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Lampiran 1. *Certificate Of Analysis* (COA) Naringenin

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## CERTIFICATE OF ANALYSIS

<b>Product Name</b>	Naringenin	<b>Code</b>	BPBE-622-A																																																						
<b>Botanical Source</b>	Citrus Grandis (L.) Osbeck	<b>Used Part</b>	Fruit																																																						
<b>Batch No.</b>	H020862217A	<b>Mfg. Date</b>	Aug. 15, 2017																																																						
<b>Packing</b>	25kg/Drum	<b>Rebtest Date</b>	Aug. 14, 2019																																																						
<b>Quantity</b>	25g	<b>Report Date</b>	Aug. 21, 2017																																																						
<b>Specification</b>	98%(HPLC)																																																								
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<b>Analyst:</b>	<b>QC Manager:</b>	<b>QA:</b>																																																							

## Lampiran 2. Certificate Of Analysis (COA) Kitosan



Shaanxi Jintai Biological Engineering Co., Ltd.

陕西锦泰生物工程有限公司

### CERTIFICATE OF ANALYSIS

Product Name	<b>Chitosan</b>	
Batch Number	JT20220210	
Quantity	300kg	
Manufacture Date	2022-02-10	
Testing Date	2022-02-15	
<b>Analysis</b>	<b>Specification</b>	<b>Results</b>
Appearance	White or yellowish, flaky product glossy	Complies
State	Flake or powder	Complies
Smell	With its own inherent smell, no odor	Complies
Viscosity	As claimed	65
DAC (%)	≥85	91.3
Moisture (%)	≤10.0	7.0
Ash (%)	≤1.0	0.6
Insoluble (%)	≤1.0	0.2
PH Value	6.5-8.5	7.5
Pb (mg/kg)	≤2	0.3
As (mg/kg)	≤1	0.4
<b>Microbiological:</b>		
Total plate count (CFU/g )	≤30000	$1.0 \times 10^2$
Coliform Bacteria (MPN/g)	≤0.92	<0.92
Mold and yeast (CFU/g )	≤50	<10
Staphylococcus aureus (/25g)	Negative	Complies
Salmonella (/25g)	Negative	Complies
Storage	Store in cool & dry place. Do not freeze. Keep away from strong light and heat.	
Shelf life	2 years when properly stored	
Analyzed: Wangjun	Approved: Zhanghua	



### Lampiran 3. *Certificate Of Analysis* (COA) NaTPP


**ARROW FINE CHEMICALS**

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 Website : [www.arrowfinechemicals.com](http://www.arrowfinechemicals.com)

### Certificate of Analysis

#### SPECIFICATION OF SODIUM TRIPOLYPHOSPHATE

Sr No.	Characteristics	Specifications
1	APPEARANCE	White Colour
2	PURITY	94.6%
3	Phosphates (P <sub>2</sub> O <sub>5</sub> )	57.1%
4	Iron (Fe)	0.008 %
5	Water Insoluble matter	0.03%
6	pH Value (1% Solution)	9.4
7	Bulk Density	0.75g/cm <sup>3</sup>
8	18 Mesh	98.6

For any further clarification in this regards please do feel free to contact us at any point of time at [info@arrowfinechemicals.com](mailto:info@arrowfinechemicals.com).

Assuring you great attention at all times.

For Arrow Fine Chemicals

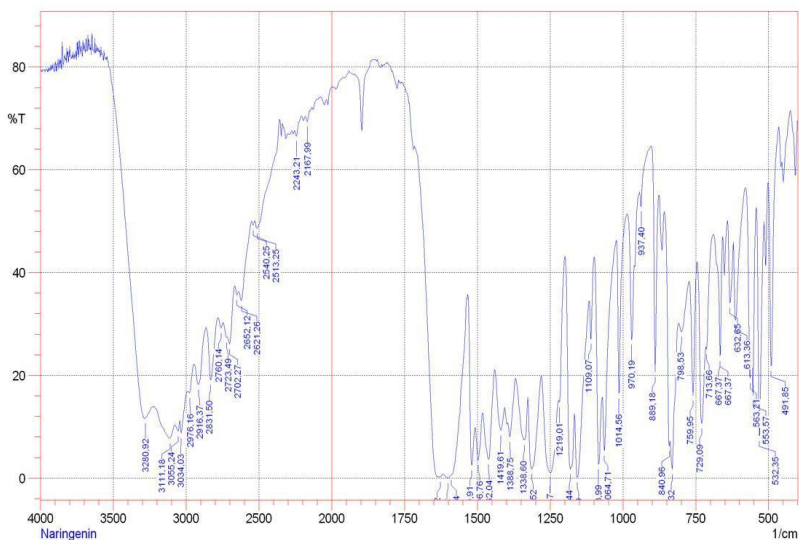
Quality Assurance Department

\*\* Note : This is a computer generated report hence not needed to sign.



An ISO 9001 : 2008 Company

## Lampiran 4. Hasil identifikasi Naringenin menggunakan FTIR



	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	491.85	21.801	38.569	501.49	466.77	11.676	4.643
2	532.35	8.151	42.393	540.07	516.92	14.004	7.016
3	553.21	16.12	15.272	557.43	542	7.434	1.105
4	563.21	19.481	12.097	578.64	559.36	9.225	1.13
5	613.36	30.809	17.127	621.08	580.57	14.669	2.884
6	632.65	34.094	13.23	640.37	623.01	7.109	1.343
7	667.37	23.725	23.451	688.59	657.73	12.876	2.823
8	667.37	23.725	23.451	688.59	657.73	12.873	2.823
9	713.66	25.037	2.207	715.59	690.52	10.558	0.157
10	729.09	10.631	21.599	744.52	717.52	19.424	5.969
11	759.95	16.065	23.839	771.53	746.45	13.75	3.812
12	798.53	28.523	3.915	808.17	773.46	17.107	0.943
13	831.32	1.715	9.833	837.11	810.1	25.918	3.982
14	840.96	6.263	5.926	856.39	839.03	12.274	0.735
15	889.18	20.723	38.687	902.69	877.61	9.321	3.62
16	937.4	52.912	4.078	943.19	904.61	8.422	0.159
17	970.19	26.962	18.005	983.7	962.48	9.062	1.837
18	1014.56	16.483	30.868	1022.27	985.62	15.213	3.834
19	1064.71	5.408	14.115	1070.49	1024.2	28.311	4.017
20	1083.99	2.732	25.368	1097.5	1072.42	23.553	8.434
21	1109.07	27.079	10.469	1114.86	1099.43	7.108	0.801
22	1157.29	0.138	14.552	1165	1116.78	53.62	19.842
23	1180.44	1.723	24.142	1197.79	1166.93	36.063	16.021
24	1219.01	14.775	2.883	1220.94	1199.72	11.747	0.363
25	1249.87	0.973	16.249	1280.73	1222.87	77.159	32.809
26	1313.52	1.809	15.068	1327.03	1282.66	53.873	20.417
27	1338.6	7.37	8.278	1367.53	1328.95	37.262	7.143
28	1388.75	8.004	4.555	1394.53	1369.46	22.869	1.974
29	1419.61	9.322	6.841	1438.9	1408.04	28.111	3.924
30	1462.04	3.646	12.98	1481.33	1440.83	43.318	11.604
31	1496.76	3.469	7.424	1506.41	1483.26	27.546	5.51
32	1519.91	2.491	19.976	1531.48	1508.33	25.644	8.19
33	1589.34	0.603	1.212	1591.27	1533.41	61.684	0.589

## Lampiran 5. Penentuan ukuran partikel, PDI dan zeta potensial

### A. Hasil ukuran partikel dan indeks polidispersitas formula 3

#### Size Distribution Report by Number

v2.2



#### Sample Details

Sample Name: Formula 3 3

SOP Name: mansettings.nano

General Notes:

File Name: Bagus Kurniawan 2022... Dispersant Name: Water  
 Record Number: 2 Dispersant RI: 1,330  
 Material RI: 1,30 Viscosity (cP): 0,8872  
 Material Absorbtion: 0,100 Measurement Date and Time: 22 Agustus 2022 13:26:15

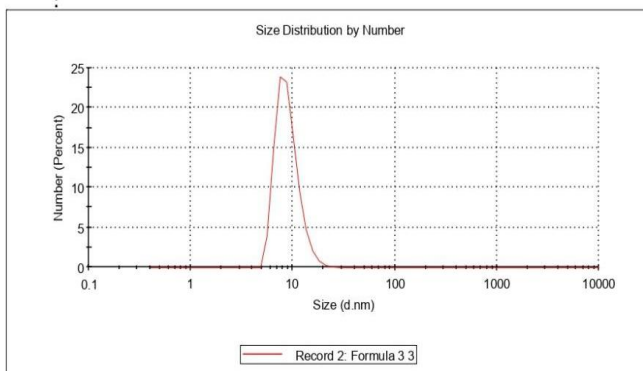
#### System

Temperature (°C): 25,0 Duration Used (s): 60  
 Count Rate (kcps): 460,0 Measurement Position (mm): 0,85  
 Cell Description: Disposable sizing cuvette Attenuator: 9

#### Results

	Size (d.n...	% Number:	St Dev (d.n...
<b>Z-Average (d.nm): 16,30</b>	<b>Peak 1:</b> 9,005	100,0	2,491
<b>Pdl: 0,287</b>	<b>Peak 2:</b> 0,000	0,0	0,000
<b>Intercept: 0,918</b>	<b>Peak 3:</b> 0,000	0,0	0,000

Result quality **Good**



## B. Hail zeta potensial formula 3

### Zeta Potential Report

v2.3



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#### Sample Details

**Sample Name:** Formula 3 3  
**SOP Name:** mansettings.nano  
**General Notes:**

**File Name:** Bagus Kurniawan 2022.dts      **Dispersant Name:** Water  
**Record Number:** 6      **Dispersant RI:** 1,330  
**Date and Time:** 22 August 2022 13:35:51      **Viscosity (cP):** 0,8872

**Dispersant Dielectric Constant:** 78,5

#### System

**Temperature (°C):** 25,0      **Zeta Runs:** 12  
**Count Rate (kcps):** 241,0      **Measurement Position (mm):** 4,50  
**Cell Description:** Zeta dip cell      **Attenuator:** 10

#### Results

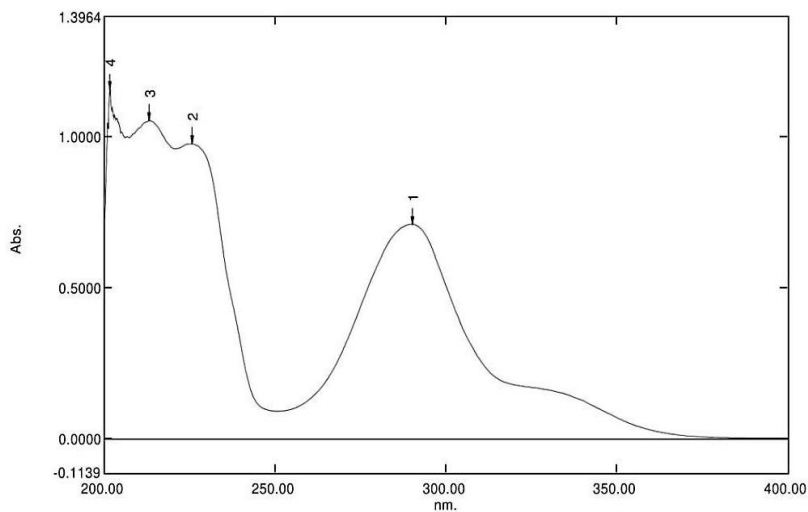
	Mean (mV)	Area (%)	St Dev (mV)
<b>Zeta Potential (mV):</b> -9,56	<b>Peak 1:</b> -9,56	100,0	4,95
<b>Zeta Deviation (mV):</b> 4,95	<b>Peak 2:</b> 0,00	0,0	0,00
<b>Conductivity (mS/cm):</b> 2,79	<b>Peak 3:</b> 0,00	0,0	0,00
<b>Result quality</b> Good			

## Lampiran 6. Penetapan panjang gelombang maksimum Naringenin

### Spectrum Peak Pick Report

08/11/2022 12:17:25 PM

Data Set: NARINGENIN LAMDA MAX - RawData



[Measurement Properties]  
 Wavelength Range (nm.): 200.00 to 400.00  
 Scan Speed: Fast  
 Sampling Interval: 0.2  
 Auto Sampling Interval: Enabled  
 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	🟢	290.00	0.6260	
2	🟢	225.40	0.9713	
3	🟢	213.00	1.0486	
4	🟢	201.60	1.1494	
5	🔵	250.40	0.0894	
6	🔵	220.60	0.9550	
7	🔵	207.20	0.9917	



**Lampiran 7. Penentuan *operating time* Naringenin****Kinetics Data Print Report**

08/11/2022 01:14:59 PM

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Time ( Minute )	RawData ...
0.000	0.612
1.000	0.612
2.000	0.613
3.000	0.614
4.000	0.614
5.000	0.614
6.000	0.614
7.000	0.614
8.000	0.614
9.000	0.613
10.000	0.613
11.000	0.613
12.000	0.614
13.000	0.614
14.000	0.614
15.000	0.614
16.000	0.614
17.000	0.614
18.000	0.614
19.000	0.614
20.000	0.614
21.000	0.614
22.000	0.614
23.000	0.614
24.000	0.614
25.000	0.614
26.000	0.614
27.000	0.615
28.000	0.615
29.000	0.614
30.000	0.614
31.000	0.615
32.000	0.615
33.000	0.615
34.000	0.615
35.000	0.615
36.000	0.615
37.000	0.616
38.000	0.616
39.000	0.616
40.000	0.616
41.000	0.616
42.000	0.616
43.000	0.616
44.000	0.616
45.000	0.617
46.000	0.617
47.000	0.616
48.000	0.616
49.000	0.616
50.000	0.616

## Lampiran 8. % efisiensi enkapsulasi

### A. Penimbangan kurva baku

Kertas timbang	= 0,2722 g	
Kertas + Naringenin	= 0,2825 g	}
<u>Kertas + Sisa</u>	= 0,2725 g -	
Naringenin	= 0,010 g	

### B. Konsentrasi Naringenin

Larutan Induk	= 10 mg/100 mL
	= 100 mg/1000 mL
	= 100 ppm
	= 100 µg/ml

### C. Pengenceran kurva baku

#### Kons. 4 ppm

$V_1 \times C_1$	= $V_2 \times N_2$
$V_1 \times 100 \text{ ppm}$	= 10 mL x <b>4 ppm</b>
$V_1$	= 0,4 mL

#### Kons. 10 ppm

$V_1 \times C_1$	= $V_2 \times N_2$
$V_1 \times 100 \text{ ppm}$	= 10 mL x <b>10 ppm</b>
$V_1$	= 1 mL

#### Kons. 6 ppm

$V_1 \times C_1$	= $V_2 \times N_2$
$V_1 \times 100 \text{ ppm}$	= 10 mL x <b>6 ppm</b>
$V_1$	= 0,6 mL

#### Kons. 12 ppm

$V_1 \times C_1$	= $V_2 \times N_2$
$V_1 \times 100 \text{ ppm}$	= 10 mL x <b>12 ppm</b>
$V_1$	= 1,2 mL

#### Kons. 8 ppm

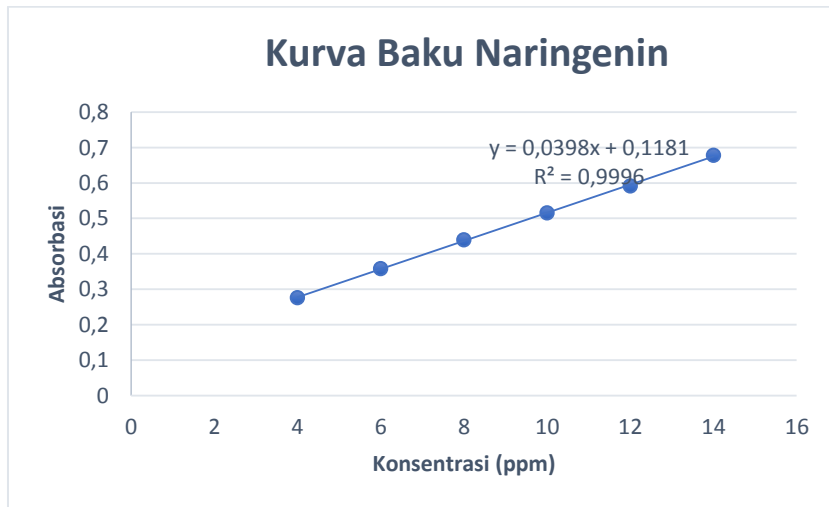
$V_1 \times C_1$	= $V_2 \times N_2$
$V_1 \times 100 \text{ ppm}$	= 10 mL x <b>8 ppm</b>
$V_1$	= 0,8 mL

#### Kons. 14 ppm

$V_1 \times C_1$	= $V_2 \times N_2$
$V_1 \times 100 \text{ ppm}$	= 10 mL x <b>14 ppm</b>
$V_1$	= 1,4 mL

### D. Hasil pengukuran absorbansi baku Naringenin

Konsentrasi (ppm)	Absorbansi	
4	0,357	
6	0,428	a = 0,1264
8	0,614	b = 0,0476
10	0,717	r = 0,9991
12	0,835	
14	0,678	



### E. Akurasi

Kons.	Replikasi	Absorbansi	Kons. sebenarnya	Recovery	Rata-rata (%)
6	1	0,351	5,8540	97,57%	84,84%
	2	0,355	5,9545	99,24%	
	3	0,354	5,9294	98,82%	
8	1	0,438	8,0407	100,51%	87,86%
	2	0,433	7,9150	98,94%	
	3	0,431	7,8648	98,31%	
10	1	0,511	9,8755	98,76%	90,15%
	2	0,516	10,0012	100,01%	
	3	0,517	10,0263	100,26%	
<b>Rata-rata keseluruhan ± SD</b>					<b>99% ± 0,57%</b>

### F. Presisi

Replikasi	Absorbansi	Konsentrasi
1	0,439	8,0683
2	0,436	7,9928
3	0,437	8,0180
4	0,433	7,9173
5	0,431	7,8669
6	0,433	7,9173
7	0,432	7,8921
8	0,432	7,8921
9	0,434	7,9424
10	0,435	7,9676
<b>SD</b>		0,0637
<b>Rata-rata</b>		7,9474
<b>CV</b>		0,80 %

**G. LOD dan LOQ**

Kons.	Abs. (Y)	(Y')	Y-Y'	(Y-Y') <sup>2</sup>	Rata-rata
4	0,276	0,2772	-0,001238095	1,53288E-06	9
6	0,358	0,3568	0,001190476	1,41723E-06	
8	0,439	0,4364	0,002619048	6,85941E-06	
10	0,515	0,5160	-0,000952381	9,07029E-07	
12	0,591	0,5955	-0,00452381	2,04649E-05	
14	0,678	0,6751	0,002904762	8,43764E-06	
<b>Sigma</b>				3,9619E-05	
<b>a</b>	0,1181		<b>N-2</b>	4	
<b>b</b>	0,0398		<b>SY/X</b>	0,003147183	
<b>r</b>	0,9998		<b>LOD</b>	0,261041046	
<b>LOQ</b>				0,791033472	
<b>V x 0</b>				0,88 %	

**H. Data % efisiensi enkapsulasi**

Formula	Replikasi	Absorbansi	Rata rata Absorbansi	% EE
1	1	0,483	0,485	45,87%
	2	0,487		
	3	0,485		
2	1	0,365	0,365	56,63%
	2	0,361		
	3	0,369		
3	1	0,276	0,274	64,83%
	2	0,271		
	3	0,274		

Rumus % efisiensi enkapsulasi :

$$\% EE = \frac{TD-FD}{TD} \times 100\%$$

Keterangan :

TD : total jumlah fenolat yang terdapat pada formula

FD : total senyawa fenolat yang terdeteksi pada supernatan (tidak terjerap)

## I. Perhitungan :

### 1. Formula 1

- $y = a + bx$   
 $0,485 = 0,1180 + 0,0397x$   
 $x = \frac{0,485 + 0,1180}{0,0397} = 15,159 \text{ ppm ( dalam volume 5 mL)}$

5 mL sampel sampel dibuat dengan mengenceerkan 2 mL supernatan dari 10 mL sampel nanopartikel Naringenin.

- Konsentrasi Naringenin dalam 2 mL supernatan  
 $= \frac{5 \text{ mL}}{2 \text{ mL}} \times 15,159 \text{ ppm} = 37,897 \text{ ppm}$
- Konsentrasi Naringenin dalam 10 mL sampel  
 $= \frac{2 \text{ mL}}{10 \text{ mL}} \times 37,897 \text{ ppm} = 7,579 \text{ ppm}$
- Massa Naringenin tidak terjerap dalam sampel  
 $= 7,579 \text{ ppm} \times 42,6 \text{ mL} = 322,865 \mu\text{g} = 0,3228 \text{ mg}$
- Massa zat aktif x volume total  
 $= 0,0014\% \times 42,6 \text{ mL} = 0,0005964 \text{ g} = 0,5964 \text{ mg}$
- %EE =  $\frac{0,5964 \text{ mg} - 0,3228 \text{ mg}}{0,5964 \text{ mg}} \times 100 \% = 45,87 \%$

### 2. Formula 2

- $y = a + bx$   
 $0,365 = 0,1180 + 0,0397x$   
 $x = \frac{0,365 + 0,1180}{0,0397} = 12,142 \text{ ppm ( dalam volume 5 mL)}$

5 mL sampel sampel dibuat dengan mengenceerkan 2 mL supernatan dari 10 mL sampel nanopartikel Naringenin.

- Konsentrasi Naringenin dalam 2 mL supernatan  
 $= \frac{5 \text{ mL}}{2 \text{ mL}} \times 12,142 \text{ ppm} = 30,355 \text{ ppm}$
- Konsentrasi Naringenin dalam 10 mL sampel  
 $= \frac{2 \text{ mL}}{10 \text{ mL}} \times 30,355 \text{ ppm} = 6,071 \text{ ppm}$
- Massa Naringenin tidak terjerap dalam sampel  
 $= 6,071 \text{ ppm} \times 42,6 \text{ mL} = 258,624 \mu\text{g} = 0,2586 \text{ mg}$
- Massa zat aktif x volume total  
 $= 0,0014\% \times 42,6 \text{ mL} = 0,0005964 \text{ g} = 0,5964 \text{ mg}$

- $\%EE = \frac{0,5964 \text{ mg} - 0,2586 \text{ mg}}{0,5964 \text{ mg}} \times 100 \% = 56,63 \%$

### 3. Formula 3

- $y = a + bx$

$$0,274 = 0,1180 + 0,0397x$$

$$x = \frac{0,274 + 0,1180}{0,0397} = 9,847 \text{ ppm (dalam volume 5 mL)}$$

5 mL sampel sampel dibuat dengan mengenceerkan 2 mL supernatan dari 10 mL sampel nanopartikel Naringenin.

- Konsentrasi Naringenin dalam 2 mL supernatan

$$= \frac{5 \text{ mL}}{2 \text{ mL}} \times 9,847 \text{ ppm} = 24,615 \text{ ppm}$$

- Konsentrasi Naringenin dalam 10 mL sampel

$$= \frac{2 \text{ mL}}{10 \text{ mL}} \times 24,615 \text{ ppm} = 4,923 \text{ ppm}$$

- Massa Naringenin tidak terjerap dalam sampel

$$= 4,923 \text{ ppm} \times 42,6 \text{ mL} = 209,741 \text{ } \mu\text{g} = 0,2097 \text{ mg}$$

- Massa zat aktif x volume total

$$= 0,0014\% \times 42,6 \text{ mL} = 0,0005964 \text{ g} = 0,5964 \text{ mg}$$

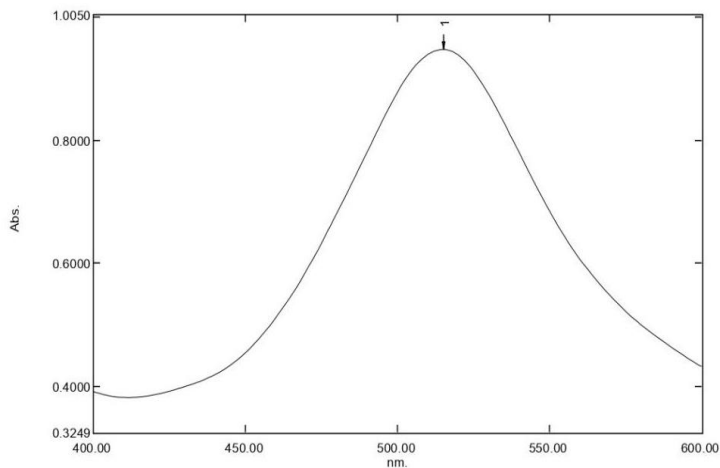
- $\%EE = \frac{0,5964 \text{ mg} - 0,2097 \text{ mg}}{0,5964 \text{ mg}} \times 100 \% = 64,83 \%$

## Lampiran 9. Penetapan panjang gelombang maksimum DPPH

### Spectrum Peak Pick Report

09/29/2022 07:15:50 AM

Data Set: DPPH LAMDA MAX - RawData



[Measurement Properties]  
 Wavelength Range (nm.): 400.00 to 600.00  
 Scan Speed: Fast  
 Sampling Interval: 1.0  
 Auto Sampling Interval: Disabled  
 Scan Mode: Single

No.	P/V	Wavelength	Abs.	Description
1		516.00	0.9483	
2		411.00	0.3815	

[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:

$$\begin{aligned}
 \text{Penimbangan DPPH} &= \text{BM DPPH} \times \text{Volume larutan} \times \text{Molaritas DPPH} \\
 &= 394,32 \text{ g/mol} \times 0,1 \text{ liter} \times 0,0004 \text{ M} \\
 &= 0,015772 \text{ g} \approx 15,78 \text{ mg} \approx \mathbf{15,8 \text{ mg}}
 \end{aligned}$$

**Lampiran 10. Penentuan *operating time*****A. OT DPPH + isolat Naringenin****Kinetics Data Print Report**

09/29/2022 08:30:37 AM

---

Time ( Minute )	RawData ...
0.000	0.868
1.000	0.867
2.000	0.868
3.000	0.867
4.000	0.866
5.000	0.866
6.000	0.865
7.000	0.865
8.000	0.864
9.000	0.864
10.000	0.863
11.000	0.862
12.000	0.860
13.000	0.859
14.000	0.859
15.000	0.859
16.000	0.859
17.000	0.859
18.000	0.859
19.000	0.859
20.000	0.858
21.000	0.858
22.000	0.857
23.000	0.857
24.000	0.856
25.000	0.856
26.000	0.853
27.000	0.853
28.000	0.852
29.000	0.851
30.000	0.851
31.000	0.851
32.000	0.851
33.000	0.850
34.000	0.850
35.000	0.849
36.000	0.849
37.000	0.848
38.000	0.846
39.000	0.846
40.000	0.845
41.000	0.845
42.000	0.845
43.000	0.845
44.000	0.844
45.000	0.844
46.000	0.844
47.000	0.844
48.000	0.843
49.000	0.843
50.000	0.843



**B. OT DPPH + nanopartikel Naringenin****Kinetics Data Print Report**

09/29/2022 09:45:23 AM

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Time ( Minute )	RawData ...
0.000	0.793
1.000	0.793
2.000	0.793
3.000	0.792
4.000	0.791
5.000	0.790
6.000	0.789
7.000	0.789
8.000	0.788
9.000	0.787
10.000	0.787
11.000	0.787
12.000	0.786
13.000	0.786
14.000	0.786
15.000	0.785
16.000	0.785
17.000	0.785
18.000	0.784
19.000	0.784
20.000	0.784
21.000	0.784
22.000	0.784
23.000	0.784
24.000	0.784
25.000	0.784
26.000	0.784
27.000	0.783
28.000	0.783
29.000	0.782
30.000	0.771
31.000	0.771
32.000	0.770
33.000	0.778
34.000	0.778
35.000	0.776
36.000	0.776
37.000	0.776
38.000	0.775
39.000	0.775
40.000	0.774
41.000	0.773
42.000	0.773
43.000	0.772
44.000	0.771
45.000	0.770
46.000	0.770
47.000	0.769
48.000	0.769
49.000	0.768
50.000	0.768

**C. OT DPPH + Vitamin C (pembanding)****Kinetics Data Print Report**

09/29/2022 11:14:59 AM

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Time ( Minute )	RawData ...
0.000	0.737
1.000	0.737
2.000	0.736
3.000	0.735
4.000	0.736
5.000	0.734
6.000	0.734
7.000	0.733
8.000	0.733
9.000	0.733
10.000	0.733
11.000	0.733
12.000	0.733
13.000	0.732
14.000	0.732
15.000	0.731
16.000	0.729
17.000	0.729
18.000	0.728
19.000	0.727
20.000	0.727
21.000	0.727
22.000	0.725
23.000	0.725
24.000	0.724
25.000	0.723
26.000	0.723
27.000	0.722
28.000	0.722
29.000	0.721
30.000	0.720
31.000	0.720
32.000	0.720
33.000	0.720
34.000	0.729
35.000	0.719
36.000	0.718
37.000	0.717
38.000	0.716
39.000	0.716
40.000	0.716
41.000	0.715
42.000	0.714
43.000	0.714
44.000	0.714
45.000	0.712
46.000	0.712
47.000	0.712
48.000	0.710
49.000	0.709
50.000	0.709

## Lampiran 11. Uji antioksidan Naringenin

### A. Pembuatan larutan induk Naringenin

Kertas timbang	= 0,2722 g	
Kertas + Naringenin	= 0,2825 g	}
<u>Kertas + Sisa</u>	= 0,2725 g -	
Naringenin	= 0,010 g	

### B. Konsentrasi Naringenin

Larutan Induk	= 10 mg/100 mL
	= 100 mg/1000 mL
	= 100 ppm
	= 100 µg/ml

### C. Pembuatan seri konsentrasi Naringenin

#### Kons. 5 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 5 \text{ ppm} \\ V_1 &= 0,25 \text{ mL} \end{aligned}$$

#### Kons. 20 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 20 \text{ ppm} \\ V_1 &= 1 \text{ mL} \end{aligned}$$

#### Kons. 10 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 10 \text{ ppm} \\ V_1 &= 0,5 \text{ mL} \end{aligned}$$

#### Kons. 25 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 25 \text{ ppm} \\ V_1 &= 1,25 \text{ mL} \end{aligned}$$

#### Kons. 15 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 15 \text{ ppm} \\ V_1 &= 0,75 \text{ mL} \end{aligned}$$

#### D. Hasil IC<sub>50</sub> Naringenin (formula 3)

Kons.	Replikasi	Abs. DPPH	Abs. Sampel	% Inhibisi
5	1	0,923	0,823	10,834
	2	0,923	0,819	11,268
	3	0,923	0,821	11,051
10	1	0,923	0,719	22,102
	2	0,923	0,718	22,210
	3	0,923	0,721	21,885
15	1	0,923	0,617	33,153
	2	0,923	0,615	33,369
	3	0,923	0,619	32,936
20	1	0,923	0,464	49,729
	2	0,923	0,468	49,296
	3	0,923	0,466	49,512
25	1	0,923	0,387	58,072
	2	0,923	0,385	58,288
	3	0,923	0,389	57,855

Replikasi	a	b	r	IC <sub>50</sub> (ppm)	Rata-rata IC <sub>50</sub>
1	-1,8527	2,4420	0,9960	19,7161	19,8133 ppm
2	-1,4518	2,4225	0,9970	20,0403	
3	-1,7226	2,4247	0,9958	19,9106	

#### Perhitungan persen peredaman isolat Naringenin :

##### % inhibisi radikal DPPH

$$= \frac{\text{Absorbansi DPPH} - \text{Absorbansi sampel}}{\text{Absorbansi DPPH}} \times 100\%$$

Kons.	Replikasi 1	Replikasi 2	Replikasi 3
5	$= \frac{0,923 - 0,823}{0,923} \times 100\%$ = 10,834%	$= \frac{0,923 - 0,819}{0,923} \times 100\%$ = 11,268%	$= \frac{0,923 - 0,821}{0,923} \times 100\%$ = 11,051%
10	$= \frac{0,923 - 0,719}{0,923} \times 100\%$ = 22,102%	$= \frac{0,923 - 0,718}{0,923} \times 100\%$ = 22,210%	$= \frac{0,923 - 0,721}{0,923} \times 100\%$ = 21,885%
15	$= \frac{0,923 - 0,617}{0,923} \times 100\%$ = 33,153%	$= \frac{0,923 - 0,615}{0,923} \times 100\%$ = 33,369%	$= \frac{0,923 - 0,619}{0,923} \times 100\%$ = 32,936%

Kons.	Replikasi 1	Replikasi 2	Replikasi 3
20	$= \frac{0,923 - 0,464}{0,923} \times 100\%$ $= 49,729\%$	$= \frac{0,923 - 0,468}{0,923} \times 100\%$ $= 49,296\%$	$= \frac{0,923 - 0,466}{0,923} \times 100\%$ $= 49,512\%$
25	$= \frac{0,923 - 0,387}{0,923} \times 100\%$ $= 58,072\%$	$= \frac{0,923 - 0,385}{0,923} \times 100\%$ $= 58,288\%$	$= \frac{0,923 - 0,389}{0,923} \times 100\%$ $= 57,855\%$

### Perhitungan IC<sub>50</sub> Isolat Naringenin :

Replikasi 1	Replikasi 2	Replikasi 3
$y = a + bx$ $y = -1,8527 + 2,4420x$ $x = \frac{50 - 1,8527}{2,4420}$ $x = 19,7161 \text{ ppm}$	$y = a + bx$ $y = -1,4518 + 2,4225x$ $x = \frac{50 - 1,4518}{2,4225}$ $x = 20,0403 \text{ ppm}$	$y = a + bx$ $y = -1,7226 + 2,2129x$ $x = \frac{50 - 1,7226}{2,2129}$ $x = 19,9106 \text{ ppm}$
Rata-rata nilai IC <sub>50</sub> = 19,8133 ppm		

## Lampiran 12. Uji antioksidan Nanopartikel Naringenin

### A. Konsentrasi Nanopartikel Naringenin

- Larutan Induk 10%

Mengambil 1 mL larutan induk menambahkan metanol *p.a* sampai 10 mL, didapatkan konsentrasi larutan induk 10%

### B. Pembuatan seri konsentrasi nanopartikel Naringenin

#### Kons. 0,5 %

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ 0,25 \text{ mL} \times 10\% &= 5 \text{ mL} \times C_2 \\ 0,5\% &= C_2 \end{aligned}$$

#### Kons. 2%

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ 1 \text{ mL} \times 10\% &= 5 \text{ mL} \times C_2 \\ 2\% &= C_2 \end{aligned}$$

#### Kons. 1%

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ 0,5 \text{ mL} \times 10\% &= 5 \text{ mL} \times C_2 \\ 1\% &= C_2 \end{aligned}$$

#### Kons. 2,5%

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ 1,25 \text{ mL} \times 10\% &= 5 \text{ mL} \times C_2 \\ 2,5\% &= C_2 \end{aligned}$$

#### Kons. 1,5%

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ 0,75 \text{ mL} \times 10\% &= 5 \text{ mL} \times C_2 \\ 1,5\% &= C_2 \end{aligned}$$

### C. Hasil IC<sub>50</sub> nanopartikel Naringenin (formula 3)

Kons.	Replikasi	Abs. DPPH	Abs. Sampel	% Inhibisi
0,5%	1	0,938	0,694	26,013
	2	0,938	0,691	26,333
	3	0,938	0,696	25,800
1%	1	0,938	0,631	32,004
	2	0,938	0,636	32,196
	3	0,938	0,637	32,090
1,5%	1	0,938	0,547	41,684
	2	0,938	0,534	43,070
	3	0,938	0,539	42,537
2%	1	0,938	0,513	45,309
	2	0,938	0,523	44,243
	3	0,938	0,519	44,670
2,5%	1	0,938	0,463	50,640
	2	0,938	0,473	49,574
	3	0,938	0,467	50,213

Replikasi	a	b	r	IC <sub>50</sub> (ppm)	Rata-rata IC <sub>50</sub>
1	20,7249	12,3667	0,9900	2,367%	
2	21,5245	11,7058	0,9720	2,433%	2,397%
3	20,6397	12,2814	0,9803	2,391%	

**Perhitungan persen peredaman nanopartikel Naringenin :**

**% inhibisi radikal DPPH**

$$= \frac{\text{Absorbansi DPPH} - \text{Absorbansi sampel}}{\text{Absorbansi DPPH}} \times 100\%$$

Kons.	Replikasi 1	Replikasi 2	Replikasi 3
0,5%	$= \frac{0,938 - 0,694}{0,923} \times 100\%$ = 26,013%	$= \frac{0,938 - 0,691}{0,923} \times 100\%$ = 26,333%	$= \frac{0,938 - 0,696}{0,923} \times 100\%$ = 25,800%
1%	$= \frac{0,938 - 0,631}{0,923} \times 100\%$ = 32,729%	$= \frac{0,938 - 0,636}{0,923} \times 100\%$ = 32,196%	$= \frac{0,938 - 0,637}{0,923} \times 100\%$ = 32,090%
1,5%	$= \frac{0,938 - 0,547}{0,923} \times 100\%$ = 41,684%	$= \frac{0,938 - 0,534}{0,923} \times 100\%$ = 43,070%	$= \frac{0,938 - 0,539}{0,923} \times 100\%$ = 42,537%
2%	$= \frac{0,938 - 0,513}{0,923} \times 100\%$ = 45,309%	$= \frac{0,938 - 0,523}{0,923} \times 100\%$ = 44,243%	$= \frac{0,938 - 0,519}{0,923} \times 100\%$ = 44,670%
2,5%	$= \frac{0,938 - 0,463}{0,923} \times 100\%$ = 50,640%	$= \frac{0,938 - 0,473}{0,923} \times 100\%$ = 49,574%	$= \frac{0,938 - 0,467}{0,923} \times 100\%$ = 50,213%

**Perhitungan IC<sub>50</sub> nanopartikel Naringenin :**

Replikasi 1	Replikasi 2	Replikasi 3
$y = a + bx$	$y = a + bx$	$y = a + bx$
$y = 20,7249 + 12,1962x$	$y = 21,5245 + 11,7058x$	$y = 20,6397 + 12,2814x$
$x = \frac{50 - 20,7249}{12,3667}$	$x = \frac{50 - 21,5245}{11,7058}$	$x = \frac{50 - 20,6397}{12,2814}$
$x = 2,367\%$	$x = 2,433\%$	$x = 2,391\%$
Rata-rata nilai IC <sub>50</sub> = 2,397%		

### Lampiran 13. Uji antioksidan perbandingan (Vitamin C)

#### A. Pembuatan larutan induk vitamin C

Kertas timbang	= 0,2833 g	
Kertas + Naringenin	= 0,2886 g	}
<u>Kertas + Sisa</u>	= 0,2835 g -	
Naringenin	= 0,0051 g	

#### B. Konsentrasi vitamin C

Larutan Induk	= 5 mg/50 mL
	= 100 mg/1000 mL
	= 100 ppm
	= 100 µg/ml

#### C. Pembuatan seri konsentrasi vitamin C

##### Kons. 4 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 4 \text{ ppm} \\ V_1 &= 0,2 \text{ mL} \end{aligned}$$

##### Kons. 10 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 10 \text{ ppm} \\ V_1 &= 0,5 \text{ mL} \end{aligned}$$

##### Kons. 6 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 6 \text{ ppm} \\ V_1 &= 0,3 \text{ mL} \end{aligned}$$

##### Kons. 12 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 12 \text{ ppm} \\ V_1 &= 0,6 \text{ mL} \end{aligned}$$

##### Kons. 8 ppm

$$\begin{aligned} V_1 \times C_1 &= V_2 \times C_2 \\ V_1 \times 100 \text{ ppm} &= 5 \text{ mL} \times 8 \text{ ppm} \\ V_1 &= 0,4 \text{ mL} \end{aligned}$$



#### D. Hasil IC<sub>50</sub> Pemanding (Vitamin C)

Kons.	Replikasi	Abs. DPPH	Abs. Sampel	% Inhibisi
4	1	0,948	0,677	28,586
	2	0,948	0,675	28,797
	3	0,948	0,667	29,641
6	1	0,948	0,619	34,705
	2	0,948	0,618	34,810
	3	0,948	0,621	34,599
8	1	0,948	0,573	39,557
	2	0,948	0,582	38,608
	3	0,948	0,572	39,662
10	1	0,948	0,532	50,211
	2	0,948	0,529	49,473
	3	0,948	0,531	50,105
12	1	0,948	0,472	50,211
	2	0,948	0,479	49,473
	3	0,948	0,473	50,105

Replikasi	a	b	r	IC <sub>50</sub> (ppm)	Rata-rata IC <sub>50</sub>
1	18,4177	2,6213	0,9980	12.0483	
2	18,8819	2,5369	0,9983	12,2661	12,1554 ppm
3	19,6203	2,5000	0,9986	12.1519	

#### Perhitungan persen peredaman pemanding (Vitamin C):

% *inhibisi radikal DPPH*

$$= \frac{\text{Absorbansi DPPH} - \text{Absorbansi sampel}}{\text{Absorbansi DPPH}} \times 100\%$$

Kons.	Replikasi 1	Replikasi 2	Replikasi 3
4	$= \frac{0,948 - 0,677}{0,948} \times 100\%$ $= 28,586\%$	$= \frac{0,948 - 0,675}{0,948} \times 100\%$ $= 28,797\%$	$= \frac{0,948 - 0,665}{0,948} \times 100\%$ $= 29,852\%$
6	$= \frac{0,948 - 0,619}{0,948} \times 100\%$ $= 34,705\%$	$= \frac{0,948 - 0,618}{0,948} \times 100\%$ $= 34,810\%$	$= \frac{0,948 - 0,621}{0,948} \times 100\%$ $= 34,494\%$

Kons.	Replikasi 1	Replikasi 2	Replikasi 3
8	$= \frac{0,948 - 0,573}{0,948} \times 100\%$ $= 39,557\%$	$= \frac{0,948 - 0,582}{0,948} \times 100\%$ $= 38,608\%$	$= \frac{0,948 - 0,572}{0,948} \times 100\%$ $= 39,662\%$
10	$= \frac{0,948 - 0,532}{0,948} \times 100\%$ $= 43,882\%$	$= \frac{0,948 - 0,529}{0,948} \times 100\%$ $= 44,198\%$	$= \frac{0,948 - 0,531}{0,948} \times 100\%$ $= 43,987\%$
12	$= \frac{0,948 - 0,472}{0,948} \times 100\%$ $= 50,211\%$	$= \frac{0,948 - 0,479}{0,948} \times 100\%$ $= 49,473\%$	$= \frac{0,948 - 0,473}{0,948} \times 100\%$ $= 50,105\%$

**Perhitungan IC<sub>50</sub> pembanding (Vitamin C):**

Replikasi 1	Replikasi 2	Replikasi 3
$y = a + bx$ $y = 18,4177 + 2,6213x$ $x = \frac{50 - 18,4177}{2,6213}$ $x = 12,048 \text{ ppm}$	$y = a + bx$ $y = 18,8819 + 2,5369x$ $x = \frac{50 - 18,8819}{2,5369}$ $x = 12,266 \text{ ppm}$	$y = a + bx$ $y = 19,6203 + 2,5000x$ $x = \frac{50 - 19,6203}{2,5000}$ $x = 12,151 \text{ ppm}$
Rata-rata nilai IC <sub>50</sub> = 12,1554 ppm		

### Lampiran 14. Analisis SPSS aktivitas antioksidan

Tests of Normality		
	Nilai IC50 Isolat	Shapiro-Wilk <sup>a</sup>
		Sig.
IC50	Isolat Naringenin	.714
	Nanopartikel Naringenin	.156
	Pembanding (Vit C)	.096

### Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
IC50	Based on Mean	.627	2	6	.566
	Based on Median	.075	2	6	.929
	Based on Median and with adjusted df	.075	2	4.666	.929
	Based on trimmed mean	.540	2	6	.609

### ANOVA

IC50					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	120.376	2	60.188	23994.152	.000
Within Groups	.015	6	.003		
Total	120.391	8			

### IC50

Tukey HSD <sup>a</sup>				
Nilai IC50 Isolat	N	Subset for alpha = 0.05		
		1	2	3
Pembanding (Vit C)	3	12.15540		
Nanopartikel Naringenin	3		246.2818	
Isolat Naringenin	3			19.81330
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3.000.