4875	1.7	685.1
Intercept:	0.946	**Peak 3:**	0.000	0.0	0.000
Result quality	Good				



Size Distribution Report by Intensity

v2.2

Malvern

Sample Details

Sample Name: sampel 1 3

SOP Name: mansettings.nano

General Notes:

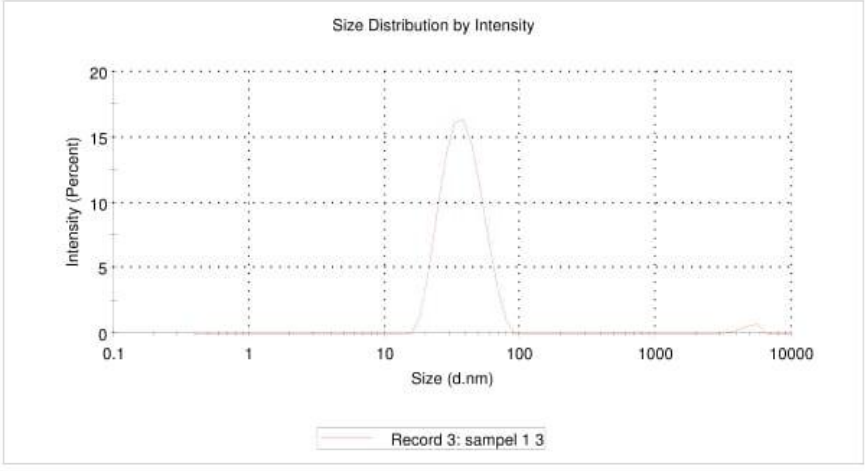
File Name:	Anisa Devi 2019.dts	**Dispersant Name:**	Water
Record Number:	3	**Dispersant RI:**	1.330
Material RI:	1.33	**Viscosity (mPa.s):**	0.8872
Material Absorbtion:	0.500	**Measurement Date and Time:**	Friday, June 28, 2019 8:32:...

System

Temperature (°C):	25.0	**Duration Used (s):**	60
Count Rate (kcps):	258.8	**Measurement Position (mm):**	1.05
Cell Description:	Disposable sizing cuvette	**Attenuator:**	5

Results

			Size (d.nm...	% Intensity:	St Dev (d.n...
Z-Average (d.nm):	36.20	**Peak 1:**	38.56	98.0	12.48
PdI:	0.166	**Peak 2:**	4831	2.0	709.0
Intercept:	0.941	**Peak 3:**	0.000	0.0	0.000
Result quality	Good				



Size Distribution Report by Intensity

v2.2

Malvern

Sample Details

Sample Name: sampel 1 4

SOP Name: mansettings.nano

General Notes:

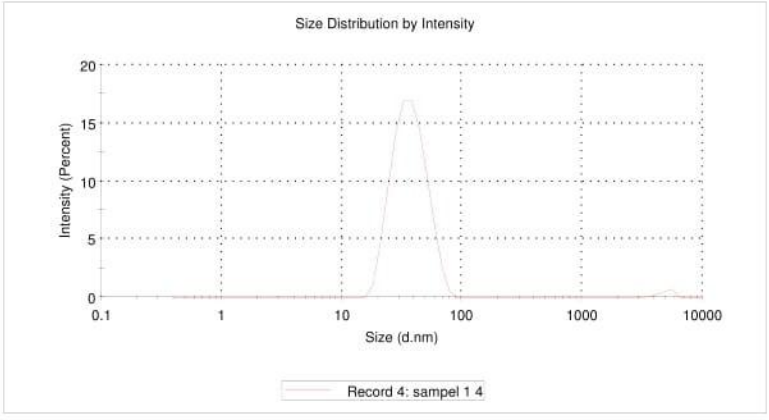
File Name:	Anisa Devi 2019.dts	**Dispersant Name:**	Water
Record Number:	4	**Dispersant RI:**	1.330
Material RI:	1.33	**Viscosity (mPa.s):**	0.8872
Material Absorbtion:	0.500	**Measurement Date and Time:**	Friday, June 28, 2019 8:35:...

System

Temperature (°C):	25.0	**Duration Used (s):**	60
Count Rate (kcps):	254.9	**Measurement Position (mm):**	1.05
Cell Description:	Disposable sizing cuvette	**Attenuator:**	5

Results

			Size (d.nm...	% Intensity:	St Dev (d.n...
Z-Average (d.nm):	35.60	**Peak 1:**	37.83	98.3	11.76
PdI:	0.164	**Peak 2:**	4934	1.7	644.8
Intercept:	0.948	**Peak 3:**	0.000	0.0	0.000
Result quality	Good				



Lampiran 4. Gambar uji zeta potensial

Zeta Potential Report

v2.3

Malvern

Sample Details

Sample Name: sampel 1 4
SOP Name: mansettings.nano
General Notes:

File Name: Anisa Devi 2019.dts
Record Number: 9
Date and Time: Friday, June 28, 2019 8:42:35 ...
Dispersant Name: Water
Dispersant RI: 1.330
Viscosity (cP): 0.8872
Dispersant Dielectric Constant: 78.5

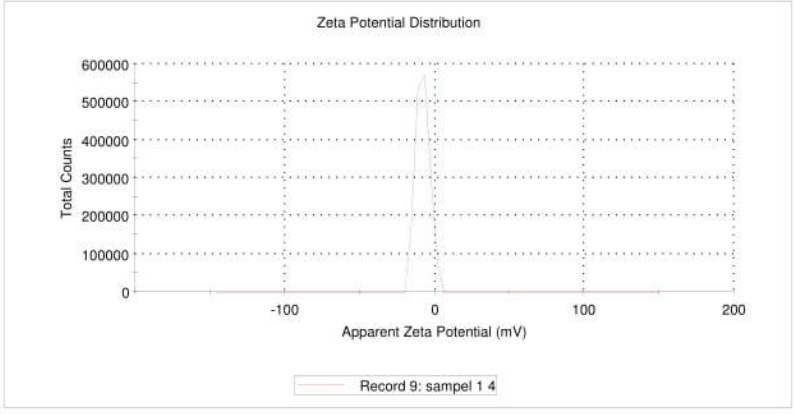
System

Temperature (°C): 25.0
Count Rate (kcps): 214.8
Cell Description: Zeta dip cell
Zeta Runs: 12
Measurement Position (mm): 4.50
Attenuator: 7

Results

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -7.99	**Peak 1:**	-7.99	100.0	4.46
Zeta Deviation (mV): 4.46	**Peak 2:**	0.00	0.0	0.00
Conductivity (mS/cm): 0.0975	**Peak 3:**	0.00	0.0	0.00

Result quality Good



Size Distribution Report by Intensity

v2.2

Malvern

Sample Details

Sample Name: sampel 1 5

SOP Name: mansettings.nano

General Notes:

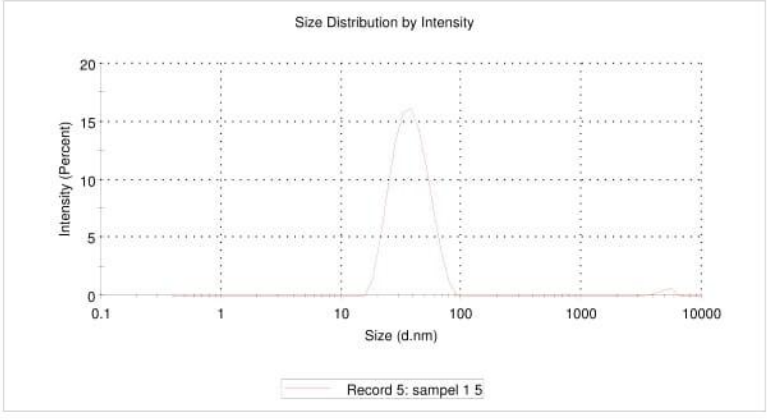
File Name:	Anisa Devi 2019.dts	**Dispersant Name:**	Water
Record Number:	5	**Dispersant RI:**	1.330
Material RI:	1.33	**Viscosity (mPa.s):**	0.8872
Material Absorbtion:	0.500	**Measurement Date and Time:**	Friday, June 28, 2019 8:37:...

System

Temperature (°C):	25.0	**Duration Used (s):**	60
Count Rate (kcps):	259.7	**Measurement Position (mm):**	1.05
Cell Description:	Disposable sizing cuvette	**Attenuator:**	5

Results

			Size (d.nm...	% Intensity:	St Dev (d.n...
Z-Average (d.nm):	36.07	**Peak 1:**	38.87	98.4	12.80
PdI:	0.168	**Peak 2:**	4942	1.6	639.9
Intercept:	0.947	**Peak 3:**	0.000	0.0	0.000
Result quality	Good				



Zeta Potential Report

v2.3

Malvern

Sample Details

Sample Name: sampel 1 3
SOP Name: mansettings.nano
General Notes:

File Name: Anisa Devi 2019.dts
Record Number: 8
Date and Time: Friday, June 28, 2019 8:41:52 ...
Dispersant Name: Water
Dispersant RI: 1.330
Viscosity (cP): 0.8872
Dispersant Dielectric Constant: 78.5

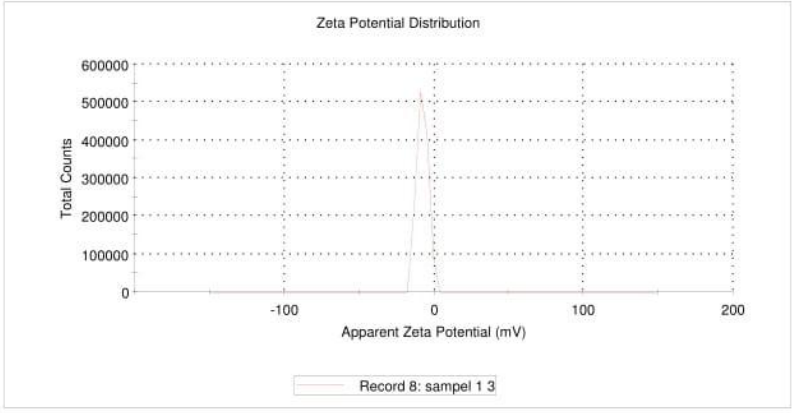
System

Temperature (°C): 25.0
Count Rate (kcps): 65.6
Cell Description: Zeta dip cell
Zeta Runs: 13
Measurement Position (mm): 4.50
Attenuator: 7

Results

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -7.80	**Peak 1:**	-7.80	100.0	3.68
Zeta Deviation (mV): 3.68	**Peak 2:**	0.00	0.0	0.00
Conductivity (mS/cm): 0.0969	**Peak 3:**	0.00	0.0	0.00

Result quality Good



Zeta Potential Report

v2.3

Sample Details

Sample Name: sampel 1 2
SOP Name: mansettings.nano
General Notes:

File Name: Anisa Devi 2019.dts
Record Number: 7
Date and Time: Friday, June 28, 2019 8:41:13 ...
Dispersant Name: Water
Dispersant RI: 1.330
Viscosity (cP): 0.8872
Dispersant Dielectric Constant: 78.5

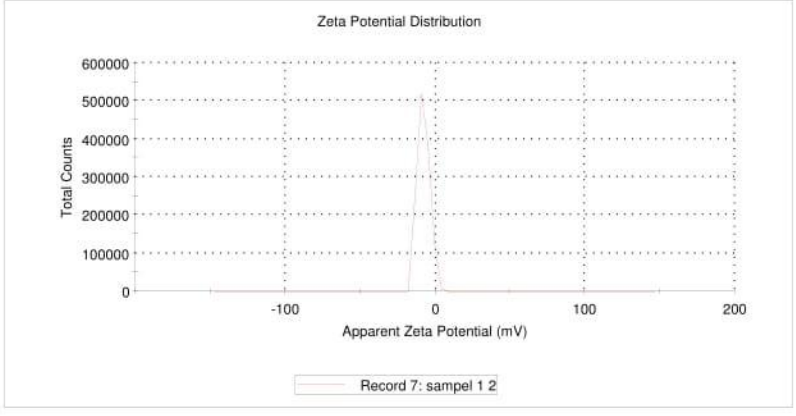
System

Temperature (°C): 25.0
Count Rate (kcps): 89.3
Cell Description: Zeta dip cell
Zeta Runs: 12
Measurement Position (mm): 4.50
Attenuator: 7

Results

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -7.79	**Peak 1:**	-7.79	100.0	4.04
Zeta Deviation (mV): 4.04	**Peak 2:**	0.00	0.0	0.00
Conductivity (mS/cm): 0.0967	**Peak 3:**	0.00	0.0	0.00

Result quality Good



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CERTIFICATE OF ANALYSIS

Product Name	Resveratrol	**Code**	BPBE-629-A
Botanical Source	Polygonum cuspidatum Sieb.Et Zucc	**Used Part**	Root
Batch No.	H020862918A	**Mfg. Date**	Aug. 10, 2018
Packing	25kg/Drum	**Retest Date**	Aug. 09, 2020
Quantity	10g	**Report Date**	Aug. 17, 2018
Specification	98%(HPLC)		

ITEM	SPECIFICATION	RESULT
Assay(HPLC)	≥98.0%	98.26%
Appearance	Milky - white powder	Complies
Odor	Characteristic	Complies
Taste	Characteristic	Complies
Particle Size	NLT 95% pass 80 mesh	Complies
Loss on Drying	≤0.5%	0.20%
Ash	≤0.5%	0.07%
Bulk Density	35-45g/100mL	40g/100mL
Heavy Metals -As -Pb -Cd -Hg	≤10ppm ≤1.0ppm ≤1.5ppm ≤0.5ppm ≤0.1ppm	Complies Complies Complies Complies Complies
Total Plate Count -Yeast & Mold -E.Coli -Salmonella	≤1000cfu/g ≤100cfu/g Negative Negative	Complies Complies Negative Negative
Conclusion	Comply with the specification.	
Storage	Preserve in tight containers, protected from strong light and high heat. Store in dry cool place.	

Analyst: QC Manager: QA:

Lampiran 5. Uji ANOVA kumulatif

Use your mouse to right click on individual cells for definitions.

Response 1 Kumulatif

ANOVA for selected factorial model

Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	3.85	3	1.28	302.34	< 0.0001	significant
A-Viskositas	*1.30*	*1*	*1.30*	*305.93*	*< 0.0001*	
B-Enhancer	*2.13*	*1*	*2.13*	*500.05*	*< 0.0001*	
AB	*0.43*	*1*	*0.43*	*101.04*	*< 0.0001*	
Pure Error	0.034	8	4.250E-003			
Cor Total	3.89	11				

The Model F-value of 302.34 implies the model is significant. There is only a 0.01% chance that a "Model F-Value" this large could occur due to noise.

Values of "Prob > F" less than 0.0500 indicate model terms are significant. In this case A, B, AB are significant model terms.

Values greater than 0.1000 indicate the model terms are not significant. If there are many insignificant model terms (not counting those required to support hierarchy), model reduction may improve your model.

Std. Dev.	0.065	R-Squared	0.9913
Mean	3.91	Adj R-Squared	0.9880
C.V. %	1.67	Pred R-Squared	0.9803
PRESS	0.076	Adeq Precision	39.853

[redacted]	Coefficient		Standard	95% CI	95% CI	
Factor	Estimate	df	Error	Low	High	VIF
Intercept	3.91	1	0.019	3.86	3.95	
A-Viskositas	-0.33	1	0.019	-0.37	-0.29	1.00
B-Enhancer	0.42	1	0.019	0.38	0.46	1.00
AB	-0.19	1	0.019	-0.23	-0.15	1.00

Final Equation in Terms of Coded Factors:

Kumulatif =
+3.91
-0.33 * A
+0.42 * B
-0.19 * A * B

Final Equation in Terms of Actual Factors:

Kumulatif =
+3.23389
-1.38889E-004 * Viskositas
+0.26639 * Enhancer
-6.30556E-004 * Viskositas * Enhancer

Lampiran 6. Uji ANOVA Fluks

Response 2 Fluks

ANOVA for selected factorial model

Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	0.084	3	0.028	961.51	< 0.0001	significant
A-Viskositas	*0.028*	*1*	*0.028*	*969.42*	*< 0.0001*	
B-Enhancer	*0.041*	*1*	*0.041*	*1418.27*	*< 0.0001*	
AB	*0.014*	*1*	*0.014*	*496.85*	*< 0.0001*	
Pure Error	2.331E-004	8	2.914E-005			
Cor Total	0.084	11				

The Model F-value of 961.51 implies the model is significant. There is only a 0.01% chance that a "Model F-Value" this large could occur due to noise.

Values of "Prob > F" less than 0.0500 indicate model terms are significant.
In this case A, B, AB are significant model terms.
Values greater than 0.1000 indicate the model terms are not significant.
If there are many insignificant model terms (not counting those required to support hierarchy), model reduction may improve your model.

Std. Dev.	5.398E-003	R-Squared	0.9972
Mean	0.55	Adj R-Squared	0.9962
C.V. %	0.99	Pred R-Squared	0.9938
PRESS	5.245E-004	Adeq Precision	68.795

Std. Dev.	5.398E-003	R-Squared	0.9972
Mean	0.55	Adj R-Squared	0.9962
C.V. %	0.99	Pred R-Squared	0.9938
PRESS	5.245E-004	Adeq Precision	68.795

The "Pred R-Squared" of 0.9938 is in reasonable agreement with the "Adj R-Squared" of 0.9962.

"Adeq Precision" measures the signal to noise ratio. A ratio greater than 4 is desirable. Your ratio of 68.795 indicates an adequate signal. This model can be used to navigate the design space.

Factor	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
Intercept	0.55	1	1.558E-003	0.54	0.55	
A-Viskositas	0.049	1	1.558E-003	0.045	0.052	1.00
B-Enhancer	-0.059	1	1.558E-003	-0.062	-0.055	1.00
AB	0.035	1	1.558E-003	0.031	0.038	1.00

Final Equation in Terms of Coded Factors:

Fluks =
+0.55
+0.049 * A
-0.059 * B
+0.035 * A * B

Lampiran 7. Uji ANOVA AUC total

Response 3 AUC total

ANOVA for selected factorial model

Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	12493.85	3	4164.62	230.54	< 0.0001	significant
A-Viskositas	*4382.66*	*1*	*4382.66*	*242.61*	*< 0.0001*	
B-Enhancer	*6637.96*	*1*	*6637.96*	*367.45*	*< 0.0001*	
AB	*1473.23*	*1*	*1473.23*	*81.55*	*< 0.0001*	
Pure Error	144.52	8	18.06			
Cor Total	12638.37	11				

The Model F-value of 230.54 implies the model is significant. There is only a 0.01% chance that a "Model F-Value" this large could occur due to noise.

Values of "Prob > F" less than 0.0500 indicate model terms are significant.
In this case A, B, AB are significant model terms.
Values greater than 0.1000 indicate the model terms are not significant.
If there are many insignificant model terms (not counting those required to support hierarchy), model reduction may improve your model.

Std. Dev.	4.25	R-Squared	0.9886
Mean	250.25	Adj R-Squared	0.9843
C.V. %	1.70	Pred R-Squared	0.9743
PRESS	325.17	Adeq Precision	34.745

Std. Dev.	4.25	R-Squared	0.9886
Mean	250.25	Adj R-Squared	0.9843
C.V. %	1.70	Pred R-Squared	0.9743
PRESS	325.17	Adeq Precision	34.745

The "Pred R-Squared" of 0.9743 is in reasonable agreement with the "Adj R-Squared" of 0.9843.

"Adeq Precision" measures the signal to noise ratio. A ratio greater than 4 is desirable. Your ratio of 34.745 indicates an adequate signal. This model can be used to navigate the design space.

Factor	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
Intercept	250.25	1	1.23	247.42	253.08	
A-Viskositas	-19.11	1	1.23	-21.94	-16.28	1.00
B-Enhancer	23.52	1	1.23	20.69	26.35	1.00
AB	-11.08	1	1.23	-13.91	-8.25	1.00

Final Equation in Terms of Coded Factors:

AUC total =
+250.25
-19.11 * A
+23.52 * B
-11.08 * A * B

Lampiran 8. Uji ANOVA perubahan inhibisi

Use your mouse to right click on individual cells for definitions.

Response 4 Perubahan inhibisi

ANOVA for selected factorial model

Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	14.17	3	4.72	63.04	< 0.0001	significant
A-Viskositas	*2.13*	*1*	*2.13*	*28.47*	*0.0007*	
B-Enhancer	*12.04*	*1*	*12.04*	*160.66*	*< 0.0001*	
AB	*0.000*	*1*	*0.000*	*0.000*	*1.0000*	
Pure Error	0.60	8	0.075			
Cor Total	14.77	11				

The Model F-value of 63.04 implies the model is significant. There is only a 0.01% chance that a "Model F-Value" this large could occur due to noise.

Values of "Prob > F" less than 0.0500 indicate model terms are significant.
In this case A, B are significant model terms.
Values greater than 0.1000 indicate the model terms are not significant.
If there are many insignificant model terms (not counting those required to support hierarchy), model reduction may improve your model.

Std. Dev.	0.27	R-Squared	0.9594
Mean	29.11	Adj R-Squared	0.9442
C.V. %	0.94	Pred R-Squared	0.9087
PRESS	1.35	Adeq Precision	18.011

Std. Dev.	0.27	R-Squared	0.9594
Mean	29.11	Adj R-Squared	0.9442
C.V. %	0.94	Pred R-Squared	0.9087
PRESS	1.35	Adeq Precision	18.011

The "Pred R-Squared" of 0.9087 is in reasonable agreement with the "Adj R-Squared" of 0.9442.

"Adeq Precision" measures the signal to noise ratio. A ratio greater than 4 is desirable. Your ratio of 18.011 indicates an adequate signal. This model can be used to navigate the design space.

Factor	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
Intercept	29.11	1	0.079	28.93	29.29	
A-Viskositas	0.42	1	0.079	0.24	0.60	1.00
B-Enhancer	-1.00	1	0.079	-1.18	-0.82	1.00
AB	0.000	1	0.079	-0.18	0.18	1.00

Final Equation in Terms of Coded Factors:

Perubahan inhibisi =

+29.11

+0.42 * A

-1.00 * B

+0.000 * A * B

Lampiran 9. *Desirability*

Constraints

Name	Goal	Lower Limit	Upper Limit	Lower Weight	Upper Weight	Importance
Viskositas	is in range	100	300	1	1	3
Enhancer	is in range	2	8	1	1	3
Kumulatif	maximize	2.84	4.51	1	1	3
Fluks	minimize	0.426	0.7003	1	1	3
AUC total	maximize	183.393	279.533	1	1	3
Perubahan inhib	minimize	27.38	30.84	1	1	3

Solutions

Number	Viskositas	Enhancer	Kumulatif	Fluks	AUC total	Perubahan inh	Desirability	
1	100.00	8.00	4.42667	0.432033	273.728	27.6867	0.944	Selected

1 Solutions found

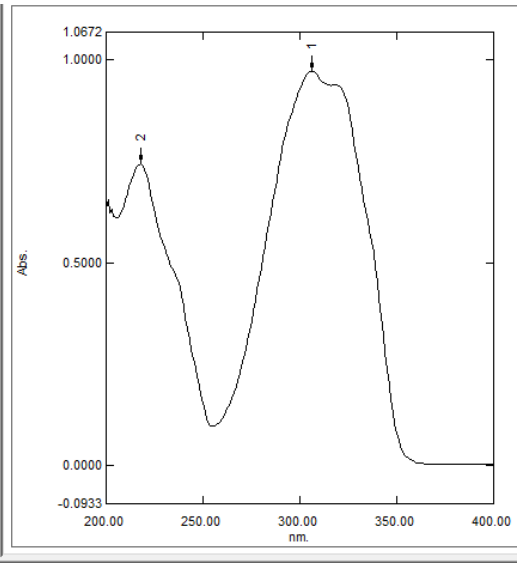
Number of Starting Points: 34

Viskositas	Enhancer
100.00	8.00
300.00	2.00
300.00	8.00
100.00	2.00
208.46	7.35
244.68	5.43
211.34	7.11

Lampiran 10. Panjang gelombang resveratrol

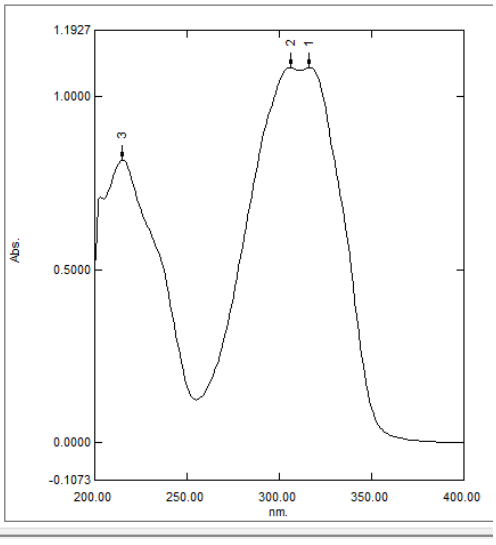
A. Resveratrol dalam media metanol

No.	P/V	Wavelength nm.	Abs.	Description
1		306.00	0.9705	
2		218.00	0.7423	
3		255.00	0.0972	



B. Resveratrol dalam media dapar fosfat *p*H 7,4

No.	P/V	Wavelength nm.	Abs.	Description
1		316.00	1.0838	
2		306.00	1.0844	
3		215.00	0.8176	
4		312.00	1.0769	
5		255.00	0.1247	



Lampiran 11. Kurva kalibrasi dan validasi metode analisis

A. Kurva kalibrasi resveratrol dalam metanol

Perhitungan larutan induk

Berat penimbangan = 52,6 mg

$52{,}6\ mg/_{10\ mL} = {}^{5260\ mg}/_{1000\ mL}$ = 5260 µg/mL

Pembuatan larutan stok 105,02 µg/mL

V_1 x C_1 = V_2 x C_2

V_1 x 5260 µg/mL = 10000 µL x 105,2 µg/mL

V_1 = 200 µL

Pembuatan larutan 10,52 µg/mL

Larutan 10,52 µg/mL digunakan untuk menentukan panjang gelombang maksimum

V_1 x C_1 = V_2 x C_2

10,52 µg/mL → V_1 x 105,2 µg/mL = 10000 µL x 10,52 µg/mL

V_1 = 1000 µL

Perhitungan kurva baku :

V_1 x C_1 = V_2 x C_2

- 0,63 µg/mL → V_1 x 105,2 µg/mL = 10000 µL x 0,63 µg/mL

  V_1 = 60 µL
- 0,99 µg/mL → V_1 x 105,2µg/mL = 10000 µL x 0,99 µg/mL

  V_1 = 94 µL
- 1,96 µg/mL → V_1 x 105,2µg/mL = 10000 µL x 1,96 µg/mL

  V_1 = 186 µL
- 2,92 µg/mL → V_1 x 105,2µg/mL = 10000 µL x 2,92 µg/mL

  V_1 = 227 µL
- 3,85 µg/mL → V_1 x 105,2µg/mL = 10000 µL x 3,85 µg/mL

  V_1 = 366 µL

- 5,67 µg/mL → V_1 x 105,2µg/mL = 10000 µL x 5,67 µg/mL

  V_1 =539 µL

- 7,43 µg/mL → V_1 x 105,2µg/mL = 10000 µL x 7,43 µg/mL

  V_1 = 706 µL

Hasil kurva kalibrasi resveratrol dalam metanol

Konsentrasi (µg/mL)	Absorbansi				
	I	II	III	IV	Rerata
0,63	0,076	0,076	0,074	0,072	0,075
0,99	0,136	0,138	0,132	0,131	0,134
1,96	0,275	0,275	0,263	0,263	0,269
2,92	0,403	0,403	0,433	0,432	0,418
3,85	0,555	0,556	0,552	0,552	0,554
5,67	0,797	0,800	0,785	0,786	0,792
7,43	1,033	1,030	1,044	1,045	1,038

B. Data kurva kalibrasi resveratrol dalam dapar fosfat *p*H 7,4

Perhitungan larutan induk

Berat penimbangan = 49,52 mg

$49{,}52\ {}^{mg}/_{10\ mL} = {}^{4952\ mg}/_{1000\ mL}$ = 4952 µg/mL

Pembuatan larutan stok 99,04 µg/mL

V_1 x C_1 = V_2 x C_2

V_1 x 4952 µg/mL = 10000 µL x 99,04 µg/mL

V_1 = 200 µL

Pembuatan larutan 9,90 µg/mL

Larutan 9,90 µg/mL digunakan untuk menentukan panjang gelombang maksimum

V_1 x C_1 = V_2 x C_2

9,90 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 9,90 µg/mL

V_1 = 1000 µL

Perhitungan kurva baku :

$V_1 \times C_1 = V_2 \times C_2$

- 0,49 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 0,49 µg/mL
  V_1 = 50 µL
- 0,98 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 0,98 µg/mL
  V_1 = 99 µL
- 1,94 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 1,94 µg/mL
  V_1 = 1896 µL
- 2,91 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 2,91 µg/mL
  V_1 = 294 µL
- 3,81 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 3,81 µg/mL
  V_1 = 385 µL
- 4,76 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 4,76 µg/mL
  V_1 =481 µL
- 5,65 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 5,65 µg/mL
  V_1 = 570 µL
- 6,52 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 6,52 µg/mL
  V_1 = 659 µL
- 7,40 µg/mL → V_1 x 99,04 µg/mL = 10000 µL x 7,40 µg/mL
  V_1 = 747 µL

Konsentrasi (µg/mL)	Absorbansi				
	I	II	III	IV	Rerata
0,49	0,076	0,078	0,065	0,066	0,071
0,98	0,103	0,103	0,102	0,102	0,103
1,94	0,215	0,218	0,019	0,208	0,208
2,91	0,340	0,340	0,337	0,339	0,339
3,81	0,435	0,434	0,427	0,427	0,431
4,76	0,553	0,553	0,548	0,548	0,551
5,65	0,648	0,647	0,651	0,650	0,649
6,52	0,753	0,752	0,759	0,758	0,756

7,40	0,862	0,862	0,852	0,850	0,857

C. Akurasi resveratrol dalam metanol

%	Replikasi	Absorbansi	Konsentrasi (µg/mL)	Konsentrasi Sebenarnya (µg/mL)	% Perolehan Kembali
80%	1	0,410	2,94	2,92	101%
	2	0,415	2,97	2,92	102%
	3	0,412	2,95	2,92	101%
100%	1	0,544	3,89	3,85	101%
	2	0,546	3,90	3,85	101%
	3	0,549	3,92	3,85	102%
120%	1	0,791	5,64	5,67	99%
	2	0,789	5,62	5,67	99%
	3	0,793	5,65	5,67	100%
X rata-rata ± SD					100,62% ± 0,01

D. Resveratrol dalam dapar fosfat *p*H 7,4

%	Replikasi	Absorbansi	Konsentrasi (µg/mL)	Konsentrasi Sebenarnya (µg/mL)	% Perolehan Kembali
80%	1	0,547	4,79	4,76	101%
	2	0,543	4,76	4,76	100%
	3	0,549	4,81	4,76	101%
100%	1	0,643	5,63	5,65	100%
	2	0,652	5,71	5,65	101%
	3	0,649	5,68	5,65	101%
120%	1	0,759	6,64	6,52	102%
	2	0,752	6,58	6,52	101%
	3	0,756	6,61	6,52	101%
X rata-rata ± SD					100,77% ± 0,0068

E. Presisi resveratrol dalam metanol

Replikasi	Konsentrasi (µg/mL)	Konsentrasi sebenarnya (µg/mL)	Absorbansi	%recovery
1	3,60	3,85	0,504	93,56
2	3,62	3,85	0,507	94,11
3	3,59	3,85	0,502	93,19
4	3,62	3,85	0,506	93,93
5	3,62	3,85	0,507	94,11
6	3,60	3,85	0,503	93,38
7	3,60	3,85	0,503	93,38
8	3,60	3,85	0,504	93,56
9	3,62	3,85	0,506	93,93
10	3,60	3,85	0,503	93,38
X rata-rata ± SD				93,65 ± 0,003214

F. Presisi resveratrol dalam dapar fosfat *p*H 7,4

Replikasi	Konsentrasi (µg/mL)	Konsentrasi sebenarnya (µg/mL)	Absorbansi	%recovery
1	5,62	5,65	0,504	99,50
2	5,64	5,65	0,507	99,81
3	5,65	5,65	0,502	99,96
4	5,54	5,65	0,506	98,13
5	5,59	5,65	0,507	98,89
6	5,65	5,65	0,503	99,96
7	5,65	5,65	0,503	99,96
8	5,62	5,65	0,504	99,50
9	5,67	5,65	0,506	100,27
10	5,54	5,65	0,503	97,98
X rata-rata ± SD				93,65 ± 0,003214

G. LOD dan LOQ resveratrol dalam metanol

Konsentrasi (x)	Absorbansi (y)	y’	y-y’	$(y-y')^2$
0,63	0,075	0,084181	-0,00918	8,43E-05
0,99	0,134	0,135349	-0,00135	1,82E-06
1,96	0,269	0,272463	-0,00346	1,2E-05
2,92	0,418	0,407045	0,010955	0,00012
3,85	0,554	0,539162	0,014838	0,00022
5,67	0,792	0,796275	-0,00427	1,83E-05
7,43	1,038	1,044306	-0,00631	3,98E-05
Jumlah				0,000496

H. LOD dan LOQ resveratrol dalam dapar fosfat *p*H 7,4

Konsentrasi (x)	Absorbansi (y)	y’	y-y’	$(y-y')^2$
0,49	0,071	0,053734	0,017516	0,000306821
0,98	0,103	0,110255	-0,00776	6,01435E-05
1,94	0,208	0,221638	-0,01364	0,000185996
2,91	0,339	0,333561	0,005439	2,95852E-05
3,81	0,431	0,437977	-0,00723	5,223E-05
4,76	0,551	0,548258	0,002242	5,02637E-06
5,65	0,649	0,651256	-0,00226	5,09041E-06
6,52	0,756	0,75233	0,00317	1,00493E-05
7,40	0,857	0,853991	0,002509	6,29469E-06

Lampiran 12. Hasil profil *gelling agent* HPMC K4M

Konsentrasi (%)	Kertas + zat	Kertas sisa	Zat (gram)	Viskositas (dPas)			Rata-rata
				1	**2**	**3**	
2,8	3,0772	0,2772	2,8	50	50	50	50
3,0	3,2699	0,2699	3,0	100	100	100	100
3,5	3,7791	0,2791	3,5	350	350	350	350
4,0	4,2854	0,2854	4,0	650	650	650	650
4,5	4,7923	0,2923	4,5	800	800	800	800

Lampiran 13. Hasil uji kelarutan *lipid-based*

Komponen	Jenis	Serapan		Kadar (mg/mL)		Rata-rata ± SD
		Rep 1	Rep 2	Rep 1	Rep 2	
Minyak	Asam Oleat	0,130	0,134	7,37	7,59	7,48 ± 16,44
	Labrafac Lipophil	0,237	0,248	13,23	13,83	13,53 ± 16,44
	Miglyol	0,566	0,538	5,68	5,40	5,54 ± 16,44
	Capryol	0,745	0,743	41,07	40,96	41,02 ± 16,44
Surfaktan	Tween 80	0,117	0,124	5,36	5,67	5,51 ± 17,27
	Kolliphor EL	0,402	0,413	17,93	18,42	18,18 ± 17,27
	Labrasol	0,656	0,673	29,14	29,89	29,52 ± 17,27
	Labrafil	0,831	0,845	45,78	46,55	46,17 ± 17,27
Kosurfaktan	PEG 400	0,376	0,378	81,77	82,20	81,98 ± 24,01
	Transcutol CG	0,868	0,876	47,81	48,25	48,03 ± 24,01

Lampiran 14. Hasil persen transmitan

Kons A (%)	Kons B (%)	% transmitan A		% tarnsmitan B	
		Rep 1	Rep 2	Rep 1	Rep 2
1,10	1,01	90,5	89,9	90,1	90,3
2.09	2,04	89,0	88,4	88,3	87,9
3,09	3,03	85,6	84,4	85,2	84,5
4,21	4,22	83,4	83,0	81,8	81,8
5,19	5,10	82,0	81,2	80,9	80,6
6,29	6,08	78,1	77,4	77,2	77,2
7,10	7,24	76,6	76,7	75,5	76,3
8,07	7,77	75,6	75,7	74,5	74,0
9,51	9,13	72,4	73,2	73,3	73,5
10,07	10,02	58,4	58,7	58,1	58,2

A. Minyak : Smix (4:6) dengan rasio Surfaktan : Kosurfaktan (1:1)

Kons A (%)	Kons B (%)	% transmitan A		% tarnsmitan B	
		Rep 1	Rep 2	Rep 1	Rep 2
1,01	1,01	76	76,1	76,1	76,2
2,06	2,01	86,4	86,3	82,1	82,2
3,88	3,06	82,1	82,2	88,1	88,2
5,25	4,21	83,0	83,0	88,7	88,7
5,62	5,02	86,7	86,7	89,8	89,9
6,25	6,16	87,8	87,8	87,4	87,4
7,04	7,22	87,0	87,1	85,6	85,5
8,45	8,56	85,4	85,5	84,3	84,4
9,11	8,98	85,3	85,3	86,3	86,3

B. Minyak : Smix (4:6) dengan rasio Surfaktan : Kosurfaktan (2:1)

10,45	10,09	83,6	83,6	85,5	85,4

Kons A (%)	Kons B (%)	% transmitan A		% tarnsmitan B	
		Rep 1	Rep 2	Rep 1	Rep 2
1,02	1,01	79,1	78,9	81,0	80,6
1.96	1,96	56,0	55,5	49,7	49,8
2,92	2,93	36,6	36,0	35,4	35,3
3,95	4,10	23,7	23,0	29,0	28,9
5,14	4,87	21,2	20,5	17,5	17,3
6,25	5,91	17,3	17	17,4	17,4
6,89	6,89	13,1	12,6	18,2	18,2
7,62	8,05	12,0	11,6	16,1	16,0
8,76	9,00	16,9	16,6	15,7	15,6
10,49	10,12	18,7	18,0	12,6	12,5

C. Minyak : Smix (2:8) dengan rasio Surfaktan : Kosurfaktan (2:1)

Lampiran 15. Hasil *drug loading* nanoemulsi

A. Minyak : Smix (4:6) dengan rasio Surfaktan : Kosurfaktan (1:1)

	Serapan	Kadar (µg/mL)	rata-rata (µg/mL)	Pengenceran total	*Drug loading* (mg/mL)
Rep 1	0,421	3,01	2,93	30401	89,16
Rep 2	0,416	2,98			
Rep 3	0,397	2,84			
Rep 4	0,404	2,89			

Perhitungan kadar

Persamaan regresi linear

y = -0,0044 + 0,141132x

- 0,421 → x = $\frac{(0,421+0,0044)}{0,141132}$ = 0,00301 mg/mL
- 0,416 → x = $\frac{(0,416+0,0044)}{0,141132}$ = 0,00298 mg/mL
- 0,397 → x = $\frac{(0,397+0,0044)}{0,141132}$ = 0,00284 mg/mL
- 0,404 → x = $\frac{(0,404+0,0044)}{0,141132}$ = 0,00289 mg/mL

Perhitungan *drug loading*

Drug loading = rata-rata kadar x pengenceran total

= 0,00293 mg/mL x 30401

= 89,16 mg/mL

B. Minyak : Smix (4:6) dengan rasio Surfaktan : Kosurfaktan (2:1)

	Serapan	Kadar (µg/mL)	rata-rata (µg/mL)	Pengenceran total	*Drug loading* (mg/mL)
Rep 1	0,495	3,54	3,47	30401	105,42
Rep 2	0,469	3,35			
Rep 3	0,472	3,38			
Rep 4	0,504	3,60			

Perhitungan kadar

Persamaan regresi linear

y = -0,0044 + 0,141132x

- 0,495 → x = $\frac{(0,495+0,0044)}{0,141132}$ = 0,00354 mg/mL
- 0,469 → x = $\frac{(0,469+0,0044)}{0,141132}$ = 0,00335 mg/mL
- 0,472 → x = $\frac{(0,472+0,0044)}{0,141132}$ = 0,00338 mg/mL
- 0,504 → x = $\frac{(0,504+0,0044)}{0,141132}$ = 0,00504 mg/mL

Perhitungan *drug loading*

Drug loading = rata-rata kadar x pengenceran total

= 0,00347 mg/mL x 30401

= 105,42 mg/mL

C. Minyak : Smix (2:8) dengan rasio Surfaktan : Kosurfaktan (2:1)

	Serapan	Kadar (µg/mL)	rata-rata (µg/mL)	Pengenceran total	*Drug loading* (mg/mL)
Rep 1	0,361	2,59	2,68	30401	81,40
Rep 2	0,373	2,67			
Rep 3	0,373	2,67			
Rep 4	0,387	2,77			

Perhitungan kadar

Persamaan regresi linear

y = -0,0044 + 0,141132x

- 0,361 → x = $\frac{(0,361+0,0044)}{0,141132}$ = 0,00259 mg/mL
- 0,373 → x = $\frac{(0,373+0,0044)}{0,141132}$ = 0,00267 mg/mL
- 0,373 → x = $\frac{(0,397+0,0044)}{0,141132}$ = 0,00267 mg/mL
- 0,387 → x = $\frac{(0,387+0,0044)}{0,141132}$ = 0,00277 mg/mL

Perhitungan *drug loading*

Drug loading = rata-rata kadar x pengenceran total

= 0,00268 mg/mL x 30401

= 81,40 mg/mL

Lampiran 16. Hasil uji penetrasi nano-emulgel resveratrol

A. Hasil kadar nano-emul*gel* resveratrol tiap kali sampling

Formula 1

Waktu	Serapan			Kadar (µg/mL)		
(menit)	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	0,045	0,043	0,046	0,42	0,40	0,43
10	0,046	0,044	0,047	0,43	0,41	0,43
15	0,05	0,046	0,051	0,46	0,43	0,47
30	0,054	0,055	0,055	0,50	0,50	0,50
45	0,059	0,058	0,060	0,54	0,53	0,55
60	0,065	0,064	0,066	0,59	0,58	0,60
90	0,07	0,068	0,071	0,63	0,62	0,64

Formula 2

Waktu	Serapan			Kadar (µg/mL)		
(menit)	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	0,039	0,037	0,036	0,37	0,35	0,34
10	0,043	0,041	0,040	0,40	0,38	0,37
15	0,045	0,045	0,044	0,42	0,42	0,41
30	0,056	0,053	0,052	0,51	0,49	0,48
45	0,057	0,056	0,055	0,52	0,51	0,50
60	0,058	0,059	0,058	0,53	0,54	0,53
90	0,064	0,062	0,061	0,58	0,56	0,56

Formula 3

Waktu	Serapan			Kadar (µg/mL)		
(menit)	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	0,050	0,051	0,053	0,46	0,47	0,49
10	0,058	0,059	0,061	0,53	0,54	0,56
15	0,061	0,062	0,064	0,56	0,56	0,58
30	0,072	0,083	0,075	0,65	0,66	0,68
45	0,088	0,089	0,091	0,79	0,80	0,81
60	0,092	0,093	0,095	0,82	0,83	0,85
90	0,101	0,102	0,104	0,90	0,91	0,93

Formula 4

Waktu	Serapan			Kadar (µg/mL)		
(menit)	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	0,048	0.047	0,049	0,45	0,43	0,45
10	0,049	0,048	0,050	0,46	0,44	0,46
15	0,050	0,049	0,051	0,47	0,45	0,47
30	0,055	0,054	0,056	0,51	0,50	0,51
45	0,062	0,061	0,063	0,57	0,56	0,57
60	0,068	0,067	0,069	0,62	0,61	0,62
90	0,075	0,074	0,076	0,68	0,67	0,68

Perhitungan kadar menggunakan persamaan regresi linear resveratrol dalam dapar fosfat *p*H 7,4 dengan persamaan :

$$Y = -0,0034 + 0,1159x$$

B. Hasil kumulatif sediaan nano-emulgel tiap kali sampling

Formula 1

Waktu	Total koreksi			Kumulatif (µg/cm2)		
(menit)	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	0	0	0	1,09	1,05	1,12
10	1,25	1,20	1,28	1,34	1,28	1,36
15	1,28	1,23	2,58	1,65	1,54	1,68
30	1,38	1,28	3,99	1,98	1,97	2,02
45	1,49	1,51	5,50	2,35	2,30	2,40
60	1,62	1,59	7,14	2,77	2,71	2,82
90	1,77	1,74	8,94	3.20	3,11	3,24

Formula 2

Waktu	Total koreksi			Kumulatif (µg/cm2)		
(menit)	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	0	0	0	0,96	0,91	0,89
10	1,10	1,05	1,02	1,24	1,19	1,16
15	2,30	1,15	1,12	1,50	1,48	1,45
30	3,55	1,25	1,23	1,96	1,88	1,84
45	5,09	1,46	1,43	2,26	2,20	2,16
60	6,65	1,54	1,51	2,55	2,54	2,49
90	8,24	1,62	1,59	2,96	2,89	2,84

Formula 3

Waktu (menit)	Total koreksi			Kumulatif (µg/cm2)		
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	0	0	0	1,21	1,23	1,28
10	1,38	1,41	1,46	1,63	1,66	1,71
15	1,59	1,62	3,13	1,98	2,01	2,07
30	1,67	1,69	4,87	2,52	2,55	2,62
45	1,95	1,98	6,90	3.22	3,26	3,34
60	2,37	2,39	9,34	3,72	3,77	3,86
90	2,47	2,50	11,89	4.36	4,41	4,51

Formula 4

Waktu (menit)	Total koreksi			Kumulatif (µg/cm2)		
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	0	0	0	1,16	1,14	1,19
10	1,33	1,30	1,36	1,42	1,39	1,44
15	1,36	1,33	2,74	1,68	1,65	1,71
30	1,38	1,36	4,15	2,03	2,00	2,07
45	1,51	1,49	5,68	2,45	2,41	2,49
60	1,69	1,67	7,40	2,89	2,84	2,93
90	1,85	1,82	9,28	3,37	3,32	3,42

C. Hasil Fluks sediaan nano-emul*gel*

Formula	Fluks ((µg/cm2/jam) ± SD
F1	0.66 ± 0,01
F2	0,69 ± 0,01
F3	0,43 ± 0,01
F4	0,63 ± 0,01

D. Hasil AUC total sediaan nano-emul*gel*

Formula	AUC total ((µg.menit/cm2) ± SD
F1	203,44 ± 4,38
F2	187,13 ± 73,87
F3	273,73 ± 5,32
F4	212,40 ± 3,48

Lampiran 17. Hasil uji aktivitas antioksidan resveratrol dalam metanol

A. Hasil uji DPPH resveratrol dalam metanol

Absorbansi kontrol DPPH = 0,910

Replikasi 1		Replikasi 2		Replikasi 3		Replikasi 4	
Serapan	Inhibisi (%)	Serapan	Inhibisi (%)	Serapan	Inhibisi (%)	Serapan	Inhibisi (%)
0,118	87,03	0,117	87,14	0,109	88,02	0,107	88,24
0,260	71,42	0,260	71,42	0,265	70,87	0,265	70,87
0,452	50,31	0,452	50,31	0,361	60,31	0,360	60,42
0,594	34,70	0,594	34,70	0,556	38,87	0,555	38,98
0,703	22,71	0,704	22,60	0,692	23,92	0,692	23,92
0,771	15,24	0,772	15,13	0,732	19,53	0,732	19,53

B. Perhitungan IC_{50} resveratrol

Persamaan :

y = 22,647 ln(x) + 5,1687

$IC_{50} \rightarrow \ln(x) = \frac{50-5,1687}{22,647}$

x = 7,24 µg//mL

Lampiran 18. Hasil aktivitas antioksidan nano-emul*gel* resveratrol

Inhibisi resveratrol dalam metanol 8 µg/mL

y = 22,647 ln(x) + 5,1687

8 µg/mL → y = 22,647 ln(8) + 5,1687

y = 52,26 %

Formula	Rep 1		Rep 2		Rep 3	
	abs	Inhibisi (%)	Abs	Inhibisi (%)	abs	Inhibisi (%)
F1	0,524	36,87	0,526	36,63	0,525	36,75
F2	0,527	36,51	0,529	36,27	0,53	36,14
F3	0,515	37,95	0,517	37,71	0,517	37,71
F4	0,519	37,47	0,521	37,23	0,520	37,35

Formula	Perubahan inhibisi (%)		
	Rep 1	Rep 2	Rep 3
F1	29,46	29,92	29,69
F2	30,15	30,61	30,84
F3	27,38	27,84	27,84
F4	28,30	28,76	28,53

Rumus perhitungan perubahan inhibisi :

Perubahan inhibisi = $\frac{inhibisi\ resveratrol - inhibisi\ sediaan}{inhibisi\ resveratrol} x\ 100\%$