

**LAMPIRAN**  
**Lampiran 1. Sertifikat Analisis Kuersetin**



3050 Spruce Street, Saint Louis, MO 63103, USA  
 Website: [www.sigmaaldrich.com](http://www.sigmaaldrich.com)  
 Email USA: [techserv@sial.com](mailto:techserv@sial.com)  
 Outside USA: [eurtechserv@sial.com](mailto:eurtechserv@sial.com)

### Certificate of Analysis

Product Name:  
 Quercetin - ≥95% (HPLC), solid

Product Number: Q4951  
 Batch Number: SLCJ0103  
 Brand: SIGMA  
 CAS Number: 117-39-5  
 Formula: C<sub>15</sub>H<sub>10</sub>O<sub>7</sub>  
 Formula Weight: 302.24 g/mol  
 Quality Release Date: 10 DEC 2020



Test	Specification	Result
Appearance (Color) Yellow	Conforms	Conforms
Appearance (Form) 1H NMR Spectrum	Powder Conforms to Structure	Powder Conforms
Loss on Drying	≤ 4 %	3 %
Purity (HPLC)	> 95 %	97 %



Brian Dulle, Supervisor  
 Quality Assurance  
 St. Louis, Missouri US

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at [Sigma-Aldrich.com](http://Sigma-Aldrich.com). For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.



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## Lampiran 2. Sertifikat Analisis Enzim Tirosinase

Sigma-Aldrich

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 Website: [www.sigmaaldrich.com](http://www.sigmaaldrich.com)  
 Email USA: [techserv@sial.com](mailto:techserv@sial.com)  
 Outside USA: [eurtechserv@sial.com](mailto:eurtechserv@sial.com)

## Certificate of Analysis

Product Name:

Tyrosinase from mushroom - lyophilized powder,  $\geq 1000$  unit/mg solid

Product Number: T3824  
 Batch Number: SLCG8506  
 Brand: SIGMA  
 CAS Number: 9002-10-2  
 MDL Number: MFCD00082118  
 Storage Temperature: Store at -20 °C  
 Quality Release Date: 23 SEP 2020  
 Recommended Retest Date: SEP 2023


Test	Specification	Result
units/mg Solid Tyrosinase Activity Unit Definition: One unit will cause an increase in A280 of 0.001 per minute at pH 6.5 at 25 deg C in a 3 mL reaction mix containing L-tyrosine	$\geq 1000$	8503
units/mg Solid Polyphenol Oxidase Activity Unit Definition: One unit will cause a decrease in A265 of 0.001 per minute at pH 6.5 at 25 deg C. In a 3 mL reaction mixture containing L-Beta-3,4-dihydroxyphenyl-alanine (L-DOPA)	$\geq 30000$	300628
units/mg Solid Catechol Oxidase Activity Unit Definition: One unit will cause a decrease in A265 of 0.001 per minute at pH 6.5 at 25 deg C in a 3 mL reaction mixture containing catechol and ascorbic acid	$\geq 30000$	1778114

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Sigma-Aldrich

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Outside USA: [eurtechserv@siat.com](mailto:eurtechserv@siat.com)

## Certificate of Analysis

Product Number: T3824  
Batch Number: SLCG8506



Brian Dille, Supervisor  
Quality Assurance  
St. Louis, Missouri US

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## Lampiran 3. Sertifikat Analisis Substrat L-Tirosin

**SIGMA-ALDRICH**3050 Spruce Street, Saint Louis, MO 63103 USA  
Email USA: techserv@sial.com Outside USA: eurtechserv@sial.com

## Certificate of Analysis

**Product Name:** L-Tyrosine  
reagent grade, >= 98 % HPLC

**Product Number:** T3754

**Batch Number:** BCCC5665

**Brand:** Sigma-Aldrich

**CAS Number:** 60-18-4

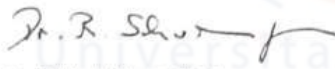
**Formula:** 4-(HO)C<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CH(NH<sub>2</sub>)CO<sub>2</sub>H

**Formula Weight:** 181.19

**Quality Release Date:** 16 DEC 2019

**Recommended Retest Date:** NOV 2025

TEST	SPECIFICATION	RESULT
APPEARANCE (COLOR)	WHITE TO OFF WHITE	OFF-WHITE
APPEARANCE (FORM)	POWDER	POWDER
PURITY (HPLC AREA %)	≥ 98 %	100 %
SPECIFIC ROTATION	-11.2 - -9.8 DEGREES	-10.5 DEGREES
CONCENTRATION	C=5 IN 1M HYDROCHLORIC ACID AT 25 C	C=5 IN 1M HYDROCHLORIC ACID AT 25 C
SOLUBILITY (COLOR)	COLORLESS TO LIGHT YELLOW	COLORLESS
SOLUBILITY (TURBIDITY)	CLEAR	CLEAR
SOLUBILITY (METHOD)	50MG/ML IN 1M HYDROCHLORIC ACID	50MG/ML IN 1M HYDROCHLORIC ACID
CARBON CONTENT	58.5 - 60.8 %	59.5 %
NITROGEN CONTENT	7.4 - 8.0 %	7.7 %
INFRARED SPECTRUM	CONFORMS TO STRUCTURE	CONFORMS



Dr. Reinhold Schwenninger  
Quality Assurance  
Buchs, Switzerland

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## Lampiran 4. Sertifikat Analisis Asam Kojat

**spectrum**  
CHEMICAL MFG CORP

## Certificate Of Analysis

Item Number	K1062	Lot Number	1J70323
Item	Kojic Acid		
CAS Number	501-30-4		
Molecular Formula	$C_6H_8O_4$	Molecular Weight	142.11

Test	Specification		Result
	min	max	
ASSAY	99 %		99.4 %
HEAVY METALS (as Pb)		20 ppm	<10 ppm
ARSENIC (As)		2 ppm	<0.1 ppm
LOSS ON DRYING		0.6 %	0.35 %
RESIDUE ON IGNITION		0.2 %	0.09 %
EXPIRATION DATE			31-MAR-2025
DATE OF MANUFACTURE			31-MAY-2022
APPEARANCE			WHITE CRYSTALLINE POWDER

Spectrum Chemical Mfg Corp  
14422 South San Pedro Street  
Gardena 90248 CA



Certificate of Analysis Results Certified by:

Himanshu Patel  
Quality Control Manager  
Spectrum Chemicals & Laboratory Products

All pharmaceutical ingredients are tested using current edition of applicable pharmacopeia.

Read and understand label and SDS before handling any chemicals. All Spectrum's chemicals are for manufacturing, processing, repacking or research purposes by experienced personnel only. It is the customer's responsibility to provide adequate hazardous material training and ensure that appropriate Personal Protective Equipment (PPE) is used before handling any chemical.

Lampiran 5. Sertifikat Analisis KH<sub>2</sub>PO<sub>4</sub>

Esa Unggul



## Certificate of Analysis

1.04873.0000 Potassium dihydrogen phosphate for analysis EMSURE® ISO  
Batch AM1704373

	Spec. Values		Batch Values	
Assay (alkalimetric, calculated on dried substance)	99.5 - 100.5	%	99.8	%
Assay (alkalimetric; dried substance)	≥ 99.5	%	99.9	%
pH-value (5 %; water)	4.2 - 4.5		4.3	
Chloride (Cl)	≤ 0.0005	%	≤ 0.0005	%
Sulfate (SO <sub>4</sub> )	≤ 0.003	%	≤ 0.003	%
Total nitrogen (N)	≤ 0.001	%	≤ 0.001	%
Heavy metals (as Pb)	≤ 0.0010	%	≤ 0.0010	%
As (Arsenic)	≤ 0.0002	%	≤ 0.0002	%
Cu (Copper)	≤ 0.0003	%	≤ 0.0003	%
Fe (Iron)	≤ 0.0010	%	≤ 0.0010	%
Na (Sodium)	≤ 0.02	%	≤ 0.02	%
Pb (Lead)	≤ 0.001	%	≤ 0.001	%
Reducing substances	passes test		passes test	
Loss on drying (110 °C)	≤ 0.2	%	< 0.2	%
Loss on drying (130 °C)	≤ 0.2	%	< 0.1	%

Corresponds to ISO

Date of release (DD.MM.YYYY) 07.05.2021  
Minimum shelf life (DD.MM.YYYY) 31.01.2026

Claudia Wiegand  
Responsible laboratory manager quality control

This document has been produced electronically and is valid without a signature.

Universitas Esa Unggul

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Lampiran 6. Alat dan Bahan



Neraca Analitik



Hot Plate



Mikropipet



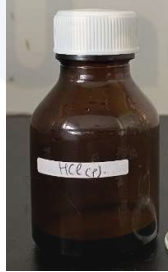
Spektrofotometer UV-Vis



pH meter



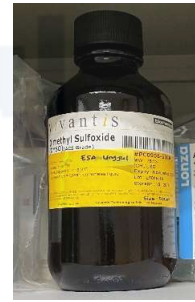
Au Foil



HCl



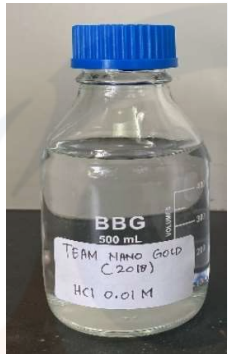
HNO<sub>3</sub>



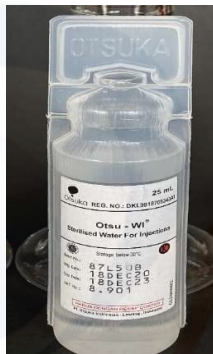
DMSO



Gom Arab



HCl 0,01 M



Aqua pro Injection



KH<sub>2</sub>PO<sub>4</sub>



NaOH

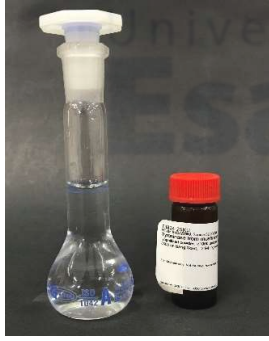


Dapar Fosfat

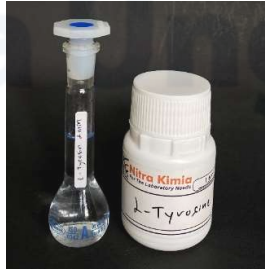


Asam Kojat





Enzim Tirosinase

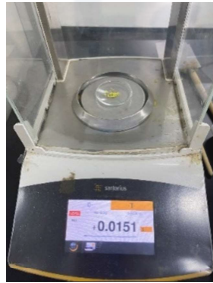


L-Tirosin



Kuersetin

Lampiran 7. Penimbangan Bahan



Kuersetin 2 mM



Kuersetin 4 mM



Kuersetin 8 mM



Au Foil



Gom Arab



$\text{KH}_2\text{PO}_4$



NaOH

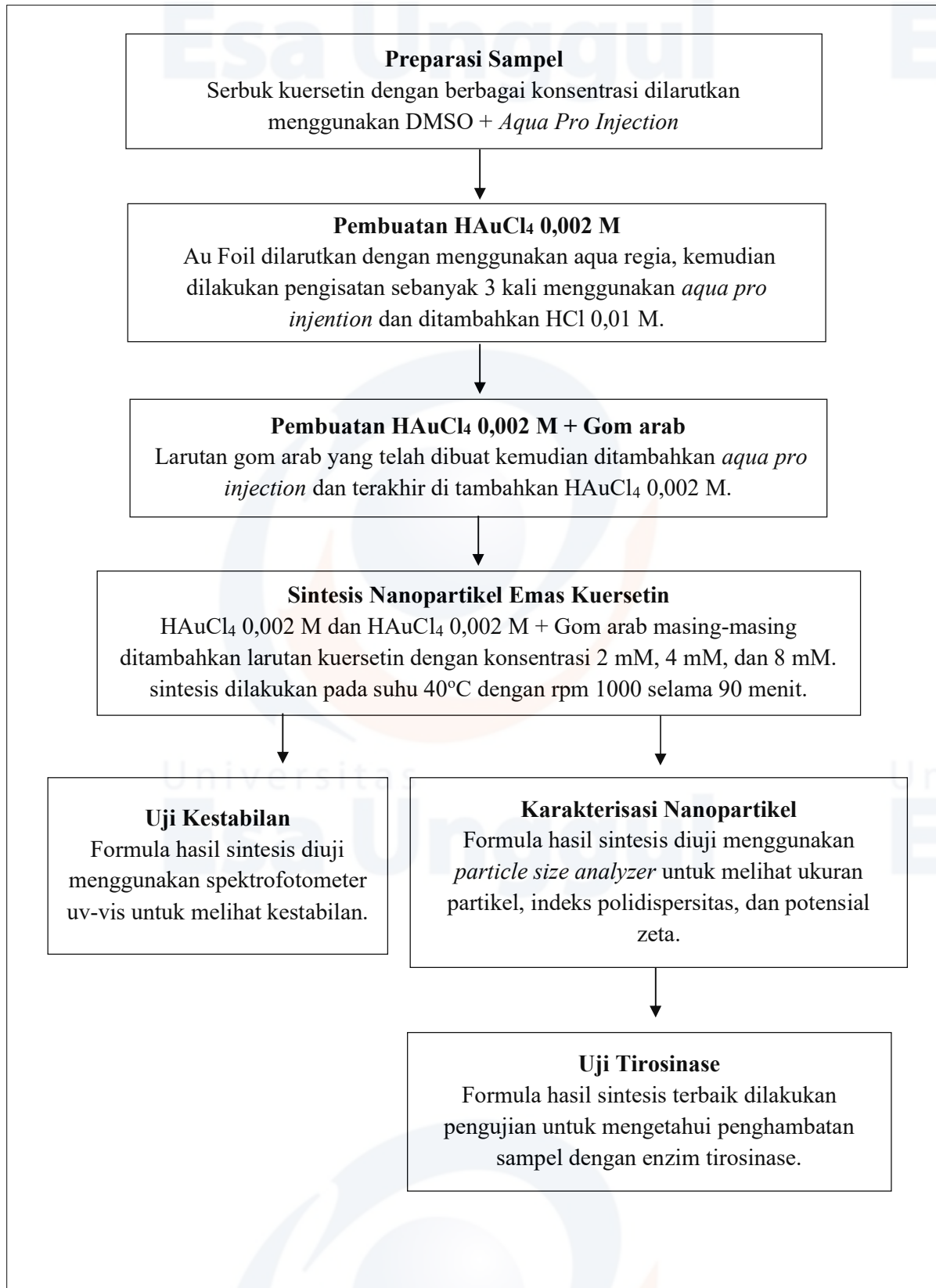


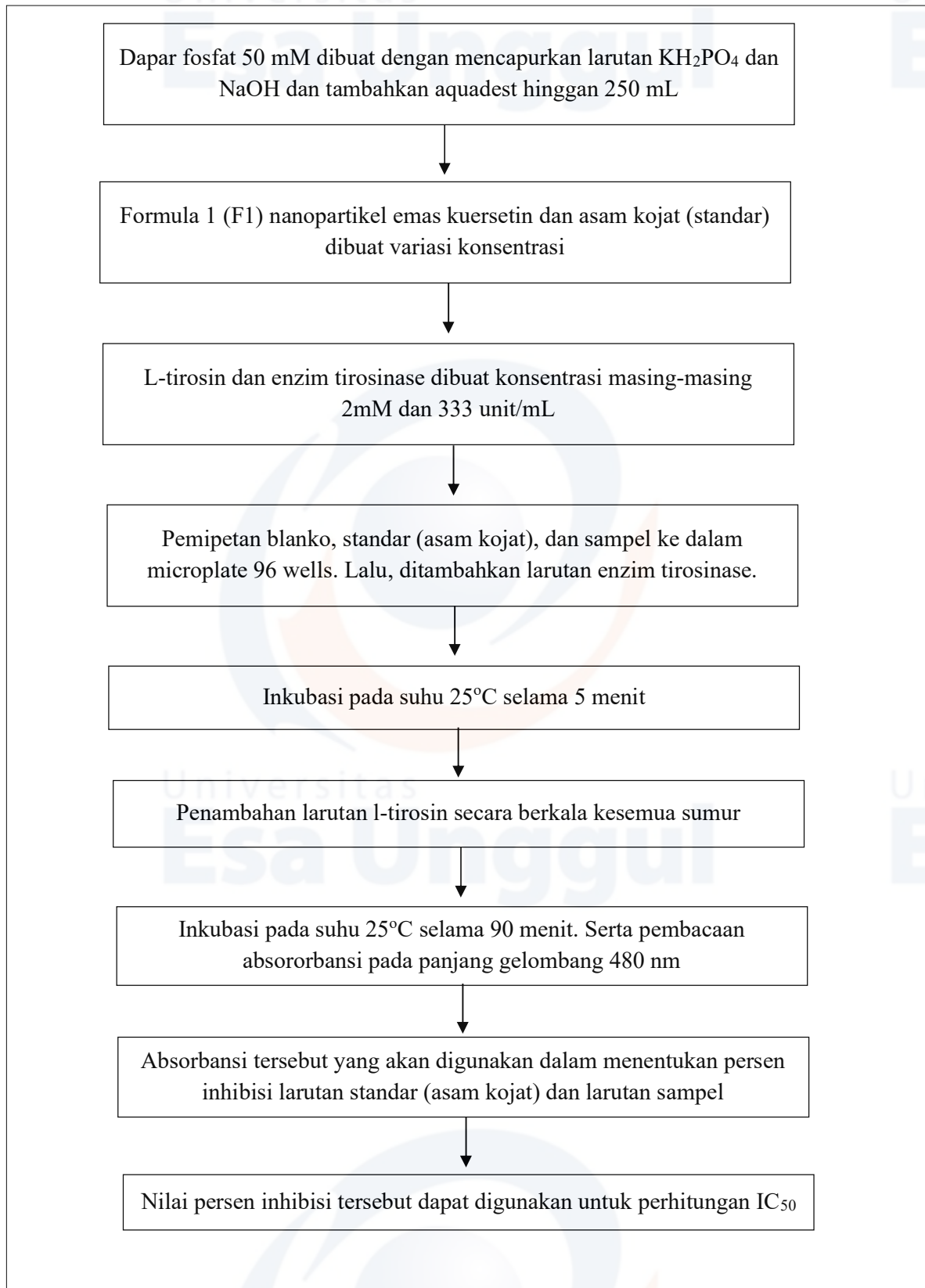
Asam Kojat



L-Tirosin

## Lampiran 8. Skema Penelitian



**Lampiran 9. Skema Uji Aktivitas Penghambatan Enzim Tirosinase**

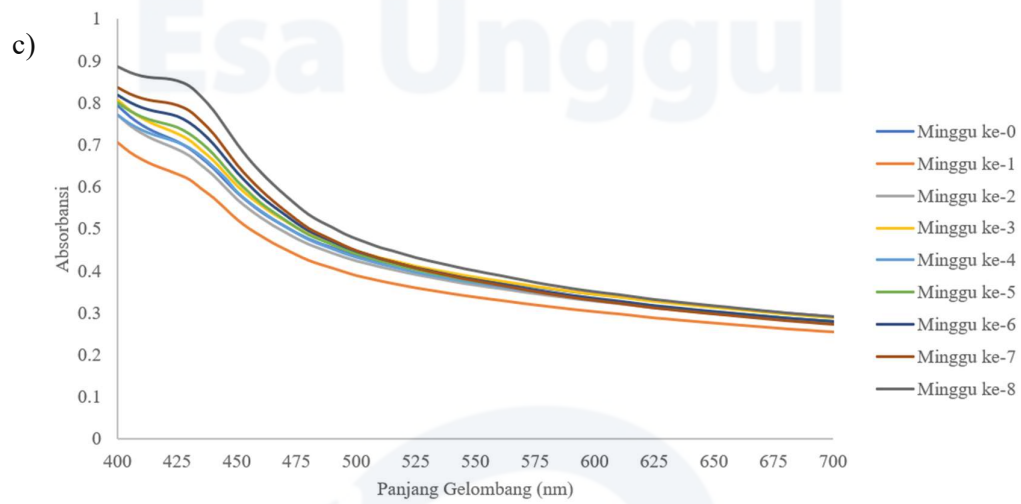
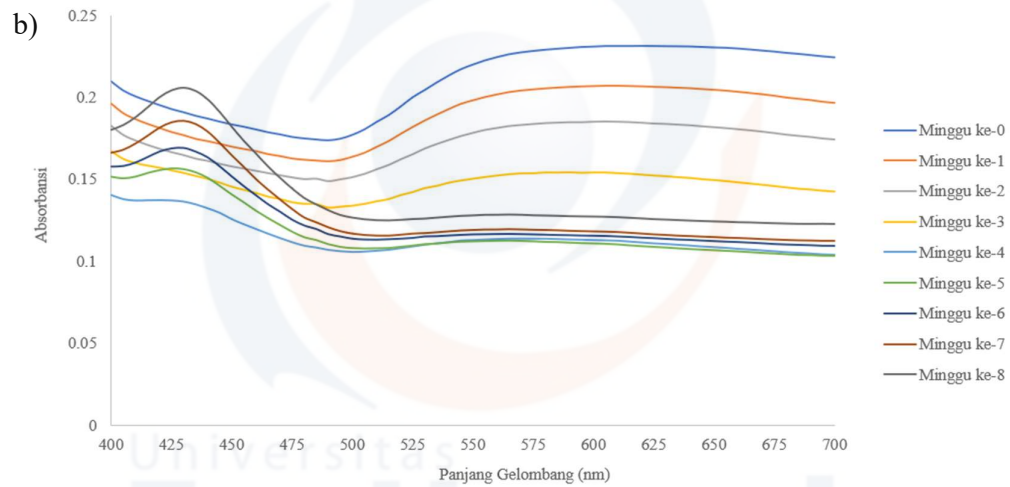
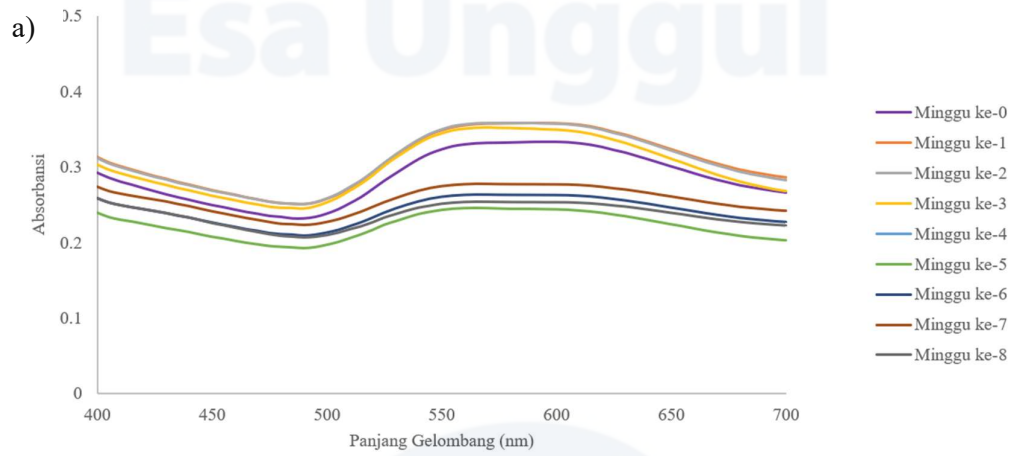
**Lampiran 10. Hasil Uji Aktivitas Enzim Tirosinase Standar (As. Kojat)**

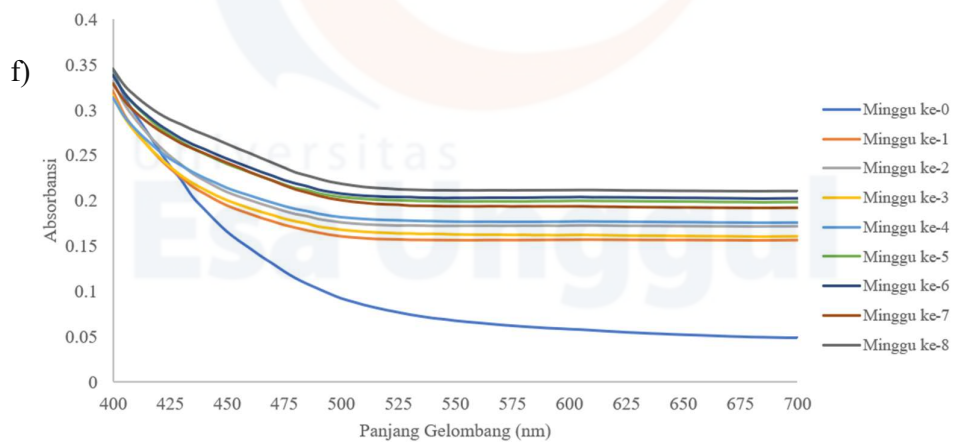
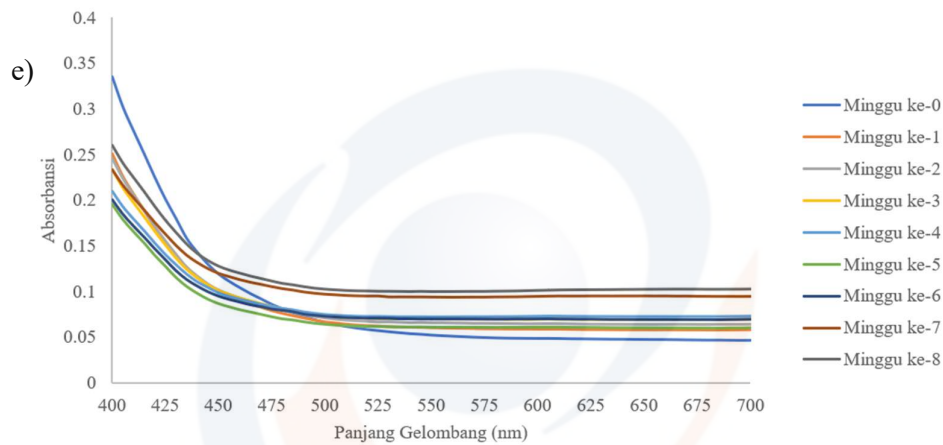
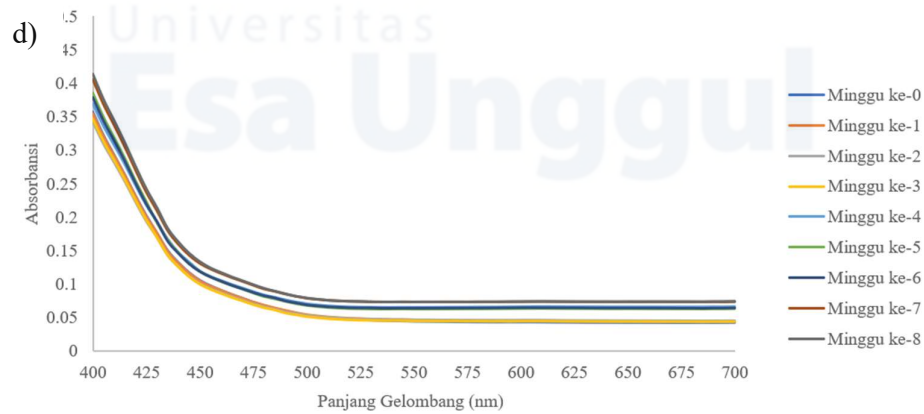
<b>Data</b>	<b>Konsentrasi (ppm)</b>	<b>Persen Penghambatan (%)</b>	<b>R<sup>2</sup></b>	<b>IC50 (ppm)</b>
<b>Asam Kojat (standar)</b>	125	89,95821113	0,9843	36,7537
	62,5	69,26339394		
	31,25	38,04652679		
	15,625	21,91105885		
	7,8125	5,526097526		

## Lampiran 11. Hasil Uji Aktivitas Sampel (Nanopartikel Emas Kuersetin)

Data	Konsentrasi (ppm)	Persen Penghambatan (%)	R <sup>2</sup>	IC50 (ppm)
<b>Nanopartikel Emas Kuersetin F1</b>	9457	92,18486827	0,9702	970
	4728,5	92,23476574		
	295,53125	16,27268912		
	147,765625	8,838023548		
	73,8828125	3,405476281		

Lampiran 12 Kurva Uji Kestabilan Formula





**Keterangan:**

- a) Uji kestabilan F1 selama 8 minggu (2 bulan)
- b) Uji kestabilan F2 selama 8 minggu (2 bulan)
- c) Uji kestabilan F3 selama 8 minggu (2 bulan)
- d) Uji kestabilan F4 selama 8 minggu (2 bulan)
- e) Uji kestabilan F5 selama 8 minggu (2 bulan)
- f) Uji kestabilan F6 selama 8 minggu (2 bulan)



Lampiran 13 Dokumentasi Penelitian

