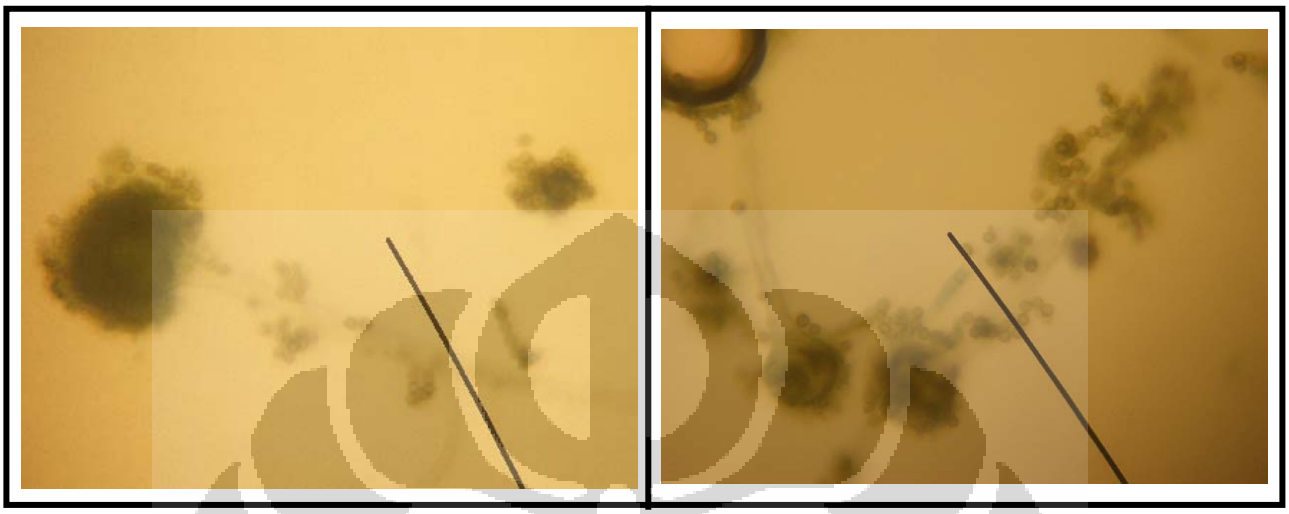
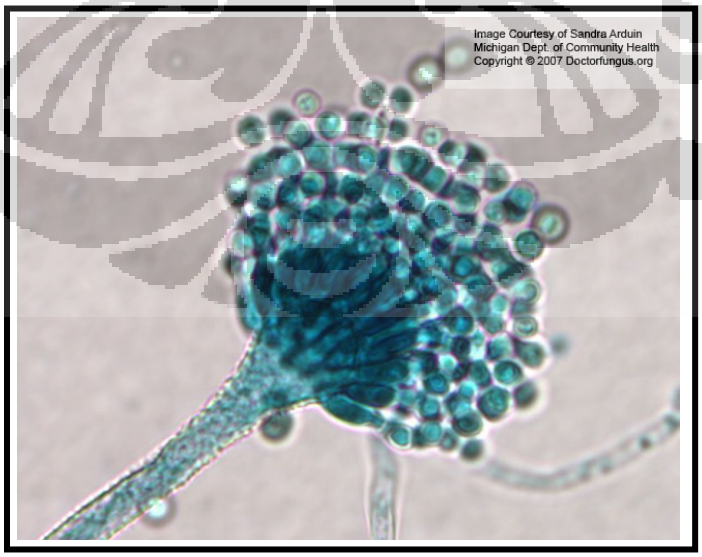
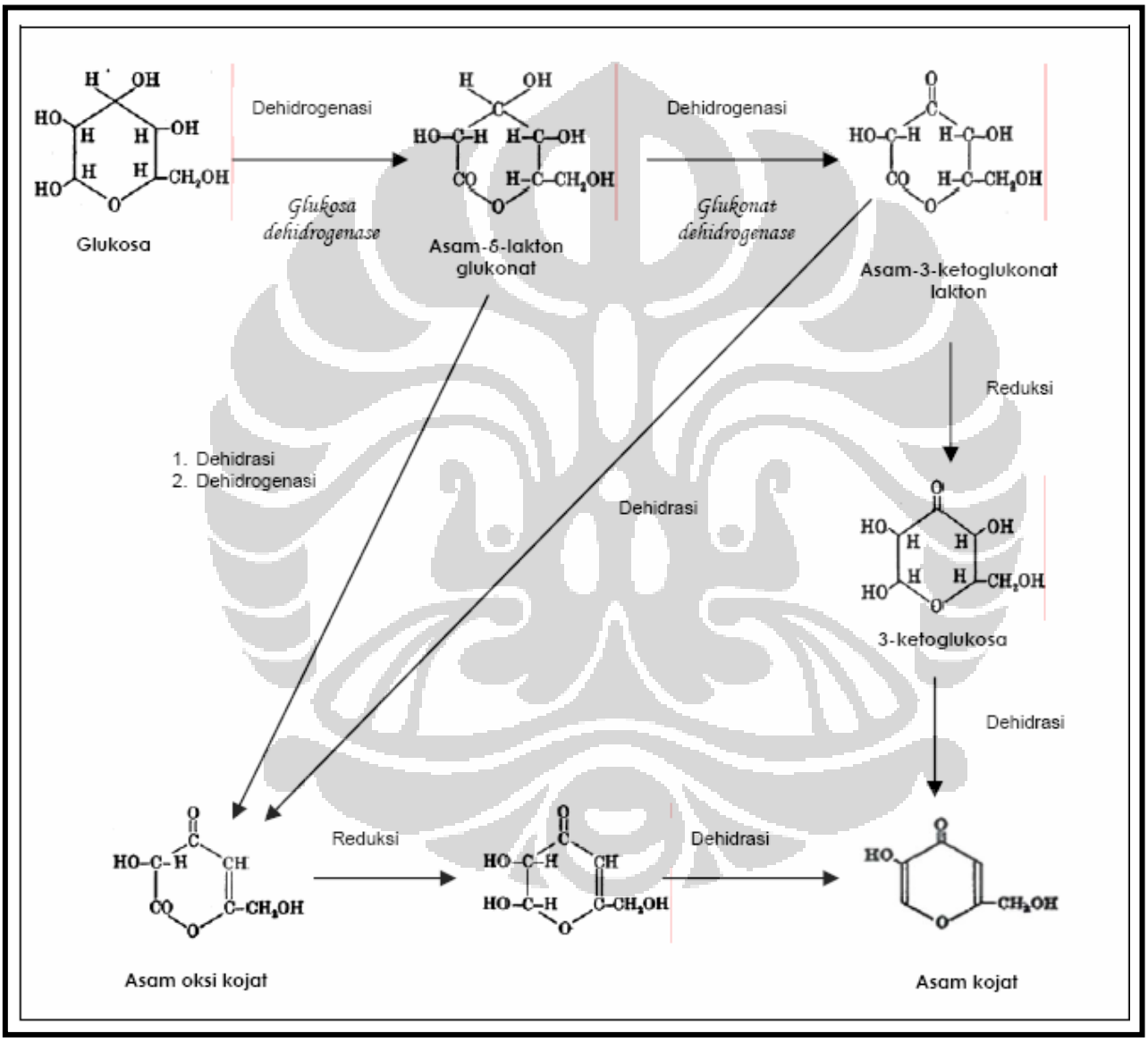
LAMPIRAN



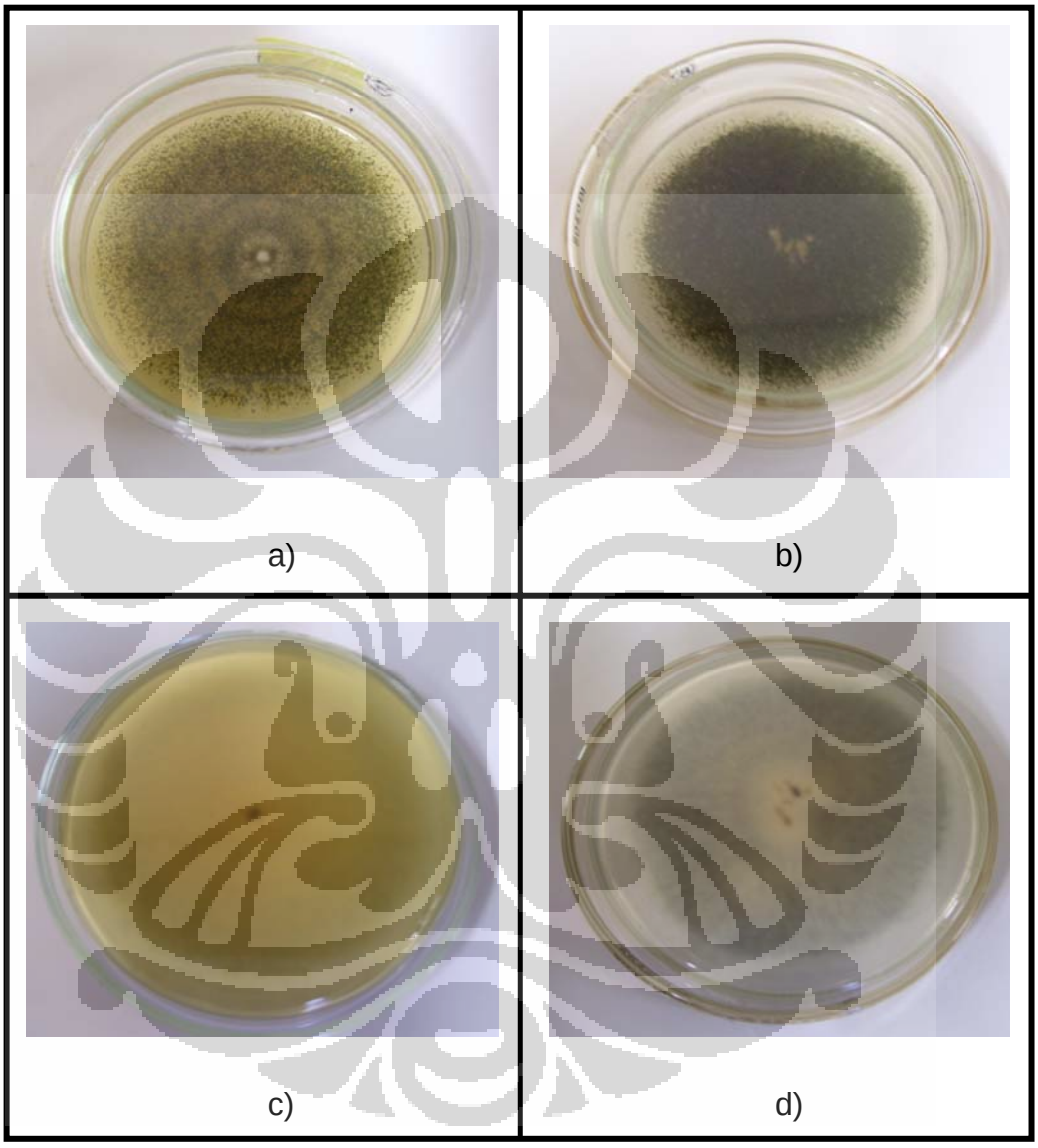
Gambar 2. Morfologi *Aspergillus flavus* NTGA7A4UVE10 secara mikroskopik dengan perbesaran 400x.



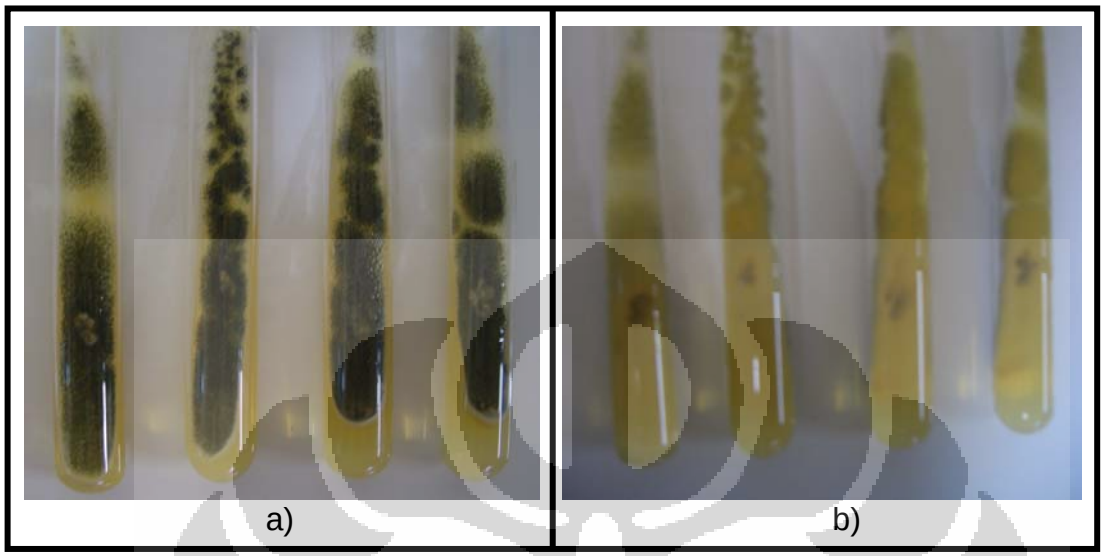
Gambar 3. Konidia *Aspergillus flavus* (36)



Gambar 4. Hipotesis jalur biosintesis asam kojat (7)

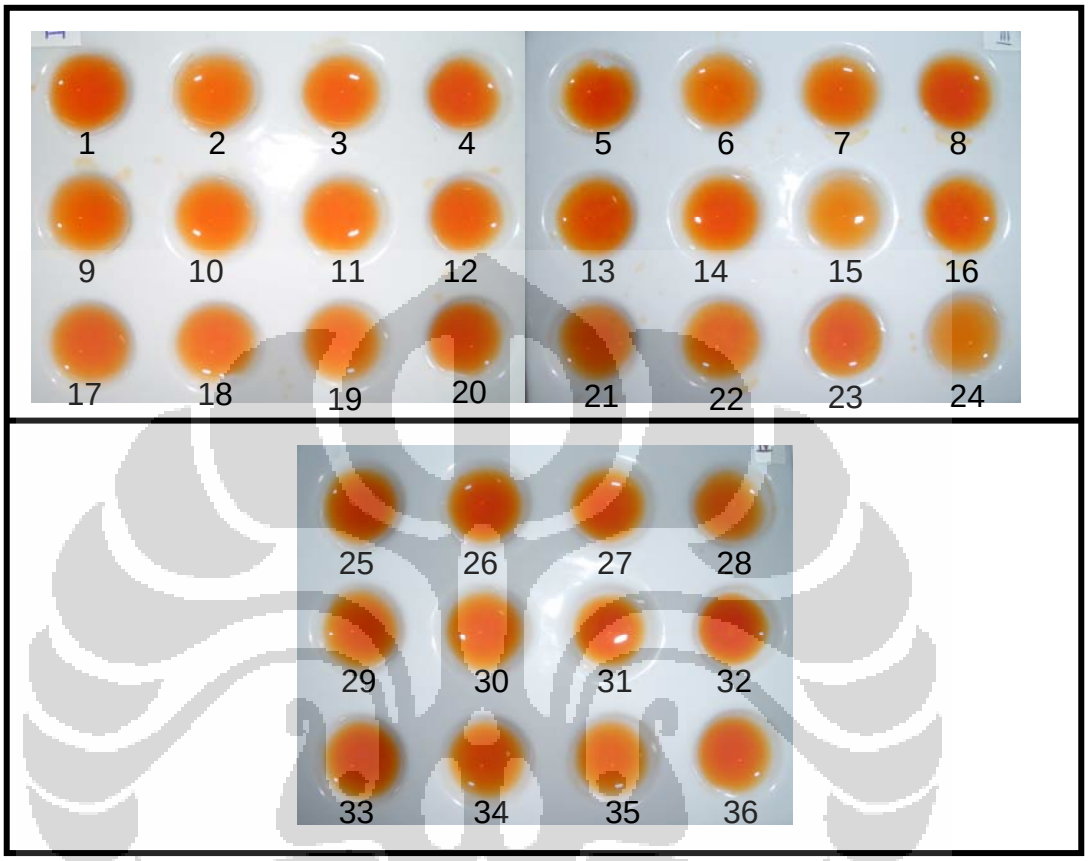


Gambar 6. Koloni *Aspergillus flavus* berumur 7 hari. a) galur NTGA7A4UVE10 tampak atas; b) galur M3B7F7G8 tampak atas; c) galur NTGA7A4UVE10 tampak bawah, media kuning; d) galur M3B7F7G8 tampak bawah media putih,



Gambar 7. Koloni *Aspergillus flavus* galur NTGA7A4UVE10 berumur 7 hari dalam agar miring pada tabung reaksi. a) tampak depan; b) tampak belakang

Gambar 8. Biomassa sel berbentuk pellet dalam tabung reaksi setelah diinkubasi pada suhu 28^0C selama 12 hari dengan pengocokan 180 rpm



Gambar 9. Hasil skrinning asam kojat dengan $FeCl_3$ 1% pada tahap fermentasi I.

Keterangan: 1 = Medium O

2 = Medium J

3 = Medium N

4 = Medium P

5 = Medium B

6 = Medium C

7 = Medium E

8 = Medium F

9 = Medium A

10 = Medium J

11= Medium N

12= Medium P

13= Medium B

14= Medium C

15= Medium E

16= Medium F

17= Medium B

18= Medium I

19= Medium G

20= Medium Q

21= Medium A

22= Medium D

23= Medium D

24= Medium G

25= Medium B

26= Medium I

27= Medium L

28= Medium M

29= Medium H

30= Medium K

31= Medium L

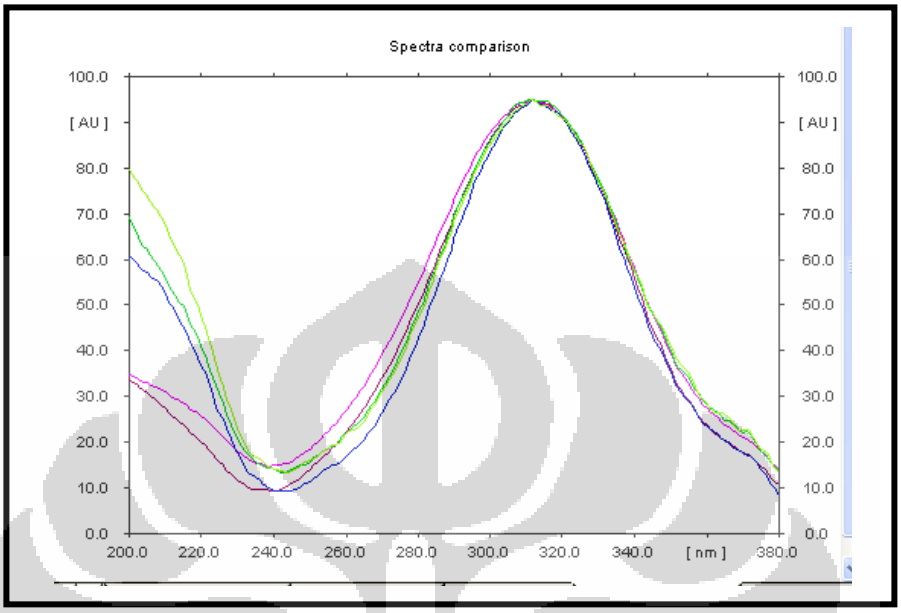
32= Medium O

33= Medium H

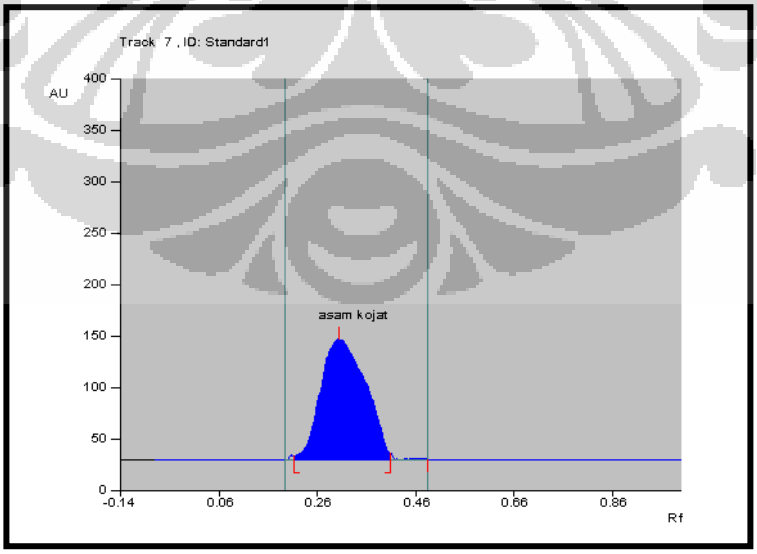
34= Medium K

35= Medium M

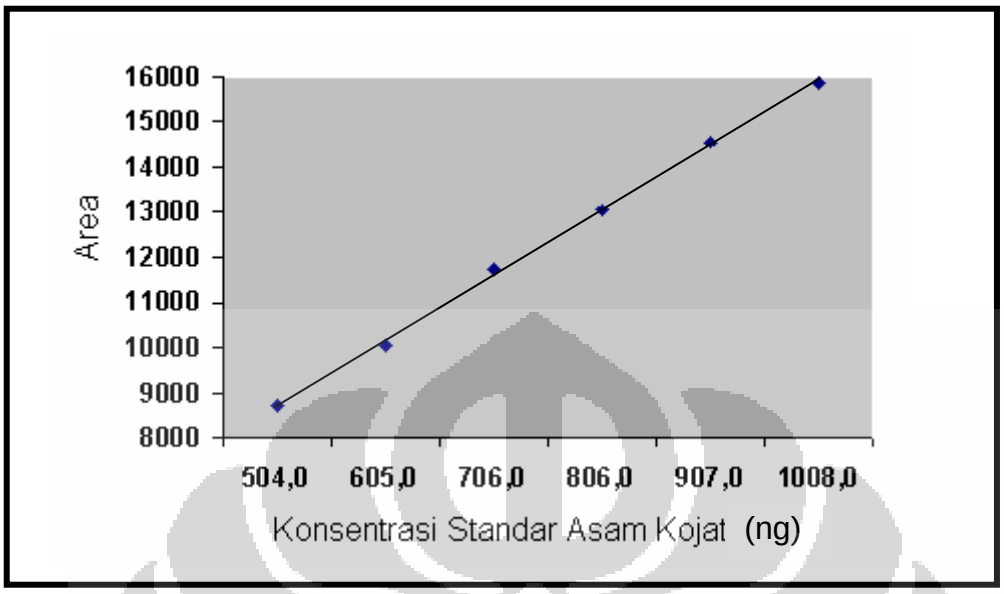
36= Medium Q



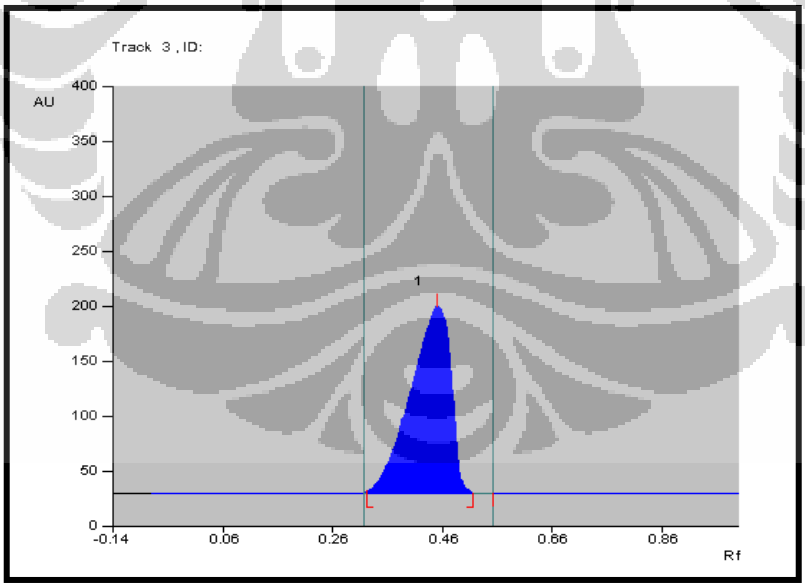
Gambar 10. Spektrum serapan standar asam kojat menggunakan KLT densitometer. Eluen=toluene-etil asetat-asam format (3:6:1). Panjang gelombang maksimum pada 312 nm.



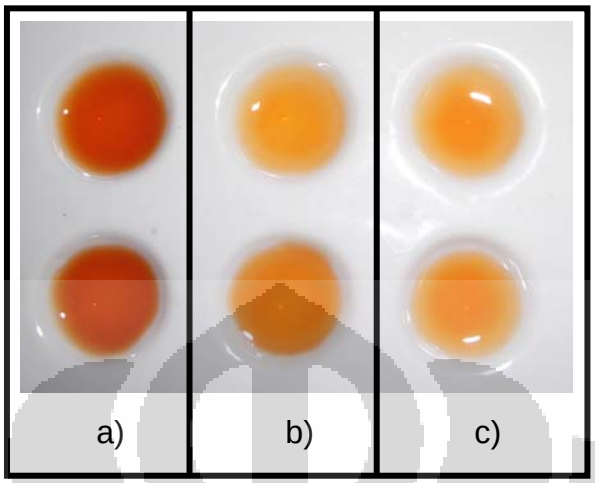
Gambar 11. Densitogram standar asam kojat 504,0 ppm (Rf=0,30). Panjang gelombang 312 nm, eluen=toluene-etil asetat-asam format (3:6:1).



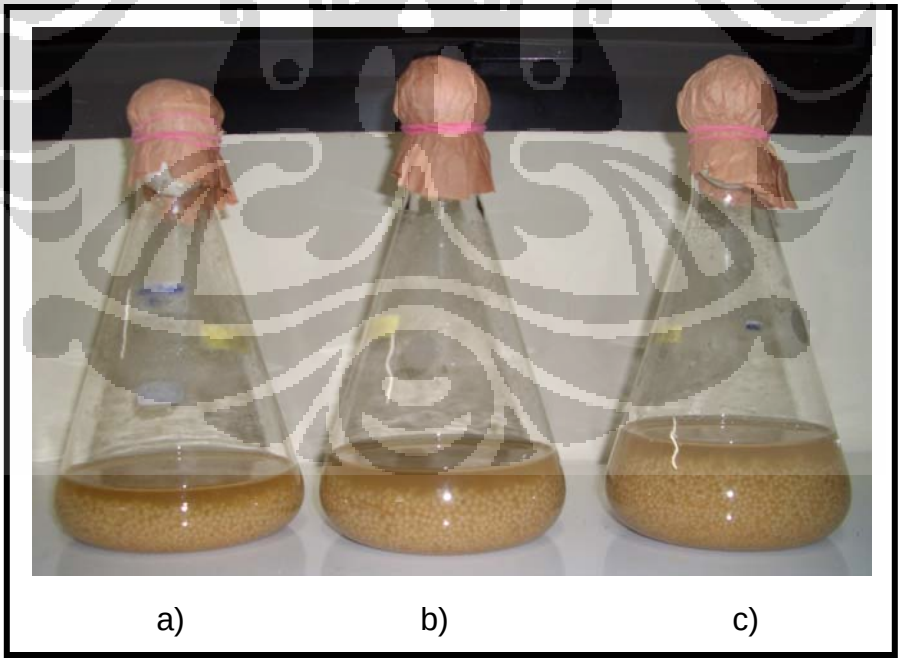
Gambar 12. Kurva kalibrasi asam kojat dengan persamaan regresi linear y = 1503,303378 + 14,31025567 dan r = 0,9994.



Gambar 13. Densitogram sampel asam kojat dalam media fermentasi minimum + asam amino L-arginin HCl (Rf=0,30). Panjang gelomban 312 nm, eluen=toluene-etil asetat-asam format (3:6:1).

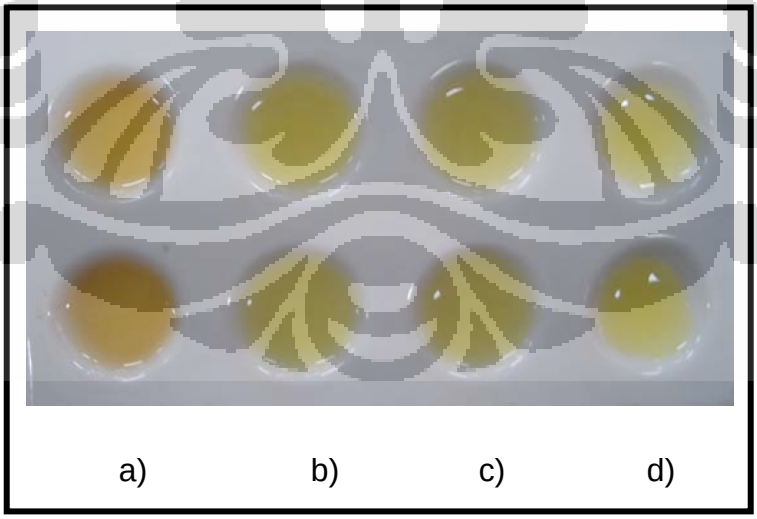


Gambar 14. Hasil skrinning asam kojat dengan $FeCl_3$ 1% pada fermentasi dalam 100 ml media, dilakukan duplo. a) medium A; b) Medium B ; c) Medium D

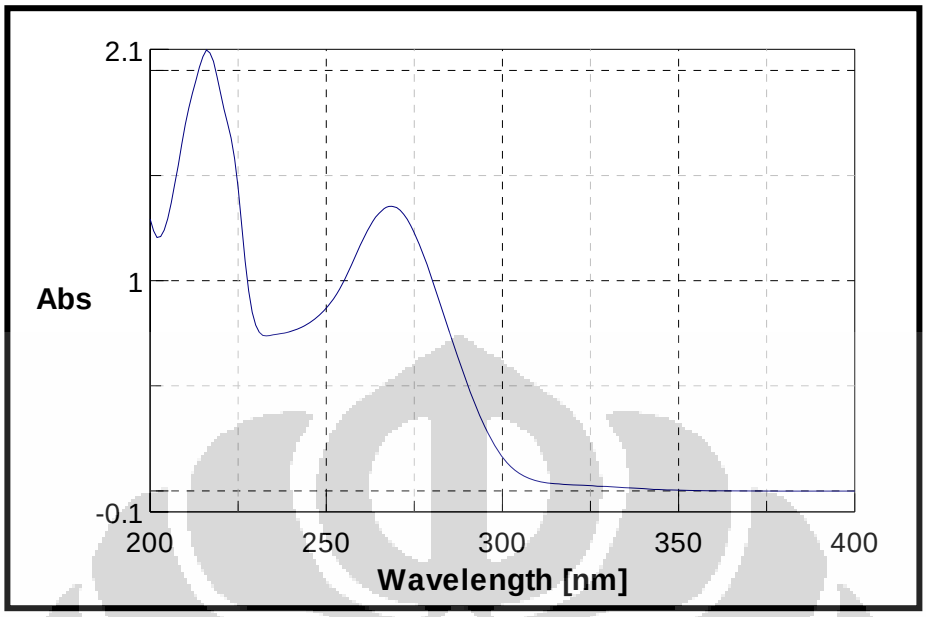


Gambar 15. Biomassa sel berbentuk pellet dalam Erlenmeyer 100 ml setelah inkubasi pada suhu 28^0C selama 12 hari pada proses fermentasi tahap II. a) Erlenmeyer 2 (300 ml); b) Erlenmeyer 3 (400 ml); c) Erlenmeyer 4 (500 ml)

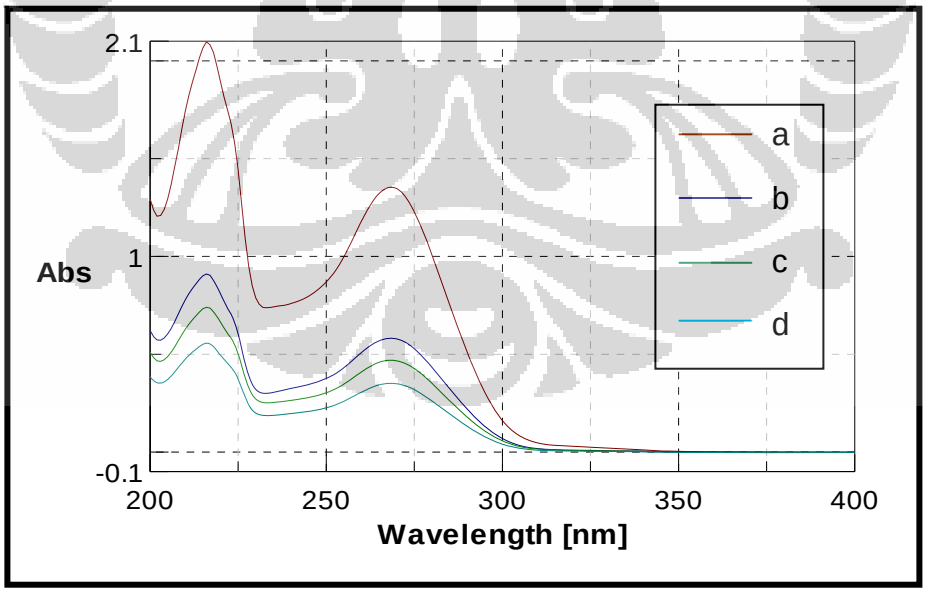
Gambar 16. Filtrat hasil fermentasi dalam volume medium 500 ml setelah penyaringan



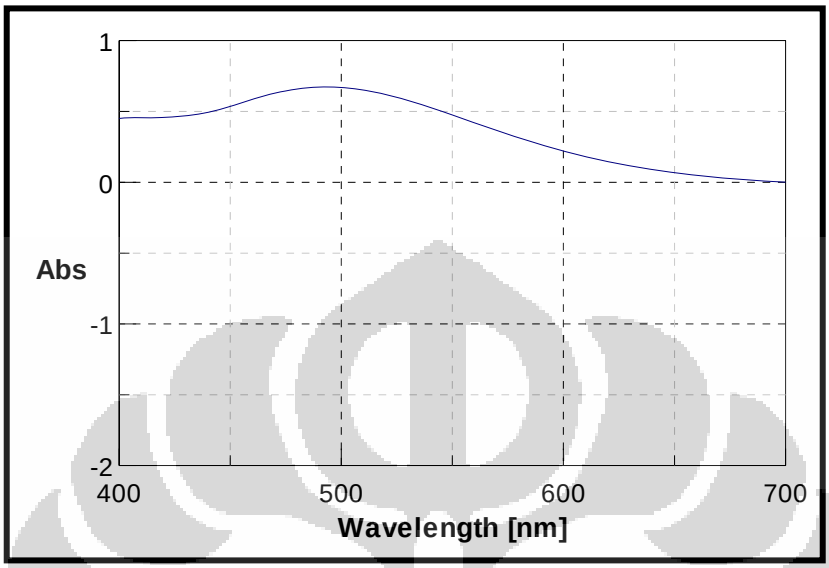
Gambar 17. Hasil skrinning asam kojat dengan $FeCl_3$ 1% pada fermentasi tahap II, dilakukan duplo. a) volume media 300 ml; b) volume media 400 ml; c) volume media 500 ml; d) larutan $FeCl_3$ 1%



Gambar 18. Spektrum serapan spektrofotometri UV dari standar asam kojat konsentrasi 25,20 ppm. Panjang gelombang maksimum 268 nm dengan serapan 1,35349.



Gambar 19. Perbandingan spektrum serapan spektrofotometri UV standar asam kojat 25,20 ppm dengan sampel asam kojat hasil fermentasi tahap II. a) standar asam kojat 25,20 ppm; b) dalam media 300 ml; c) dalam media 400 ml; d) dalam media 500 ml



Gambar 20. Spektrum serapan spektrokolorimetri dari standar asam kojat konsentrasi 104,0 ppm. Panjang gelombang maksimum 493 nm dengan serapan 0,67327.

Gambar 21. *Orbit shaker* yang digunakan untuk fermentasi tahap I.

Gambar 22. Oven untuk mengeringkan peralatan sebelum disterilisasi.

Gambar 23. Oven untuk mengeringkan peralatan setelah disterilisasi.

Gambar 24. *Sentrifuge* [Kubota 5100].

Gambar 25. *Hood.*

Gambar 26. Spektrofotometer UV/Vis [Jasco V-530].

Tabel 1

Data bobot sel kering pada optimasi waktu inokulasi

No	Waktu Inokulasi	Bobot Sel Kering (g/L)
1.	18 jam	17,34
2.	24 jam	18,3
3.	30 jam	26,45

Tabel 2

Data pengamatan biomassa sel dan hasil skrining dengan $FeCl_3$ 1%

dari fermentasi tahap I setelah 12 hari

No	Jenis Media		Biomassa sel	Skrinning $FeCl_3$ 1%
1	A	a	++	JC
2	A	b	++	JC
3	B	a	+++	J
4	B	b	+++	JC
5	C	a	+++	J
6	C	b	+++	J
7	D	a	++	JC
8	D	b	++	JC
9	E	a	+++	J
10	E	b	++	KJ
11	F	a	++	JC
12	F	b	+++	JC
13	G	a	+++	J
14	G	b	+++	KJ
15	H	a	++	JC
16	H	b	++	JC
17	I	a	++	J
18	I	b	+++	JC
19	J	a	+++	J
20	J	b	++	J
21	K	a	++	J
22	K	b	+++	J

23	L	a	++	JC
24	L	b	++	J
25	M	a	+++	J
26	M	b	+++	J
27	N	a	+++	J
28	N	b	+++	J
29	O	a	++	JC
30	O	b	++	JC
31	P	a	++	JC
32	P	b	+++	JC
33	Q	a	++	JC
34	Q	b	++	JC

Keterangan:

a dan b menunjukkan bahwa setiap percobaan dilakukan duplo

Biomassa sel: ++ sel sedikit, separuh volume media

+++ sel banyak, seluruh volume media

Skrinning $FeCl_3$ 1%: KJ : warna kuning jingga

J : warna jingga

JC : warna jingga kecoklatan

Tabel 3

Data kurva kalibrasi standar asam kojat secara KLT densitometri

No	Konsentrasi (ng/µl)	Area
1.	504,0	8726,54
2.	605,0	10033,04
3.	706,0	11731,6
4.	806,0	13045,06
5.	907,0	14549,17
6.	1008,0	15845,73

Persamaan regresi linear: $y = 1503{,}303378 + 14{,}31025567\ x$

$r = 0{,}9994$

Tabel 4

Data konsentrasi asam kojat dari fermentasi tahap I secara KLT densitometri

No	Medium	Area		Konsentrasi (g/l)		Konsentrasi Rata-rata (g/l)
		a	b	a	b	
1.	A	23511,0	27371,4	15,3789	18,0766	16,7278
2.	B	10069,7	12032,3	5,9862	7,3576	6,6719
3.	C	9699,8	9543,2	5,7277	5,6183	5.6730
4.	D	27346,0	29050,8	18,0589	19,2502	18,6545
5.	E	14259,3	13941,8	8,9139	8,692016	8,8029
6.	F	20804,8	23537,9	13,4879	15,3978	14,4378
7.	G	20106,3	16567,8	12,9998	10,5271	11,7634
8.	H	26197,2	24124,1	17,2561	15,8074	16,5317
9.	I	33007,0	21865,2	22,0148	14,2289	18,1218

10.	J	21101,5	20227,4	13,6952	13,0844	13,3898
11.	K	29136,7	24765,3	19,3102	16,2555	17,7828
12.	L	20827,2	23259,0	13,5035	15,2029	14,3532
13.	M	12395,7	15228,4	7,6116	9,5911	8,6013
14.	N	16018,6	17206,9	10,1433	10,9737	10,5585
15.	O	25585,9	24432,6	16,8289	16,0230	16,4259
16.	P	15750,1	14789,6	9,9556	9,2844	9,6200
17.	Q	25414,5	288887,6	16,7091	19,1361	17,9229

Keterangan: a dan b menunjukkan bahwa percobaan dilakukan duplo

Tabel 5

Data bobot sel kering dan hasil skrinning dengan $FeCl_3$ 1% dari fermentasi pada volume media 100 ml

No	Medium		Bobot sel kering (g/L)	Bobot sel kering rata-rata (g/L)	Skrinning $FeCl_3$ 1%
1.	A	a	14,55	13,30	C
2.	A	b	12,05		C
3.	B	a	26,95	25,95	J
4.	B	b	24,95		J
5.	D	a	23,85	23,12	J
6.	D	b	22,40		J

Keterangan: J : jingga

C : coklat

a dan b menunjukkan bahwa percobaan dilakukan duplo

Tabel 6

Data konsentrasi asam kojat dari fermentasi pada volume media 100 ml menggunakan sumber nitrogen yang berbeda secara KLT densitometri

No	Medium		Area	Konsentrasi (g/L)	Konsentrasi Rata-rata (g/L)
1.	A	a	16880.9	10,7459	10,4945
2.	A	b	16161.6	10,2432	
3.	B	a	11714.3	7,1354	7,0431
4.	B	b	11450.1	6,9508	
5.	D	a	12619.9	7,7683	7,9283
6.	D	b	13077,8	8,0883	

Keterangan: a dan b menunjukkan bahwa percobaan dilakukan duplo

Tabel 7

Data volume filtrat hasil fermentasi tahap II setelah penyaringan

No	Erlenmeyer	Volume filtrat	Skrinning $FeCl_3$ 1%
1.	2	250 ml	KJ
2.	3	330 ml	K
3.	4	440 ml	K

Keterangan: K : kuning

KJ: kuning jingga

Tabel 8

Data konsentrasi asam kojat dari fermentasi tahap II secara KLT densitometri

No	Erlenmeyer		Area	Konsentrasi (g/L)	Konsentrasi Rata-rata (g/L)
1.	1	a	12619.9	7,7683	7,9283
2.	1	b	13077,8	8,0883	
3.	2	a	4382,3	2,0118	1,8824
4.	2	b	4011,9	1,7530	
5.	3	a	3630,7	1,4866	1,3311
6.	3	b	3185,6	1,1756	
7.	4	a	1743,3	0,1677	0,3569
8.	4	b	2284,9	0,5462	

Keterangan: a dan b menunjukkan bahwa percobaan dilakukan duplo

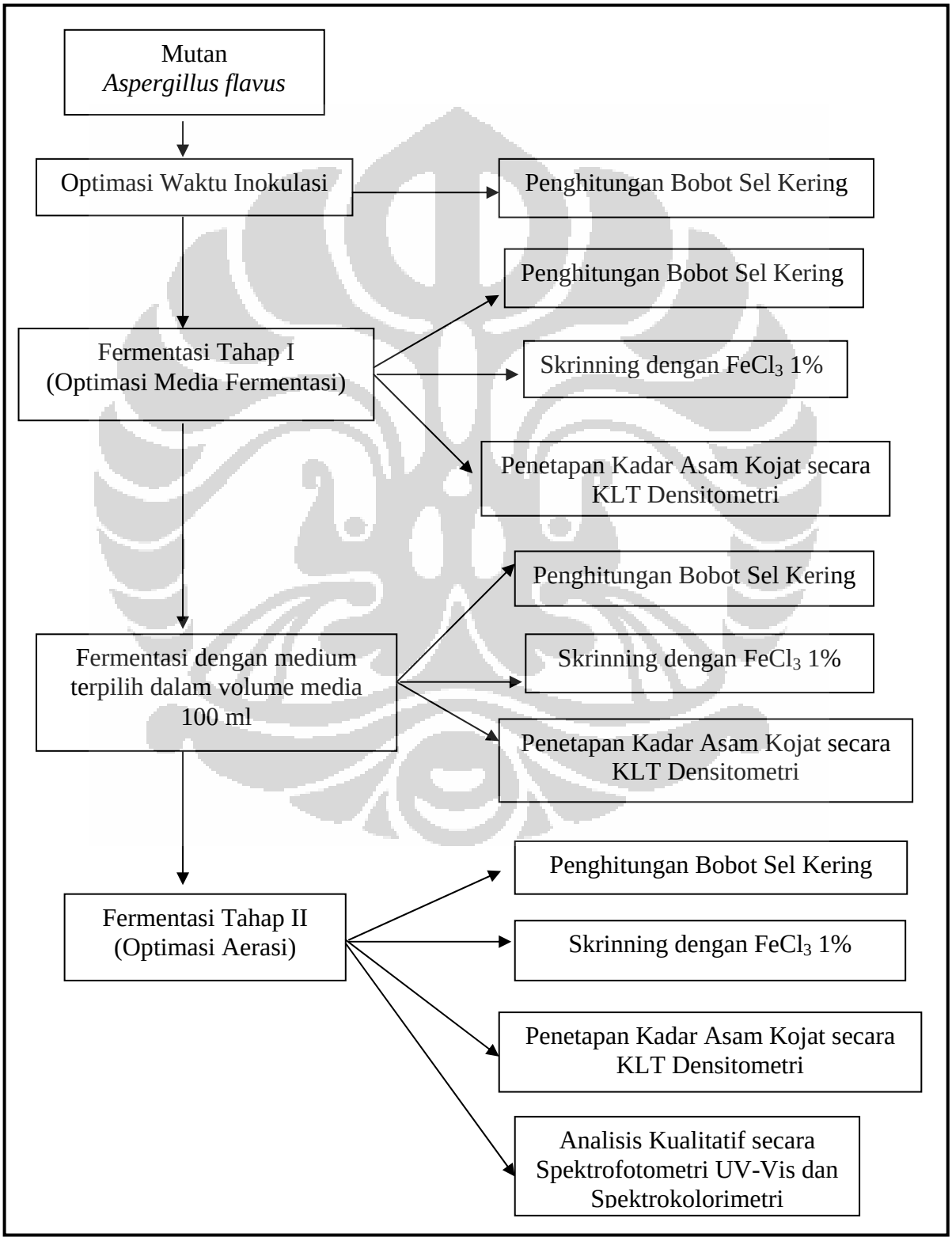
Tabel 9

Data spektrofotometri UV asam kojat hasil fermentasi tahap II

No	Erlenmeyer	λ maks (nm)	serapan
1.	2	268	0,56234
2.	3	268	0,46909
3.	4	268	0,35108

Lampiran 1

Alur Cara Kerja



Lampiran 2

Contoh Perhitungan Konsentrasi Asam Kojat

Persamaan Kurva Kalibrasi yang diperoleh dari larutan standar asam kojat adalah:

y = 1503,303378 + 14,31025567 X

r = 0,9994

Contoh perhitungan:

Area asam kojat = 23511,0

Penotolan 1 µl

23511,0 = 1503,303378 + 14,31025567 X

X = 1537,89 ng/l

X = 1,53789 g/l

Konsentrasi asam kojat dalam kultur dihitung dengan cara:

Konsentrasi asam kojat = X x faktor pengenceran

Konsentrasi asam kojat = 1,53789 x 10

Konsentrasi asam kojat = 15,3789 g/l

Lampiran 3

Medium Fermentasi Tahap I dan Tahap II

A. Medium Fermentasi Tahap I

1. Medium A : Medium Pembanding dengan penambahan *yeast extract*
2. Medium B : Medium Fermentasi Minimum (MFM)
3. Medium C : MFM + AA1
4. Medium D : MFM + AA2
5. Medium E : MFM + AA3
6. Medium F : MFM + AA4
7. Medium G : MFM + AA5
8. Medium H : MFM + AA1 + AA2
9. Medium I : MFM + AA1 +AA3
10. Medium J : MFM + AA1 + AA4
11. Medium K : MFM + AA1 + AA5
12. Medium L : MFM + AA2 + AA3
13. Medium M : MFM + AA2 + AA4
14. Medium N : MFM + AA2 + AA5
15. Medium O : MFM + AA3 + AA4
16. Medium P : MFM + AA3 + AA5
17. Medium Q : MFM + AA4 + AA5

Keterangan: AA1 = L-triptofan dengan konsentrasi 20 mg/L

AA2 = L-arginin HCl dengan konsentrasi 20 mg/L

AA3 = L-lisin HCl dengan konsentrasi 30 mg/L

AA4 = L-asam glutamat dengan konsentrasi 100 mg/L

AA5 = L-valin dengan konsentrasi 150 mg/L

B. Medium Fermentasi Tahap II

1. Erlenmeyer 1 : volume medium sebanyak 100 ml dalam Erlenmeyer 250 ml. Kemudian diinkubasi pada suhu 28^0C selama 12 hari dengan pengocokan 180 rpm.
2. Erlenmeyer 2 : volume medium sebanyak 300 ml dalam Erlenmeyer 1000 ml. Kemudian diinkubasi pada suhu 28^0C selama 12 hari dengan pengocokan 150 rpm.
3. Erlenmeyer 3 : volume medium sebanyak 400 ml dalam Erlenmeyer 1000 ml. Kemudian diinkubasi pada suhu 28^0C selama 12 hari dengan pengocokan 150 rpm.
4. Erlenmeyer 4 : volume medium sebanyak 500 ml dalam Erlenmeyer 1000 ml. Kemudian diinkubasi pada suhu 28^0C selama 12 hari dengan pengocokan 150 rpm.

Lampiran 4

Sertifikat Analisis Asam Kojat

MATERIAL SAFETY DATA SHEET

Nikko Chemicals Co., Ltd.
1-4-8 Nihonbashi-Bakurocho
Chuoku, Tokyo 103
JAPAN
Tel: +81-3-3661-1677
Fax: +81-3-3664-8620

1. CHEMICAL PRODUCT IDENTIFICATION

Product Name	Kojic Acid
Common Chemical Name	Kojic Acid
Product Code (Supplier)	NIKKO CHEMICALS CO., LTD.
INCI Name	Kojic Acid
CAS Number	501-30-4
EINECS Number	207-922-4

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Preparation:	Substance

Information on hazardous ingredients

Chemical Name	%	EINECS No.	CAS Number

3. HAZARD IDENTIFICATION

Human Health Hazards:	Not expected if handled and used properly.

4. FIRST AID MEASURES

Effects and Symptoms:

Ingestion	No adverse effects known
Inhalation	No adverse effects known
Skin Contact	May cause slight irritation
Eye Contact	May cause slight irritation

First Aid Measures:

Ingestion:	Induce vomiting by letting victim drink plenty of water (unless unconscious). Call a doctor at once.
Inhalation:	Supply person with fresh air. If symptoms persist, call a doctor.
Skin contact:	Wipe affected part and flush with lots of water. Ask for medical advice if skin is irritated.
Eye contact:	Rinse thoroughly with a lot of water for some minutes. Call a doctor if necessary.

5. FIRE FIGHTING MEASURES

Extinguishing Media Suitable:	Dry chemical. Carbon dioxide. Foam.
Special Firefighting Procedures:	In case of insufficient ventilation, wear suitable respiratory equipment.

Hazardous Thermal (de)composition Products: None

Protection of Firefighters:	According to size of fire.

6.ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Do not inhale the dust.
Environmental Precautions:	Do not empty into drains.
Methods of cleaning up	Take up mechanically. Rinse the remaining material with lots of water.

7. HANDLING AND STORAGE

Handling:	Avoid contact with skin and eyes.
Storage:	Keep away from direct sunlight. Keep container tightly closed.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

Respiratory System Protection:	Dust mask with filter for fine dust.
Skin and Body Protection:	Wear suitable protective clothing and gloves.
Hand Protection:	Wear suitable gloves.
Eye Protection:	Eye goggles, with side shields.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	Yellow
Odor:	Almost odorless
Solubility:	
Water	Soluble
Oil and Solvents	Insoluble in benzene

10. STABILITY AND REACTIVITY

Conditions to avoid:	The data available do not support any physical or chemical hazard.
Materials to avoid:	Not reactive
Hazardous Decomposition Products:	None

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:	
Oral (LD50):	2650 mg/kg (mice); 2260 mg/kg (rat)
Subcutaneous(LD50):	2050 mg/kg (mice); 3010 mg/kg (rat)
Chronic Oral Toxicity:	1000 mg/kg (rat, 6 mo.)
Skin Irritation:	Slight irritant.
Eye Irritation:	Slight irritant.
Sensitization:	Not a sensitizer.
Mutagenicity:	Mutagenic

12. ECOLOGICAL INFORMATION

13. DISPOSAL CONSIDERATIONS

Method of Disposal:	Take notice of national special regulations.

14. TRANSPORT INFORMATION

Land - Road/Railway	This product is not classified according to ADR/RID
Inland Watrways	This product is not classified according to ADNR
Sea	This product is not classified according to IMDG
Air	This product is not classified according to IATA
National Transport Regulations	No additional national transport regulations are known to the supplier.

15. REGULATORY INFORMATION

Label Name:	Kojic Acid

16. OTHER INFORMATION

History	
Date of issue	April 6, 1996 Ukaji

The statements made here are supposed to describe the product with regard to necessary safety precautions. They do not guarantee special characteristics and are made to the best of our current knowledge.

Lampiran 5

Sertifikat Analisis L-triptofan

KYOWA HAKKO KOGYO CO., LTD.
1-6-1 Ohtemachi, Chiyoda-ku, Tokyo, JAPAN
+81-3-3282-0979

KYOWA

CERTIFICATE OF ANALYSIS

Commodity : L-TRYPTOPHAN
Lot No. : 070356
Quantity : 80 KG
Manufacturing date: APR.19.2007
Analysis date : APR.19.2007
Retest date : APR.19.2010

SPECIFICATION	ACCEPTANCE CRITERIA	RESULT
APPEARANCE	WHITE TO ALMOST WHITE CRYSTALLINE POWDER	WHITE CRYSTALLINE POWDER
IDENTIFICATION	PASS TEST	PASS TEST
STATE OF SOLUTION(T%)	NOT LESS THAN 95.0 %	NOT LESS THAN 95.0 %
PH	5.5 to 6.4	6.0
SPECIFIC ROTATION(AT 20℃)	-32.5 to -30.5 °	-31.9 °
SPECIFIC ROTATION(AT 25℃)	-32.8 to -29.4 °	-31.6 °
AMMONIUM(NH4)	NOT MORE THAN 0.020 %	NOT MORE THAN 0.020 %
CHLORIDE(Cl)	NOT MORE THAN 0.020 %	NOT MORE THAN 0.020 %
SULFATE(SO4)	NOT MORE THAN 0.020 %	NOT MORE THAN 0.020 %
IRON(Fe)	NOT MORE THAN 10 ppm	NOT MORE THAN 10 ppm
HEAVY METALS(Pb)	NOT MORE THAN 10 ppm	NOT MORE THAN 10 ppm
ARSENIC(As2O3)	NOT MORE THAN 1 ppm	NOT MORE THAN 1 ppm
FOREIGN AMINO ACIDS	NOT MORE THAN 0.5% (TLC 30μg)	NOT MORE THAN 0.5% (TLC 30μg)
LOSS ON DRYING	NOT MORE THAN 0.20 %	0.05 %
RESIDUE ON IGNITION	NOT MORE THAN 0.10 %	0.00 %
PYROGEN	FREE	FREE
ASSAY(DRY BASIS)	99.0 to 101.0 %	100.1 %

WE HEREBY CERTIFY THAT THE COMMODITY DESCRIBED ABOVE MEETS THE REQUIREMENTS OF THE CURRENT JP, USP, EP AND FCC, INCLUDING REQUIREMENTS OF RESIDUAL SOLVENTS LISTED IN THE CURRENT JP, USP AND EP.

The undersigned affirms that contents mentioned above are truly reported in accordance with the analysis by Quality Control Center.

N. Hino

Bio-Chemicals Business Unit

Date of issue: AUG. 29.2007
(H029795)

Lampiran 6

Sertifikat Analisis L-arginin HCl

KYOWA HAKKO KOGYO CO., LTD.

1-6-1 Ohtemachi, Chiyoda-ku, Tokyo, JAPAN
+81-3-3282-0979

KYOWA

CERTIFICATE OF ANALYSIS

Commodity : L-ARGININE HCL
Lot No. : 071605
Quantity : 100 KG
Manufacturing date: JUN. 21. 2007
Analysis date : JUN. 21. 2007
Retest date : JUN. 21. 2010

SPECIFICATION	ACCEPTANCE CRITERIA	RESULT
APPEARANCE	WHITE CRYSTALLINE POWDER	WHITE CRYSTALLINE POWDER
IDENTIFICATION	PASS TEST	PASS TEST
STATE OF SOLUTION	COLORLESS AND CLEAR	COLORLESS AND CLEAR
pH	4.7 to 6.2	5.6
SPECIFIC ROTATION(AT 20℃)	+21.5 to +23.5 °	+22.8 °
AMMONIUM(NH4)	NOT MORE THAN 0.020 %	NOT MORE THAN 0.010 %
CHLORIDE CONTENT(Cl)	16.5 to 17.0 %	16.8 %
SULFATE(SO4)	NOT MORE THAN 0.028 %	NOT MORE THAN 0.003 %
IRON(Fe)	NOT MORE THAN 30 ppm	NOT MORE THAN 30 ppm
HEAVY METALS(Pb)	NOT MORE THAN 10 ppm	NOT MORE THAN 10 ppm
ARSENIC(As2O3)	NOT MORE THAN 1 ppm	NOT MORE THAN 1 ppm
COPPER(Cu)	NOT MORE THAN 500 ppb	NOT MORE THAN 500 ppb
FOREIGN AMINO ACIDS	NOT MORE THAN 0.4% (TLC 100μg)	NOT MORE THAN 0.4% (TLC 100μg)
LOSS ON DRYING	NOT MORE THAN 0.20 %	0.07 %
RESIDUE ON IGNITION	NOT MORE THAN 0.10 %	0.00 %
PYROGEN	FREE	FREE
ASSAY(DRY BASIS)	NOT LESS THAN 98.5 %	100.1 %

The undersigned affirms that contents mentioned above are truly reported in accordance with the analysis by Quality Control Center.

N. Hirai

Bio-Chemicals Business Unit

Date of issue: JUL. - 9. 2007

(G003641)

Lampiran 7

Sertifikat Analisis L-lisin HCl

KYOWA HAKKO KOGYO CO., LTD.
1-6-1 Ohtemachi, Chiyoda-ku, Tokyo, JAPAN
+81-3-3282-0979

KYOWA

CERTIFICATE OF ANALYSIS

Commodity : L-LYSINE HCl
Lot No. : 070043
Quantity : 200 KG
Manufacturing date: JUN. 25. 2007
Analysis date : JUL. 17. 2007
Retest date : JUN. 25. 2010

SPECIFICATION	ACCEPTANCE CRITERIA	RESULT
APPEARANCE	WHITE POWDER	WHITE POWDER
IDENTIFICATION	PASS TEST	PASS TEST
STATE OF SOLUTION	COLORLESS AND CLEAR	COLORLESS AND CLEAR
pH	5.0 to 6.0	5.7
SPECIFIC ROTATION(AT 20℃)	+19.0 to +21.5 °	+21.2 °
AMMONIUM(NH4)	NOT MORE THAN 0.020 %	NOT MORE THAN 0.020 %
CHLORIDE CONTENT(Cl)	19.0 to 19.6 %	19.3 %
SULFATE(SO4)	NOT MORE THAN 0.028 %	NOT MORE THAN 0.028 %
IRON(Fe)	NOT MORE THAN 20 ppm	NOT MORE THAN 20 ppm
HEAVY METALS(Pb)	NOT MORE THAN 10 ppm	NOT MORE THAN 10 ppm
ARSENIC(As2O3)	NOT MORE THAN 1 ppm	NOT MORE THAN 1 ppm
COPPER(Cu)	NOT MORE THAN 500 ppb	NOT MORE THAN 500 ppb
LOSS ON DRYING	NOT MORE THAN 0.60 %	0.12 %
RESIDUE ON IGNITION	NOT MORE THAN 0.10 %	0.01 %
FOREIGN AMINO ACIDS	NOT MORE THAN 0.5% (TLC 50μg)	NOT MORE THAN 0.5% (TLC 50μg)
PYROGEN	FREE	FREE
ASSAY(DRY BASIS)	NOT LESS THAN 98.5 %	99.5 %

The undersigned affirms that contents mentioned above are truly reported in accordance with the analysis by Quality Control Center.

N. Hirao

Bio-Chemicals Business Unit

Date of issue: AUG. 29. 2007

(H029797)

Lampiran 8

Sertifikat Analisis L-asam glutamat

. PT. OTSUKA INDONESIA

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10KG/DB
8000431000
PAGE 1 / 1
Aug. 13, 2007

CERTIFICATE OF ANALYSIS

AJINOMOTO CO., INC.
KAWASAKI PLANT
1-1 SUZUKI-CHO KAWASAKI-KU
KAWASAKI, KANAGAWA, JAPAN

ANALYTICAL RESULTS OF L-GLUTAMIC ACID

LOT NO. 0000030132

[Item]	[Limit]	[Result]
Description	passed test	passed test
Identification	passed test	passed test
Specific rotation (LINE, 20°)	+31.5 to +32.4°	+32.1°
State of solution (Transmittance)	NLT 98.0%	NLT 98.0%
State of solution	clear & colorless	clear & colorless
Chloride(Cl)	NMT 0.020%	NMT 0.020%
Ammonium(NH4)	NMT 0.02%	NMT 0.02%
Sulfate(SO4)	NMT 0.020%	NMT 0.020%
Iron(Fe)	NMT 10ppm	NMT 10ppm
Heavy metals(Pb)	NMT 10ppm	NMT 10ppm
Arsenic(As2O3)	NMT 1ppm	NMT 1ppm
Related substances	conforms	conforms
Loss on drying	NMT 0.10%	0.07%
Residue on ignition (sulfated)	NMT 0.10%	0.00%
Assay	98.5 to 100.5%	99.5%
pH	3.0 to 3.5	3.2
Endotoxin	less than 6.0EU/g	less than 6.0EU/g

We certify that the quality of this product conforms to EP

Manufacturing Date : Nov. 10, 2006
Expiry Date : Nov. 08, 2010

Ryouichirou Nakamura
Quality Control Manager
KAWASAKI PLANT

A taste of the future.
AJINOMOTO.

Lampiran 9

Sertifikat Analisis L-valin

KYOWA HAKKO KOGYO CO., LTD.
1-6-1 Ohtemachi, Chiyoda-ku, Tokyo, JAPAN
+81-3-3282-0979

KYOWA

CERTIFICATE OF ANALYSIS

Commodity : L-VALINE
Lot No. : 070437
Quantity : 100 KG
Manufacturing date: FEB. 15. 2007
Analysis date : FEB. 15. 2007
Retest date : FEB. 15. 2010

SPECIFICATION	ACCEPTANCE CRITERIA	RESULT
APPEARANCE	WHITE CRYSTALLINE POWDER	WHITE CRYSTALLINE POWDER
IDENTIFICATION	PASS TEST	PASS TEST
STATE OF SOLUTION	COLORLESS AND CLEAR	COLORLESS AND CLEAR
PH	5.5 to 6.5	6.0
SPECIFIC ROTATION (AT 20℃)	+26.5 to +29.0 °	+28.6 °
AMMONIUM (NH4)	NOT MORE THAN 0.020 %	NOT MORE THAN 0.020 %
CHLORIDE (Cl)	NOT MORE THAN 0.021 %	NOT MORE THAN 0.021 %
SULFATE (SO4)	NOT MORE THAN 0.028 %	NOT MORE THAN 0.028 %
IRON (Fe)	NOT MORE THAN 30 ppm	NOT MORE THAN 30 ppm
HEAVY METALS (Pb)	NOT MORE THAN 10 ppm	NOT MORE THAN 10 ppm
ARSENIC (As2O3)	NOT MORE THAN 1 ppm	NOT MORE THAN 1 ppm
COPPER (Cu)	NOT MORE THAN 500 ppb	NOT MORE THAN 500 ppb
FOREIGN AMINO ACIDS	NOT MORE THAN 0.5% (TLC 20 μg)	NOT MORE THAN 0.5% (TLC 20 μg)
LOSS ON DRYING	NOT MORE THAN 0.20 %	0.01 %
RESIDUE ON IGNITION	NOT MORE THAN 0.10 %	0.00 %
PYROGEN	FREE	FREE
ASSAY (DRY BASIS)	NOT LESS THAN 98.5 %	100.2 %

The undersigned affirms that contents mentioned above are truly reported in accordance with the analysis by Quality Control Center.

N. Hirao

Bio-Chemicals Business Unit

Date of issue: AUG. 29. 2007
(H029795)