

BAB V

KESIMPULAN DAN SARAN

A. Kesimpulan

Kesimpulan dari hasil penelitian ini adalah :

1. Proporsi kitosan yang semakin banyak dan proporsi karbopol yang semakin kecil dapat meningkatkan kekerasan dan mengurangi kerapuhan tablet, sedangkan uji disolusi untuk masing-masing formula menunjukkan bahwa kecepatan disolusi menurun jika proporsi kitosan pada matriks kombinasi diperbanyak.
2. Proporsi kombinasi matriks karbopol dan kitosan yang menunjukkan sifat fisik tablet yang paling baik adalah proporsi karbopol 12,5 mg dan kitosan 25 mg.

B. Saran

1. Perlu dilakukan optimasi untuk mengetahui formula optimum dari kombinasi matriks karbopol dan kitosan pada tablet mukoadhesif Propranolol HCl.
2. Perlu dilakukan penelitian dengan menggunakan metode granulasi yang berbeda untuk mengetahui metode mana yang menunjukkan hasil yang paling baik.

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L

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I

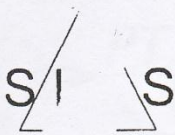
R

A

N

Lampiran 1. Sertifikat analisis Propranolol HCl

B13 1736



S.I. S. TRADING s.r.l.

Sede legale amministrativa:
50125 Firenze - Via Dante Da Castiglione, 8
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BANCA CARIGE ITALIA
C/C 24440/80 - ABI: 03431 - CAB: 37851
Swift: CARITGG
IBAN: IT 85 A 03431 37851 00000 2444080
Banca Nazionale del Lavoro Sede di Firenze
C/C 24115 - ABI: 1005 - CAB: 2800 - CIN: B
C.C.I.A.A. Firenze N. 381049
Cancelleria Tribunale Firenze N. 44231
Partita IVA e Codice Fiscale N. 03680510488
Magazzino: Tel. 055 863051

Firenze 12.06.2013

CERTIFICATE OF ANALYSIS

Batch number : 213.049 ✓

PRODUCT : PROPRANOLOL HCL

QUANTITY : Kg . 200

REVIEWED
By Petru Apu at F.06-17 PM, 6/12/2013

INT.CODE : 0159-1-P

PACKING : 8 x 25 Kg. drums

APPARENCE: White to off-white crystalline powder, odourless, bitter taste

SOLUBILITY : Soluble in water and in alcohol, slightly soluble in chloroform; practically insoluble in ether

STORAGE : Preserve in well closed containers, protected from light

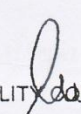
TESTS	RESULT/OUTCOME	PRESCRIBED
Identification I.R./Ident.IR	positive	Conforms to RS
Identification Chloride/Ident. Clor.	positive	positive
Melting point/ Punto di fusione	164.5 °C	163.0 - 166.0°C
Identification T.L.C./Identif. T.L.C.	positive	Conforms to RS
Acidity/Acidità pH	complies	Conforms
Heavy metals/Metalli pesanti	< 20 ppm	n.m.t. 20 ppm
Loss on drying/Perdita di peso	0.23%	n.m.t. 0.5%
Sulphate Ash/Ceneri Solfate	0.06%	n.m.t. 0.1%
Related Substances/Impurezze		
-Single Impurity	0.04%	n.m.t. 0.1%
-Total Impurities	0.12%	n.m.t. 0.4%
Assay (HPLC)/Titolo	99.81%	99.0 -101.0%
Residual Solvents/Solventi residui		
Ethanol / Etanolo	complies	< 5000 ppm
Xylene/Xilene	complies	< 2170 ppm

Man. date : June/2013

Exp. Date : June./2018 ✓

Product complies the requirements BP2010/EP6

PT. MENSA
L/C N° 014ITSY036202
PO N° PH-3811
N° : 1 - UP
JAKARTA


 QUALITY CONTROL

Lampiran 2. Data uji waktu alir granul

Replikasi	F1 (detik)	F2 (detik)	F3 (detik)	F4 (detik)	F5 (detik)
I	8,35	8,40	7,55	9,40	8,75
II	8,50	8,10	8,65	9,10	8,65
III	8,05	8,00	8,40	8,60	8,75
Rata-rata	8,30	8,17	8,20	9,03	8,72
SD	0,23	0,21	0,57	0,404	0,058

Keterangan :

Formula 1 : 100% karbopol dan 0% kitosan
 Formula 2 : 75% karbopol dan 25% kitosan
 Formula 3 : 50% karbopol dan 50% kitosan
 Formula 4 : 25% karbopol dan 75% kitosan
 Formula 5 : 0% karbopol dan 100% kitosan
 SD : Simpangan baku

Lampiran 3. Hasil spss uji waktu alir**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
waktualir	15	8.4833	.45539	7.55	9.40

One-Sample Kolmogorov-Smirnov Test

		Waktualir
N		15
Normal Parameters ^{a, b}	Mean	8.4833
	Std. Deviation	.45539
Most Extreme Differences	Absolute	.146
	Positive	.146
	Negative	-.118
Kolmogorov-Smirnov Z		.564
Asymp. Sig. (2-tailed)		.908

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Waktualir

Levene Statistic	df1	df2	Sig.
3.079	4	10	.068

ANOVA

Waktu alir

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.713	4	.428	3.599	.046
Within Groups	1.190	10	.119		
Total	2.903	14			

Multiple Comparisons

Waktualir

LSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula1	formula 2	.13333	.28166	.646	-.4942	.7609
	formula 3	.10000	.28166	.730	-.5276	.7276
	formula 4	-.73333*	.28166	.026	-1.3609	-.1058
	formula 5	-.41667	.28166	.170	-1.0442	.2109
formula 2	formula1	-.13333	.28166	.646	-.7609	.4942
	formula 3	-.03333	.28166	.908	-.6609	.5942
	formula 4	-.86667*	.28166	.012	-1.4942	-.2391
	formula 5	-.55000	.28166	.079	-1.1776	.0776
formula 3	formula1	-.10000	.28166	.730	-.7276	.5276
	formula 2	.03333	.28166	.908	-.5942	.6609
	formula 4	-.83333*	.28166	.014	-1.4609	-.2058
	formula 5	-.51667	.28166	.096	-1.1442	.1109
formula 4	formula1	.73333*	.28166	.026	.1058	1.3609
	formula 2	.86667*	.28166	.012	.2391	1.4942
	formula 3	.83333*	.28166	.014	.2058	1.4609
	formula 5	.31667	.28166	.287	-.3109	.9442
formula 5	formula1	.41667	.28166	.170	-.2109	1.0442
	formula 2	.55000	.28166	.079	-.0776	1.1776
	formula 3	.51667	.28166	.096	-.1109	1.1442
	formula 4	-.31667	.28166	.287	-.9442	.3109

*. The mean difference is significant at the 0.05 level.

Lampiran 4. Data Kandungan lembab

Replikasi	Formula 1 (%)	Formula 2 (%)	Formula 3 (%)	Formula 4 (%)	Formula 5 (%)
I	5,5	5	5	6,5	5,5
II	5	5	5,5	5	6
III	5	4,5	5	6	5
rata-rata	5,17	4,83	5,17	5,83	5,50
SD	0,29	0,29	0,76	0,29	0,50

Keterangan :

Formula 1 : 100% karbopol dan 0% kitosan

Formula 2 : 75% karbopol dan 25% kitosan

Formula 3 : 50% karbopol dan 50% kitosan

Formula 4 : 25% karbopol dan 75% kitosan

Formula 5 : 0% karbopol dan 100% kitosan

SD : Simpangan baku

Lampiran 5. Hasil SPSS kandungan lembab

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
kelembaban	15	5.3000	.52780	4.50	6.50

One-Sample Kolmogorov-Smirnov Test

		Kelembaban
N		15
Normal Parameters ^{a, b}	Mean	5.3000
	Std. Deviation	.52780
Most Extreme Differences	Absolute	.315
	Positive	.315
	Negative	-.218
Kolmogorov-Smirnov Z		1.220
Asymp. Sig. (2-tailed)		.102

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

kandungan lembab

Levene Statistic	df1	df2	Sig.
1.360	4	10	.315

ANOVA

Kelembaban

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.733	4	.433	2.000	.171
Within Groups	2.167	10	.217		
Total	3.900	14			

Multiple Comparisons

Kandungan lembab

LSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula1	formula 2	.33333	.38006	.401	-.5135	1.1802
	formula 3	-.66667	.38006	.110	-1.5135	.1802
	formula 4	.00000	.38006	1.000	-.8468	.8468
	formula 5	-.33333	.38006	.401	-1.1802	.5135
formula 2	formula1	-.33333	.38006	.401	-1.1802	.5135
	formula 3	-1.00000*	.38006	.025	-1.8468	-.1532
	formula 4	-.33333	.38006	.401	-1.1802	.5135
	formula 5	-.66667	.38006	.110	-1.5135	.1802
formula 3	formula1	.66667	.38006	.110	-.1802	1.5135
	formula 2	1.00000*	.38006	.025	.1532	1.8468
	formula 4	.66667	.38006	.110	-.1802	1.5135
	formula 5	.33333	.38006	.401	-.5135	1.1802
formula 4	formula1	.00000	.38006	1.000	-.8468	.8468
	formula 2	.33333	.38006	.401	-.5135	1.1802
	formula 3	-.66667	.38006	.110	-1.5135	.1802
	formula 5	-.33333	.38006	.401	-1.1802	.5135
formula 5	formula1	.33333	.38006	.401	-.5135	1.1802
	formula 2	.66667	.38006	.110	-.1802	1.5135
	formula 3	-.33333	.38006	.401	-1.1802	.5135
	formula 4	.33333	.38006	.401	-.5135	1.1802

*. The mean difference is significant at the 0.05 level.

Lampiran 6. Data uji keseragaman bobot

Tablet	Bobot tablet (mg)				
	F1	F2	F3	F4	F5
1	248	251	249	252	253
2	250	253	251	253	252
3	246	256	248	252	252
4	251	256	249	255	252
5	248	255	248	250	251
6	250	256	250	249	254
7	246	254	252	253	253
8	246	254	251	251	251
9	248	245	250	255	253
10	246	252	247	251	251
11	246	256	248	251	253
12	249	253	250	250	250
13	248	255	256	253	251
14	248	255	250	252	252
15	247	256	248	248	256
16	247	257	250	254	251
17	249	255	247	249	253
18	247	254	249	252	252
19	248	253	251	250	251
20	249	256	248	252	253
bobot rata-rata	247,85	254,1	249,6	251,6	252,2
SD	1,496	2,654	2,062	1,930	1,361
CV	0,60%	1,04%	0,82%	0,77%	0,54%

Hasil perhitungan rentang keseragaman bobot:

Formula	Kolom A		Kolom B	
	minimal	maksimal	minimal	Maksimal
1	229,26	266,44	210,67	285,03
2	235,04	273,16	215,99	292,22
3	230,88	268,32	212,16	287,04
4	232,73	270,47	213,86	289,34
5	233,29	271,12	214,37	290,03

Keterangan :

Kolom A : Penyimpangan 7,5% dari bobot rata-rata

Kolom B : Penyimpangan 15% dari bobot rata-rata

Lampiran 7. Data uji kekerasan tablet

Replikasi	F1	F2	F3	F4	F5
I	9,100	9,400	11,900	12,600	12,400
II	8,500	11,100	12,000	10,400	12,300
III	9,800	9,000	11,000	11,400	12,900
rata-rata	9,133	9,833	11,633	11,467	12,533
SD	0,651	1,115	0,551	1,102	0,321

Keterangan :

Formula 1 : 100% karbopol dan 0% kitosan

Formula 2 : 75% karbopol dan 25% kitosan

Formula 3 : 50% karbopol dan 50% kitosan

Formula 4 : 25% karbopol dan 75% kitosan

Formula 5 : 0% karbopol dan 100% kitosan

SD : Simpangan baku

Lampiran 8. Hasil SPSS uji kekerasan tablet

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
kekerasan	15	10.9200	1.46199	8.50	12.90

One-Sample Kolmogorov-Smirnov Test

		kekerasan
N		15
Normal Parameters ^{a, b}	Mean	10.9200
	Std. Deviation	1.46199
Most Extreme Differences	Absolute	.149
	Positive	.117
	Negative	-.149
Kolmogorov-Smirnov Z		.576
Asymp. Sig. (2-tailed)		.895

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Kekerasan

Levene Statistic	df1	df2	Sig.
1.323	4	10	.327

ANOVA

Kekerasan

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	23.351	4	5.838	8.881	.003
Within Groups	6.573	10	.657		
Total	29.924	14			

Multiple Comparisons

kekerasan

LSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula1	formula 2	-.70000	.66198	.315	-2.1750	.7750
	formula 3	-2.50000*	.66198	.004	-3.9750	-1.0250
	formula 4	-2.33333*	.66198	.005	-3.8083	-.8583
	formula 5	-3.40000*	.66198	.000	-4.8750	-1.9250
formula 2	formula1	.70000	.66198	.315	-.7750	2.1750
	formula 3	-1.80000*	.66198	.022	-3.2750	-.3250
	formula 4	-1.63333*	.66198	.033	-3.1083	-.1583
	formula 5	-2.70000*	.66198	.002	-4.1750	-1.2250
formula 3	formula1	2.50000*	.66198	.004	1.0250	3.9750
	formula 2	1.80000*	.66198	.022	.3250	3.2750
	formula 4	.16667	.66198	.806	-1.3083	1.6417
	formula 5	-.90000	.66198	.204	-2.3750	.5750
formula 4	formula1	2.33333*	.66198	.005	.8583	3.8083
	formula 2	1.63333*	.66198	.033	.1583	3.1083
	formula 3	-.16667	.66198	.806	-1.6417	1.3083
	formula 5	-1.06667	.66198	.138	-2.5417	.4083
formula 5	formula1	3.40000*	.66198	.000	1.9250	4.8750
	formula 2	2.70000*	.66198	.002	1.2250	4.1750
	formula 3	.90000	.66198	.204	-.5750	2.3750
	formula 4	1.06667	.66198	.138	-.4083	2.5417

*. The mean difference is significant at the 0.05 level.

Lampiran 9. Data uji kerapuhan tablet

Formula	Bobot awal (g)	Bobot akhir (g)	% kerapuhan
1	4930	4904,667	0,514
2	5108,667	5087	0,424
3	4984,333	4969,333	0,301
4	5022,667	5006,333	0,325
5	5026,667	5014,667	0,238

Keterangan :

Formula 1 : 100% karbopol dan 0% kitosan

Formula 2 : 75% karbopol dan 25% kitosan

Formula 3 : 50% karbopol dan 50% kitosan

Formula 4 : 25% karbopol dan 75% kitosan

Formula 5 : 0% karbopol dan 100% kitosan

SD : Simpangan baku

Perhitungan kerapuhan tablet : $\frac{\text{bobot awal tablet} - \text{bobot akhir tablet}}{\text{bobot awal tablet}} \times 100\%$

$$\begin{aligned} \square \text{ Formula 1 : } \quad \text{Kerapuhan} &= \frac{4930 - 4904,667}{4930} \times 100\% \\ &= 0,515\% \end{aligned}$$

$$\begin{aligned} \square \text{ Formula 2 : } \quad \text{Kerapuhan} &= \frac{5108,667 - 5087}{5108,667} \times 100\% \\ &= 0,424\% \end{aligned}$$

$$\begin{aligned} \square \text{ Formula 3 : } \quad \text{Kerapuhan} &= \frac{4984,333 - 4969,333}{4984,333} \times 100\% \\ &= 0,301\% \end{aligned}$$

$$\begin{aligned} \square \text{ Formula 4 : } \quad \text{Kerapuhan} &= \frac{5022,667 - 5006,333}{5022,667} \times 100\% \\ &= 0,325\% \end{aligned}$$

$$\begin{aligned} \square \text{ Formula 5 : } \quad \text{Kerapuhan} &= \frac{5026,667 - 4904,667}{5026,667} \times 100\% \\ &= 0,238\% \end{aligned}$$

Lampiran 10. Hasil SPSS uji kerapuhan tablet**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
kerapuhan	15	.3605	.13122	.04	.61

One-Sample Kolmogorov-Smirnov Test

		Kerapuhan
N		15
Normal Parameters ^{a, b}	Mean	.3605
	Std. Deviation	.13122
Most Extreme Differences	Absolute	.153
	Positive	.117
	Negative	-.153
Kolmogorov-Smirnov Z		.593
Asymp. Sig. (2-tailed)		.874

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Kerapuhan

Levene Statistic	df1	df2	Sig.
2.289	4	10	.131

ANOVA

Kerapuhan

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.142	4	.035	3.569	.047
Within Groups	.099	10	.010		
Total	.241	14			

Multiple Comparisons

kerapuhan

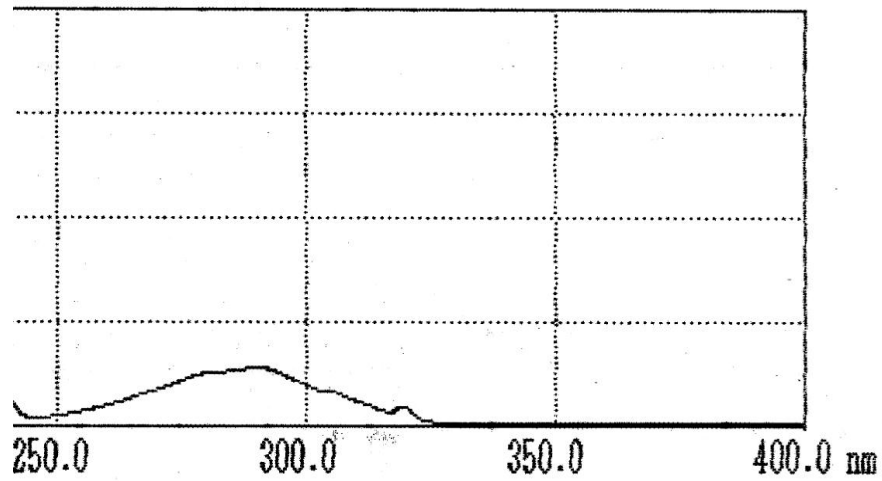
LSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula1	formula 2	.09033	.08136	.293	-.0910	.2716
	formula 3	.21300 [*]	.08136	.026	.0317	.3943
	formula 4	.18867 [*]	.08136	.043	.0074	.3700
	formula 5	.27567 [*]	.08136	.007	.0944	.4570
formula 2	formula1	-.09033	.08136	.293	-.2716	.0910
	formula 3	.12267	.08136	.163	-.0586	.3040
	formula 4	.09833	.08136	.255	-.0830	.2796
	formula 5	.18533 [*]	.08136	.046	.0040	.3666
formula 3	formula1	-.21300 [*]	.08136	.026	-.3943	-.0317
	formula 2	-.12267	.08136	.163	-.3040	.0586
	formula 4	-.02433	.08136	.771	-.2056	.1570
	formula 5	.06267	.08136	.459	-.1186	.2440
formula 4	formula1	-.18867 [*]	.08136	.043	-.3700	-.0074
	formula 2	-.09833	.08136	.255	-.2796	.0830
	formula 3	.02433	.08136	.771	-.1570	.2056
	formula 5	.08700	.08136	.310	-.0943	.2683
formula 5	formula1	-.27567 [*]	.08136	.007	-.4570	-.0944
	formula 2	-.18533 [*]	.08136	.046	-.3666	-.0040
	formula 3	-.06267	.08136	.459	-.2440	.1186
	formula 4	-.08700	.08136	.310	-.2683	.0943

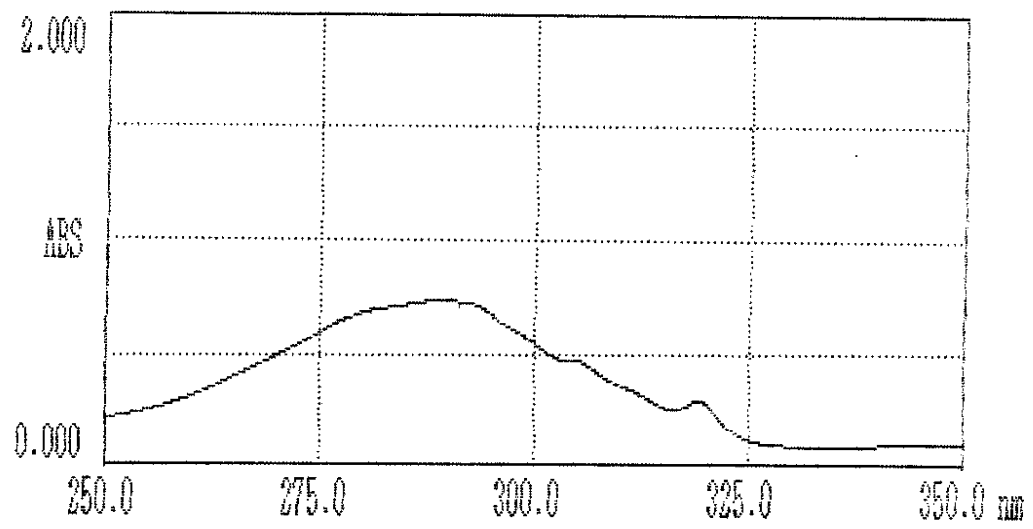
*. The mean difference is significant at the 0.05 level.

Lampiran 11. Penentuan panjang gelombang ($\lambda_{\max}$) dan *operating time* propranolol HCl

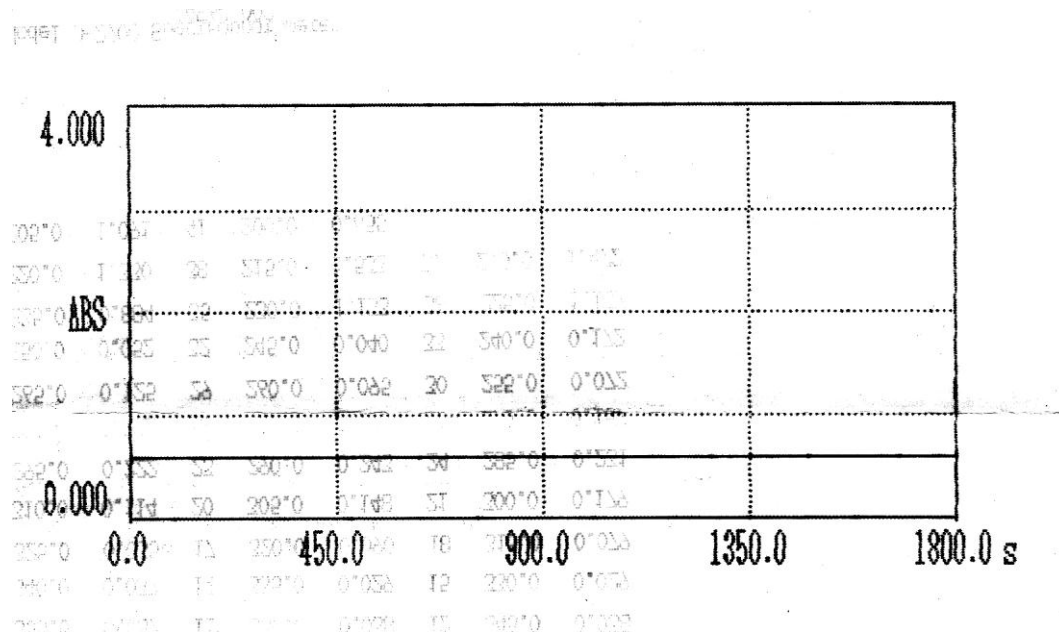
11.1. Penentuan $\lambda_{\max}$ Propranolol HCl dalam methanol



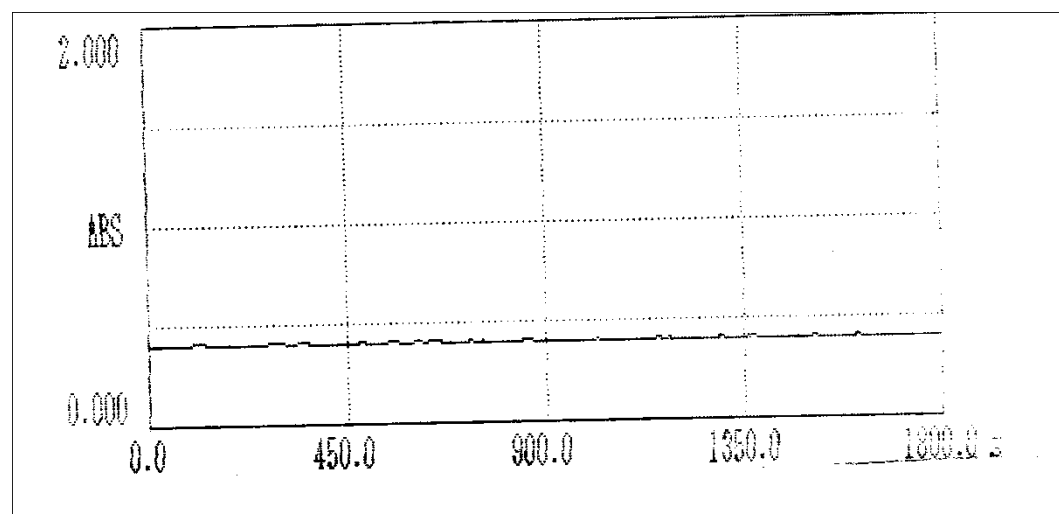
11.2. Penentuan $\lambda_{\max}$ Propranolol HCl dalam medium disolusi



11.3 Operating time Propranolol HCl dalam metanol



11.4 Operating time Propranolol HCl dalam medium disolusi



Lampiran 12. penentuan kurva baku

12.1 Kurva baku dalam medium disolusi

konsentrasi (ppm)	Absorbansi
5	0,148
10	0,233
15	0,340
20	0,441
25	0,544
30	0,636
35	0,737
40	0,835

Data regresi linier :

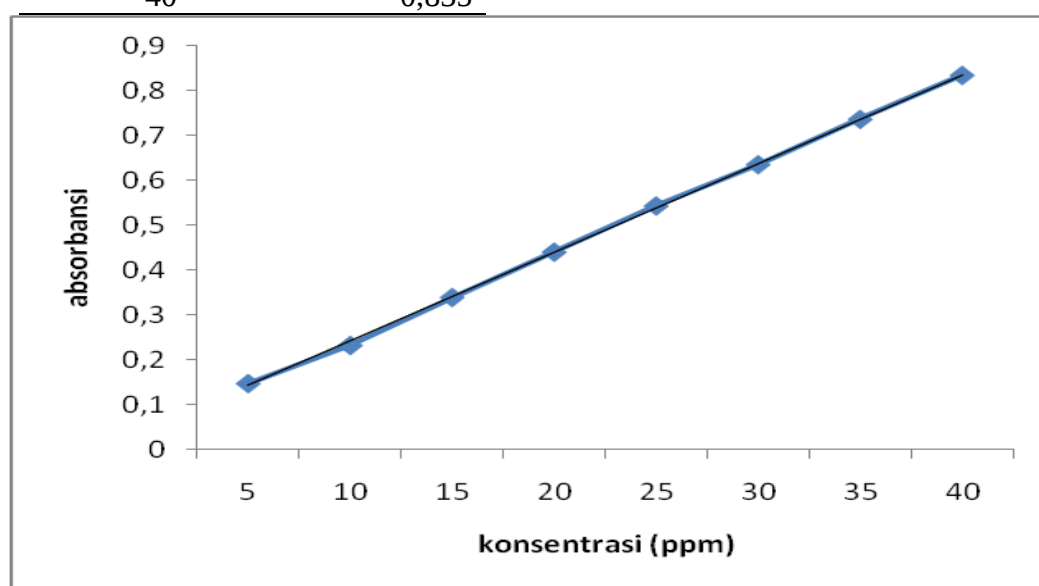
$$A = 0,043535714$$

$$B = 0,019809524$$

$$r = 0,999833304$$

persamaan regresi linier :

$$Y = 4,353 \times 10^{-2} + 1,981 \times 10^{-2} X$$



Cara pembuatan kurva baku :

Timbang secara seksama 25 mg propranolol HCl standar, kemudian dimasukkan dalam labu takar 50 ml dan tepatkan volumenya dengan medium disolusi sampai tanda batas.

□ Konsentrasi larutan induk salbutamol sulfat standar

$$50 \text{ mg} / 50 \text{ ml} = 1000 \text{ mg} / 1000 \text{ ml}$$

$$= 1000 \text{ ppm}$$

Dipipet sebanyak 0,2; 0,3; 0,4; 0,5; 0,6; dan 0,7 ml larutan induk (1000 ppm), kemudian dimasukkan masing-masing ke dalam labu takar 50,0 ml. Tepatkan volumenya dengan asam klorida 0,1N sampai tanda batas. Dibaca absorbansinya dengan spektrofotometer UV-VIS.

12.2 Kurva baku dalam methanol

konsentrasi (ppm)	absorbansi
5	0,135
10	0,228
15	0,324
20	0,415
25	0,511
30	0,615
35	0,715
40	0,813

Data regresi linier :

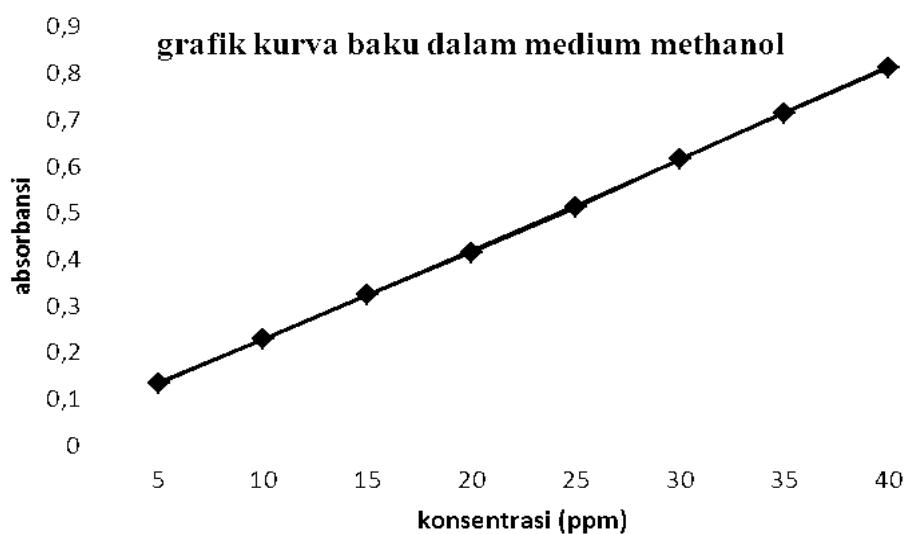
$$A = 0,037892857$$

$$B = 0,019404762$$

$$r = 0,999828085$$

persamaan regresi linier :

$$Y = 3,78 \times 10^{-2} + 1,940 \times 10^{-2} X$$



Cara pembuatan kurva baku :

Timbang secara seksama 25 mg propranolol HCl standar, kemudian dimasukkan dalam labu takar 50 ml dan tepatkan volumenya dengan medium disolusi sampai tanda batas.

□ Konsentrasi larutan induk salbutamol sulfat standar

$$50 \text{ mg} / 50 \text{ ml} = 1000 \text{ mg} / 1000 \text{ ml}$$

$$= 1000 \text{ ppm}$$

Dipipet sebanyak 0,2; 0,3; 0,4; 0,5; 0,6; dan 0,7 ml larutan induk (1000 ppm), kemudian dimasukkan masing-masing ke dalam labu takar 50,0 ml. Tepatkan volumenya dengan medium disolusi sampai tanda batas. Dibaca absorbansinya dengan spektrofotometer UV-VIS.

Lampiran 13. Data hasil penetapan kadar

replikasi	Formula				
	1	2	3	4	5
	(%)	(%)	(%)	(%)	(%)
I	94,26	90,9	101,2	91,2	94,3
II	94,6	90,9	101,35	92,35	94,26
III	95,87	91,5	101,5	92,5	95,23
rata-rata	94,91	91,1	101,35	92,017	94,59667
SD	0,848587	0,34641	0,15	0,71122	0,548847

Penetapan kadar propranolol HCl dalam tablet dilakukan dengan cara dua puluh tablet propranolol HCl digerus homogen dan di timbang sesuai bobot per tablet. Serbuk dilarutkan dalam metanol ad 50 mL, dan ditetapkan kadarnya dengan spektrofotometer UV pada λ 290 nm.

$$\text{Rumus kadar Propranolol HCl} : \frac{\text{kadar (mg/mL)} \times \text{volume} \times \text{fx}}{\text{dosis Propranolol HCl dalam 1 tablet}} \times 100\%$$

Keterangan :

volume : 50 mL
dosis propranolol HCl 1 tablet : 80 mg
fx : faktor pengenceran

contoh perhitungan penetapan kadar propranolol HCl :

persamaan kurva baku $Y = 3,29 \times 10^{-2} + 1,940 \times 10^{-2} X$

absorbansi formula 1 adalah 0,623

$$0,623 = 3,78 \times 10^{-2} + 1,940 \times 10^{-2} X$$

$$X = 30,16 \text{ ppm} = 30,16 \text{ mg/L}$$

$$X = 0,03042 \text{ mg/mL}$$

$$\begin{aligned}
 \% \text{kadar propranolol HCl} &= \frac{0,03042 (\text{mg/mL}) \times 50 \times 50}{80} \times 100\% \\
 &= \frac{75,412}{80} \times 100\% \\
 &= 94,26 \%
 \end{aligned}$$

Lampiran 14. Perhitungan kadar terdisolusi tablet mukoadhesif Propranolol HCl

Rumus kadar propranolol HCl terdisolusi:

$$\frac{\text{kadar (mg/ml)} \times \text{volum media disolusi} \times \text{fx}}{\text{dosis tramadol HCl dalam 1 tablet}} \times 100\%$$

Keterangan :

volume media disolusi : 900 mL

dosis propranolol HCl 1 tablet : hasil dari penetapan kadar

fx : faktor pengenceran

Formula 1 replikasi 1

waktu (menit)	absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,197	7,753	6,977	1	6,977	9,189
10	0,209	8,359	7,523	1	7,588	9,993
15	0,292	12,551	11,295	1	11,486	15,127
30	0,4	18,005	16,205	1	16,575	21,829
60	0,586	27,399	24,659	1	25,304	33,325
90	0,751	35,732	32,159	1	33,161	43,673
120	0,2	7,904	7,114	5	36,965	48,683
150	0,234	9,621	8,659	5	45,173	59,494
180	0,255	10,682	9,614	5	50,480	66,483
210	0,265	11,187	10,068	5	53,312	70,213
240	0,309	13,409	12,068	5	56,170	73,976
270	0,319	13,914	12,523	5	59,052	77,772
300	0,338	14,874	13,386	5	61,501	80,996
330	0,34	14,975	13,477	5	63,969	84,247
360	0,348	15,379	13,841	5	68,985	90,854

Formula 1 replikasi 2

waktu (menit)	absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,161	5,93434	5,341	1	5,341	7,034
10	0,205	8,15657	7,341	1	7,406	9,753
15	0,271	11,4899	10,341	1	10,521	13,856
30	0,369	16,4394	14,795	1	15,140	19,939
60	0,535	24,8232	22,341	1	22,933	30,203
90	0,708	33,5606	30,205	1	31,133	41,002
120	0,197	7,75253	6,977	5	36,202	47,678
150	0,234	9,62121	8,659	5	45,092	59,387
180	0,245	10,1768	9,159	5	48,101	63,349
210	0,261	10,9848	9,886	5	52,057	68,559
240	0,298	12,8535	11,568	5	55,591	73,213
270	0,328	14,3687	12,932	5	60,077	79,122
300	0,337	14,8232	13,341	5	61,619	81,152
330	0,34	14,9747	13,477	5	64,319	84,709
360	0,349	15,4293	13,886	5	69,341	91,322

Formula 1 replikasi 3

waktu (menit)	absorbansi	kadar (mg/mL)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,166	6,187	5,568	1	6,159	8,112
10	0,207	8,258	7,432	1	7,497	9,873
15	0,288	12,348	11,114	1	11,302	14,885
30	0,378	16,894	15,205	1	15,562	20,495
60	0,488	22,449	20,205	1	20,786	27,376
90	0,705	33,409	30,068	1	30,984	40,806
120	0,201	7,955	7,159	5	37,109	48,873
150	0,229	9,369	8,432	5	43,941	57,871
180	0,239	9,874	8,886	5	46,708	61,514
210	0,265	11,187	10,068	5	53,176	70,033
240	0,304	13,157	11,841	5	55,114	72,585
270	0,316	13,763	12,386	5	62,583	82,421
300	0,33	14,470	13,023	5	62,084	81,765
330	0,342	15,076	13,568	5	64,330	84,723
360	0,348	15,379	13,841	5	71,649	94,363

Kadar rata-rata (formula 1)

Waktu (menit)	R1 %	R2 %	R3 %	rata-rata %
5	9,189	7,034	8,112	8,112
10	9,993	9,753	9,873	9,873
15	15,127	13,856	14,885	14,622
30	21,829	19,939	20,495	20,754
60	33,325	30,203	27,376	30,301
90	43,673	41,002	40,806	41,827
120	48,683	47,678	48,873	48,411
150	59,494	59,387	57,871	58,917
180	66,483	63,349	61,514	63,782
210	70,213	68,559	70,033	69,601
240	73,976	73,213	72,585	73,258
270	77,772	79,122	82,421	79,772
300	80,996	81,152	81,765	81,304
330	84,247	84,709	84,723	84,560
360	90,854	91,322	94,363	92,180

Formula 2 replikasi 1

waktu (menit)	Absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,127	4,217	3,795	1	3,795	5,188
10	0,172	6,490	5,841	1	5,906	8,072
15	0,215	8,662	7,795	1	7,947	10,862
30	0,318	13,864	12,477	1	12,767	17,450
60	0,458	20,934	18,841	1	19,340	26,434
90	0,655	30,884	27,795	1	28,604	39,095
120	0,807	38,561	34,705	5	35,898	49,066
150	0,513	23,712	21,341	5	44,350	60,617
180	0,238	9,823	8,841	5	46,364	63,370
210	0,241	9,975	8,977	5	47,544	64,983
240	0,245	10,177	9,159	5	48,962	66,921
270	0,249	10,379	9,341	5	50,390	68,873
300	0,255	10,682	9,614	5	52,288	71,467
330	0,262	11,035	9,932	5	54,431	74,395
360	0,263	11,086	9,977	5	55,212	75,464

Formula 2 replikasi 2

waktu (menit)	Absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,131	4,419	3,977	1	3,977	5,436
10	0,166	6,187	5,568	1	5,633	7,699
15	0,211	8,460	7,614	1	7,763	10,611
30	0,306	13,258	11,932	1	12,214	16,694
60	0,454	20,732	18,659	1	19,148	26,172
90	0,653	30,783	27,705	1	28,502	38,956
120	0,807	38,561	34,705	5	35,887	49,050
150	0,511	23,611	21,250	5	44,155	60,351
180	0,24	9,924	8,932	5	46,810	63,980
210	0,239	9,874	8,886	5	47,077	64,344
240	0,242	10,025	9,023	5	48,260	65,961
270	0,247	10,278	9,250	5	49,910	68,217
300	0,253	10,581	9,523	5	51,803	70,804
330	0,263	11,086	9,977	5	54,630	74,667
360	0,27	11,439	10,295	5	56,793	77,624

Formula 2 replikasi 3

waktu (menit)	absorbansi	kadar (mg/mL)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,13	4,369	3,932	1	3,932	5,395
10	0,171	6,439	5,795	1	5,860	8,041
15	0,225	9,167	8,250	1	8,407	11,535
30	0,328	14,369	12,932	1	13,232	18,156
60	0,455	20,783	18,705	1	19,213	26,362
90	0,66	31,136	28,023	1	28,842	39,575
120	0,812	38,813	34,932	5	36,139	49,588
150	0,522	24,167	21,750	5	45,191	62,007
180	0,24	9,924	8,932	5	46,846	64,279
210	0,24	9,924	8,932	5	47,342	64,959
240	0,249	10,379	9,341	5	49,907	68,478
270	0,25	10,429	9,386	5	50,656	69,505
300	0,25	10,429	9,386	5	51,177	70,221
330	0,258	10,833	9,750	5	53,537	73,459
360	0,271	11,490	10,341	5	57,066	78,301

Kadar rata-rata formula 2

Waktu (menit)	R1 %	R2 %	R3 %	rata-rata %
5	5,188	5,436	5,395	5,340
10	8,072	7,699	8,041	7,937
15	10,862	10,611	11,535	11,002
30	17,450	16,694	18,156	17,433
60	26,434	26,172	26,362	26,323
90	39,095	38,956	39,575	39,209
120	49,066	49,050	49,588	49,235
150	60,617	60,351	62,007	60,992
180	63,370	63,980	64,279	63,876
210	64,983	64,344	64,959	64,762
240	66,921	65,961	68,478	67,120
270	68,873	68,217	69,505	68,865
300	71,467	70,804	70,221	70,830
330	74,395	74,667	73,459	74,174
360	75,464	77,624	78,301	77,130

Formula 3 replikasi 1

waktu (menit)	absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,117	3,712	3,341	1	3,341	4,121
10	0,152	5,480	4,932	1	4,997	6,163
15	0,188	7,298	6,568	1	6,706	8,271
30	0,276	11,742	10,568	1	10,823	13,349
60	0,395	17,753	15,977	1	16,410	20,239
90	0,614	28,813	25,932	1	26,653	32,872
120	0,770	36,692	33,023	1	34,111	42,070
150	0,513	23,712	21,341	2	44,244	54,568
180	0,229	9,369	8,432	5	44,190	54,501
210	0,232	9,520	8,568	5	45,347	55,929
240	0,239	9,874	8,886	5	47,432	58,500
270	0,248	10,328	9,295	5	49,994	61,660
300	0,251	10,480	9,432	5	51,200	63,147
330	0,260	10,934	9,841	5	53,792	66,344
360	0,262	11,035	9,932	5	54,798	67,585

Formula 3 replikasi 2

waktu (menit)	absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,123	4,015	3,614	1	3,614	4,457
10	0,153	5,530	4,977	1	5,042	6,219
15	0,195	7,652	6,886	1	7,028	8,668
30	0,289	12,399	11,159	1	11,424	14,090
60	0,424	19,217	17,295	1	17,753	21,896
90	0,617	28,965	26,068	1	26,815	33,073
120	0,777	37,045	33,341	1	34,459	42,499
150	0,516	23,864	21,477	2	44,549	54,945
180	0,232	9,520	8,568	5	44,912	55,392
210	0,235	9,672	8,705	5	46,077	56,829
240	0,238	9,823	8,841	5	47,250	58,276
270	0,251	10,480	9,432	5	50,729	62,566
300	0,254	10,631	9,568	5	51,942	64,063
330	0,261	10,985	9,886	5	54,082	66,702
360	0,262	11,035	9,932	5	54,861	67,663

Formula 3 replikasi 3

waktu (menit)	absorbansi	kadar (mg/mL)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,122	3,965	3,568	1	3,477	4,289
10	0,154	5,581	5,023	1	5,088	6,275
15	0,189	7,348	6,614	1	6,752	8,328
30	0,291	12,500	11,250	1	11,513	14,200
60	0,388	17,399	15,659	1	16,096	19,853
90	0,620	29,116	26,205	1	26,933	33,218
120	0,768	36,591	32,932	1	34,026	41,966
150	0,500	23,056	20,750	2	43,056	53,103
180	0,236	9,722	8,750	5	45,792	56,477
210	0,239	9,874	8,886	5	46,967	57,927
240	0,240	9,924	8,932	5	47,691	58,819
270	0,252	10,530	9,477	5	50,944	62,832
300	0,256	10,732	9,659	5	52,390	64,615
330	0,266	11,237	10,114	5	55,225	68,111
360	0,269	11,389	10,250	5	56,476	69,655

Kadar rata-rata

Waktu (menit)	R1 %	R2 %	R3 %	rata-rata %
5	4,121	4,457	4,289	4,289
10	6,163	6,219	6,275	6,219
15	8,271	8,668	8,328	8,422
30	13,349	14,090	14,200	13,880
60	20,239	21,896	19,853	20,663
90	32,872	33,073	33,218	33,054
120	42,070	42,499	41,966	42,179
150	54,568	54,945	53,103	54,205
180	54,501	55,392	56,477	55,457
210	55,929	56,829	57,927	56,895
240	58,500	58,276	58,819	58,532
270	61,660	62,566	62,832	62,353
300	63,147	64,063	64,615	63,942
330	66,344	66,702	68,111	67,053
360	67,585	67,663	69,655	68,301

Formula 4 replikasi 1

waktu (menit)	absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,125	4,116	3,705	1	3,704545	5,031
10	0,157	5,732	5,159	1	6,732323	7,095
15	0,2	7,904	7,114	1	8,90404	9,857
30	0,274	11,641	10,477	1	12,64141	14,583
60	0,389	17,449	15,705	1	18,44949	21,920
90	0,543	25,227	22,705	1	26,22727	31,769
120	0,665	31,389	28,250	1	32,38889	39,727
150	0,384	17,197	15,477	2	19,19697	43,867
180	0,195	7,652	6,886	5	12,65152	49,110
210	0,223	9,066	8,159	5	14,06566	58,368
240	0,231	9,470	8,523	5	14,4697	61,480
270	0,25	10,429	9,386	5	15,42929	68,053
300	0,262	11,035	9,932	5	16,03535	72,507
330	0,267	11,288	10,159	5	16,28788	74,816
360	0,268	11,338	10,205	5	16,33838	75,895

Formula 4 replikasi 2

waktu (menit)	absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,111	3,409	3,068	1	3,068	4,167
10	0,158	5,783	5,205	1	5,269	7,157
15	0,191	7,449	6,705	1	6,844	9,295
30	0,28	11,944	10,750	1	11,009	14,952
60	0,41	18,510	16,659	1	17,103	23,228
90	0,571	26,641	23,977	1	24,688	33,529
120	0,717	34,015	30,614	1	31,664	43,004
150	0,4	18,005	16,205	2	33,820	45,932
180	0,209	8,359	7,523	5	39,442	53,568
210	0,223	9,066	8,159	5	43,077	58,505
240	0,24	9,924	8,932	5	47,437	64,426
270	0,254	10,631	9,568	5	51,151	69,470
300	0,264	11,136	10,023	5	53,980	73,313
330	0,269	11,389	10,250	5	55,686	75,629
360	0,2799	11,939	10,745	5	58,760	79,805

Formula 4 replikasi 3

waktu (menit)	absorbansi	kadar (mg/mL)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,12	3,864	3,477	1	3,477	4,723
10	0,15	5,379	4,841	1	4,906	6,663
15	0,19	7,399	6,659	1	6,798	9,233
30	0,276	11,742	10,568	1	10,824	14,701
60	0,388	17,399	15,659	1	16,089	21,852
90	0,552	25,682	23,114	1	23,801	32,325
120	0,689	32,601	29,341	1	30,354	41,225
150	0,391	17,551	15,795	2	32,955	44,758
180	0,198	7,803	7,023	5	36,868	50,072
210	0,229	9,369	8,432	5	44,382	60,277
240	0,234	9,621	8,659	5	45,999	62,474
270	0,252	10,530	9,477	5	50,617	68,745
300	0,26	10,934	9,841	5	52,982	71,956
330	0,266	11,237	10,114	5	54,907	74,572
360	0,265	11,187	10,068	5	55,239	75,023

Kadar rata-rata

Waktu (menit)	R1 %	R2 %	R3 %	rata-rata %
5	5,031	4,167	4,723	4,640
10	7,095	7,157	6,663	6,971
15	9,857	9,295	9,233	9,461
30	14,583	14,952	14,701	14,745
60	21,920	23,228	21,852	22,333
90	31,769	33,529	32,325	32,541
120	39,727	43,004	41,225	41,319
150	43,867	45,932	44,758	44,852
180	49,110	53,568	50,072	50,916
210	58,368	58,505	60,277	59,050
240	61,480	64,426	62,474	62,793
270	68,053	69,470	68,745	68,756
300	72,507	73,313	71,956	72,592
330	74,816	75,629	74,572	75,006
360	75,895	79,805	75,023	76,907

Formula 5 replikasi 1

waktu (menit)	absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,121	3,914	3,523	1	3,522727	4,655
10	0,156	5,682	5,114	1	5,178535	6,844
15	0,198	7,803	7,023	1	7,165657	9,470
30	0,265	11,187	10,068	1	10,32298	13,642
60	0,417	18,864	16,977	1	17,42071	23,022
90	0,576	26,894	24,205	1	24,91692	32,928
120	0,688	32,551	29,295	1	30,33333	40,086
150	0,416	18,813	16,932	2	35,27778	46,621
180	0,21	8,409	7,568	5	39,67551	52,432
210	0,222	9,015	8,114	5	42,85354	56,632
240	0,241	9,975	8,977	5	47,67045	62,998
270	0,252	10,530	9,477	5	50,69697	66,997
300	0,259	10,884	9,795	5	52,83207	69,819
330	0,262	11,035	9,932	5	54,06566	71,449
360	0,264	11,136	10,023	5	55,07702	72,786

Formula 5 replikasi 2

waktu (menit)	absorbansi	kadar (ppm)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,126	4,167	3,750	1	3,750	4,956
10	0,163	6,035	5,432	1	5,497	7,264
15	0,2	7,904	7,114	1	7,258	9,591
30	0,269	11,389	10,250	1	10,508	13,886
60	0,415	18,763	16,886	1	17,332	22,904
90	0,564	26,288	23,659	1	24,367	32,202
120	0,701	33,207	29,886	1	30,927	40,871
150	0,425	19,268	17,341	2	36,108	47,717
180	0,2	7,904	7,114	5	37,389	49,411
210	0,206	8,207	7,386	5	39,163	51,755
240	0,216	8,712	7,841	5	41,871	55,334
270	0,246	10,227	9,205	5	49,201	65,020
300	0,254	10,631	9,568	5	51,551	68,126
330	0,258	10,833	9,750	5	53,002	70,043
360	0,26	10,934	9,841	5	54,003	71,366

Formula 5 replikasi 3

waktu (menit)	absorbansi	kadar (mg/mL)	kadar dalam 900mL	fx	total terdisolusi (mg)	kadar terdisolusi %
5	0,122	3,965	3,568	1	3,636	4,806
10	0,158	5,783	5,205	1	5,269	6,964
15	0,196	7,702	6,932	1	7,074	9,348
30	0,264	11,136	10,023	1	10,276	13,580
60	0,42	19,015	17,114	1	17,557	23,202
90	0,572	26,692	24,023	1	24,733	32,685
120	0,689	32,601	29,341	1	30,377	40,144
150	0,42	19,015	17,114	2	35,644	47,104
180	0,22	8,914	8,023	5	41,976	55,472
210	0,216	8,712	7,841	5	41,503	54,847
240	0,227	9,268	8,341	5	44,466	58,763
270	0,251	10,480	9,432	5	50,444	66,664
300	0,254	10,631	9,568	5	51,658	68,267
330	0,261	10,985	9,886	5	53,798	71,096
360	0,262	11,035	9,932	5	54,577	72,125

Kadar rata-rata

Waktu (menit)	R1 %	R2 %	R3 %	rata-rata %
5	4,655	4,956	4,806	4,806
10	6,844	7,264	6,964	7,024
15	9,470	9,591	9,348	9,470
30	13,642	13,886	13,580	13,703
60	23,022	22,904	23,202	23,043
90	32,928	32,202	32,685	32,605
120	40,086	40,871	40,144	40,367
150	46,621	47,717	47,104	47,147
180	52,432	49,411	55,472	52,439
210	56,632	51,755	54,847	54,411
240	62,998	55,334	58,763	59,032
270	66,997	65,020	66,664	66,227
300	69,819	68,126	68,267	68,737
330	71,449	70,043	71,096	70,863
360	72,786	71,366	72,125	72,092

Lampiran 15. Analisa kinetika pelepasan tablet propranolol HCl

15.1 Analisa kinetika orde nol

waktu	% pelepasan				
	F 1	F2	F 3	F 4	F 5
5	8,112	5,340	4,289	4,640	4,806
10	9,873	7,937	6,219	6,971	7,024
15	14,622	11,002	8,422	9,461	9,470
30	20,754	17,433	13,880	14,745	13,703
60	30,301	26,323	20,663	22,333	23,043
90	41,827	39,209	33,054	32,541	32,605
120	48,411	49,235	42,179	41,319	40,367
150	58,917	60,992	54,205	44,852	47,147
180	63,782	63,876	55,457	50,916	52,439
210	69,601	64,762	56,895	59,050	54,411
240	73,258	67,120	58,532	62,793	59,032
270	79,772	68,865	62,353	68,756	66,227
300	81,304	70,830	63,942	72,592	68,737
330	84,560	74,174	67,053	75,006	70,863
360	92,180	77,130	68,301	76,907	72,092

Persamaan regresi linear waktu versus % pelepasan

Formula 1 : $Y = 15,033 + 0,233X$ (R = 0,980)

Formula 2 : $Y = 14,744 + 0,204X$ (R = 0,945)

Formula 3 : $Y = 11,432 + 0,187X$ (R = 0,951)

Formula 4 : $Y = 9,540 + 0,211X$ (R = 0,985)

Formula 5 : $Y = 10,385 + 0,197X$ (R = 0,978)

15.2 analisa kinetika orde ssatu

waktu	Log % pelepasan				
	F 1	F2	F 3	F 4	F 5
5	0,909	0,728	0,632	0,667	0,682
10	0,994	0,900	0,794	0,843	0,847
15	1,165	1,041	0,925	0,976	0,976
30	1,317	1,241	1,142	1,169	1,137
60	1,481	1,420	1,315	1,349	1,363
90	1,621	1,593	1,519	1,512	1,513
120	1,685	1,692	1,625	1,616	1,606
150	1,770	1,785	1,734	1,652	1,673
180	1,805	1,805	1,744	1,707	1,720
210	1,843	1,811	1,755	1,771	1,736
240	1,917	1,827	1,767	1,798	1,771
270	1,948	1,838	1,795	1,837	1,821
300	1,972	1,850	1,806	1,861	1,837
330	1,985	1,870	1,826	1,875	1,850
360	1,999	1,887	1,834	1,886	1,858

Persamaan regresi linear waktu versus % pelepasan

Formula 1 : $Y = 1,192 + 0,0028X$ (R = 0,912)

Formula 2 : $Y = 1,121 + 0,0027X$ (R = 0,857)

Formula 3 : $Y = 1,019 + 0,0157X$ (R = 0,865)

Formula 4 : $Y = 1,033 + 0,0162X$ (R = 0,895)

Formula 5 : $Y = 1,039 + 0,0029X$ (R = 0,888)

15.3 Analisa kinetika higuchi

Akar waktu	% pelepasan				
	F 1	F2	F 3	F 4	F 5
2,24	8,112	5,340	4,289	4,640	4,806
3,16	9,873	7,937	6,219	6,971	7,024
3,87	14,622	11,002	8,422	9,461	9,470
5,48	20,754	17,433	13,880	14,745	13,703
7,75	30,301	26,323	20,663	22,333	23,043
9,49	41,827	39,209	33,054	32,541	32,605
10,95	48,411	49,235	42,179	41,319	40,367
12,25	58,917	60,992	54,205	44,852	47,147
13,42	63,782	63,876	55,457	50,916	52,439
14,49	69,601	64,762	56,895	59,050	54,411
15,49	73,258	67,120	58,532	62,793	59,032
16,43	79,772	68,865	62,353	68,756	66,227
17,32	81,304	70,830	63,942	72,592	68,737
18,17	84,560	74,174	67,053	75,006	70,863
18,97	92,180	77,130	68,301	76,907	72,092

Persamaan regresi linear waktu versus % pelepasan

Formula 1 : $Y = -5,876 + 5,107X$ ($R = 0,998$)

Formula 2 : $Y = -4,807 + 4,581X$ ($R = 0,857$)

Formula 3 : $Y = -6,256 + 4,1867X$ ($R = 0,987$)

Formula 4 : $Y = -9,025 + 4,592X$ ($R = 0,997$)

Formula 5 : $Y = -7,317 + 4,317X$ ($R = 0,997$)

15.4 Analisa kinetika korsmeyyer-peppas

log waktu	Log % pelepasan				
	F 1	F2	F 3	F 4	F 5
0,699	0,909	0,728	0,632	0,667	0,682
1,000	0,994	0,900	0,794	0,843	0,847
1,176	1,165	1,041	0,925	0,976	0,976
1,477	1,317	1,241	1,142	1,169	1,137
1,778	1,481	1,420	1,315	1,349	1,363
1,954	1,621	1,593	1,519	1,512	1,513
2,079	1,685	1,692	1,625	1,616	1,606
2,176	1,770	1,785	1,734	1,652	1,673
2,255	1,805	1,805	1,744	1,707	1,720
2,322	1,843	1,811	1,755	1,771	1,736
2,380	1,917	1,827	1,767	1,798	1,771
2,431	1,948	1,838	1,795	1,837	1,821
2,477	1,972	1,850	1,806	1,861	1,837
2,519	1,985	1,870	1,826	1,875	1,850
2,556	1,999	1,887	1,834	1,886	1,858

Persamaan regresi linear waktu versus % pelepasan

Formula 1 : $Y = 0,421 + 0,618X$ ($R = 0,997$)

Formula 2 : $Y = 0,282 + 0,651X$ ($R = 0,994$)

Formula 3 : $Y = 0,136 + 0,688X$ ($R = 0,994$)

Formula 4 : $Y = 0,177 + 0,678X$ ($R = 0,999$)

Formula 5 : $Y = 0,198 + 0,663X$ ($R = 0,998$)

Lampiran 16. Hasil SPSS uji disolusi

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
ujidisolusi	15	74.3859	3.95269	67.59	79.81

One-Sample Kolmogorov-Smirnov Test

		ujidisolusi
N		15
Normal Parameters ^{a, b}	Mean	74.3859
	Std. Deviation	3.95269
Most Extreme Differences	Absolute	.177
	Positive	.094
	Negative	-.177
Kolmogorov-Smirnov Z		.686
Asymp. Sig. (2-tailed)		.734

a. Test distribution is Normal.

b. Calculated from data.

ANOVA

Ujidisolusi

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	197.590	4	49.398	23.364	.000
Within Groups	21.142	10	2.114		
Total	218.732	14			

Multiple Comparisons

Ujidiisolusi

LSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula 1	formula 2	.36900	1.18722	.762	-2.2763	3.0143
	formula 3	9.19767 [*]	1.18722	.000	6.5524	11.8430
	formula 4	.59100	1.18722	.629	-2.0543	3.2363
	formula 5	5.40633 [*]	1.18722	.001	2.7610	8.0516
formula 2	formula 1	-.36900	1.18722	.762	-3.0143	2.2763
	formula 3	8.82867 [*]	1.18722	.000	6.1834	11.4740
	formula 4	.22200	1.18722	.855	-2.4233	2.8673
	formula 5	5.03733 [*]	1.18722	.002	2.3920	7.6826
formula 3	formula 1	-9.19767 [*]	1.18722	.000	-11.8430	-6.5524
	formula 2	-8.82867 [*]	1.18722	.000	-11.4740	-6.1834
	formula 4	-8.60667 [*]	1.18722	.000	-11.2520	-5.9614
	formula 5	-3.79133 [*]	1.18722	.010	-6.4366	-1.1460
formula 4	formula 1	-.59100	1.18722	.629	-3.2363	2.0543
	formula 2	-.22200	1.18722	.855	-2.8673	2.4233
	formula 3	8.60667 [*]	1.18722	.000	5.9614	11.2520
	formula 5	4.81533 [*]	1.18722	.002	2.1700	7.4606
formula 5	formula 1	-5.40633 [*]	1.18722	.001	-8.0516	-2.7610
	formula 2	-5.03733 [*]	1.18722	.002	-7.6826	-2.3920
	formula 3	3.79133 [*]	1.18722	.010	1.1460	6.4366
	formula 4	-4.81533 [*]	1.18722	.002	-7.4606	-2.1700

*. The mean difference is significant at the 0.05 level.

Lampiran 17. Data uji swelling index

Waktu (menit)	Penambahan volume (%)				
	1	2	3	4	5
30	106,222	113,272	122,933	133,178	121,097
60	164,7432	183,359	178,145	206,768	173,096
90	249,7283	235,408	219,359	241,273	202,045
120	261,7989	254,102	251,175	250,407	249,625
150	273,0139	308,723	286,422	297,593	283,77
180	324,2758	331,107	331,475	316,969	311,848
210	383,9708	379,324	377,199	406,584	369,258
240	429,7504	425,516	448,541	449,692	390,32

Lampiran 18. Hasil analisa SPSS *swelling index*

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
swellingindeks	15	428.7639	29.06005	380.45	464.09

One-Sample Kolmogorov-Smirnov Test

		swellingindeks
N		15
Normal Parameters ^{a, b}	Mean	428.7639
	Std. Deviation	29.06005
Most Extreme Differences	Absolute	.131
	Positive	.131
	Negative	-.121
Kolmogorov-Smirnov Z		.508
Asymp. Sig. (2-tailed)		.959

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Swellingindeks

Levene Statistic	df1	df2	Sig.
1.105	4	10	.406

ANOVA

Swellingindeks

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6955.721	4	1738.930	3.573	.047
Within Groups	4867.092	10	486.709		
Total	11822.814	14			

Multiple Comparisons

Swellingindeks

LSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula1	formula 2	4.23412	18.01313	.819	-35.9016	44.3699
	formula 3	-18.79040	18.01313	.321	-58.9262	21.3454
	formula 4	-19.94197	18.01313	.294	-60.0777	20.1938
	formula 5	39.43031	18.01313	.053	-.7054	79.5661
formula 2	formula1	-4.23412	18.01313	.819	-44.3699	35.9016
	formula 3	-23.02453	18.01313	.230	-63.1603	17.1112
	formula 4	-24.17610	18.01313	.209	-64.3118	15.9597
	formula 5	35.19619	18.01313	.079	-4.9396	75.3319
formula 3	formula1	18.79040	18.01313	.321	-21.3454	58.9262
	formula 2	23.02453	18.01313	.230	-17.1112	63.1603
	formula 4	-1.15157	18.01313	.950	-41.2873	38.9842
	formula 5	58.22071*	18.01313	.009	18.0850	98.3565
formula 4	formula1	19.94197	18.01313	.294	-20.1938	60.0777
	formula 2	24.17610	18.01313	.209	-15.9597	64.3118
	formula 3	1.15157	18.01313	.950	-38.9842	41.2873
	formula 5	59.37229*	18.01313	.008	19.2365	99.5080
formula 5	formula1	-39.43031	18.01313	.053	-79.5661	.7054
	formula 2	-35.19619	18.01313	.079	-75.3319	4.9396
	formula 3	-58.22071*	18.01313	.009	-98.3565	-18.0850
	formula 4	-59.37229*	18.01313	.008	-99.5080	-19.2365

*. The mean difference is significant at the 0.05 level.

Lampiran 19. Data uji daya lekat tablet.

Replikasi	daya lekat (menit)				
	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5
I	5,53	7,03	8,16	8,6	9,26
II	4,6	7,05	8	8,58	9,15
III	5,3	7,06	8,28	8,6	9,4
rata-rata	5,143333	7,046667	8,146667	8,593333	9,27
SD	0,48439	0,015275	0,140475	0,011547	0,1253

Lampiran 20. Hasil analisa SPSS daya lekat tablet

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
dayalekat	15	7.6567	1.48090	4.90	9.40

One-Sample Kolmogorov-Smirnov Test

		dayalekat
N		15
Normal Parameters ^{a, b}	Mean	7.6567
	Std. Deviation	1.48090
Most Extreme Differences	Absolute	.149
	Positive	.120
	Negative	-.149
Kolmogorov-Smirnov Z		.576
Asymp. Sig. (2-tailed)		.894

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Dayalekat

Levene Statistic	df1	df2	Sig.
1.274	4	10	.343

ANOVA

Dayalekat

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	30.132	4	7.533	131.878	.000
Within Groups	.571	10	.057		
Total	30.703	14			

Multiple Comparisons

Dayalekat

LSD

(I) formula	(J) formula	Mean	Std. Error	Sig.	95% Confidence Interval	
		Difference (I-J)			Lower Bound	Upper Bound
formula1	formula 2	-1.60333*	.19514	.000	-2.0381	-1.1685
	formula 3	-2.70333*	.19514	.000	-3.1381	-2.2685
	formula 4	-3.46667*	.19514	.000	-3.9015	-3.0319
	formula 5	-3.96000*	.19514	.000	-4.3948	-3.5252
formula 2	formula1	1.60333*	.19514	.000	1.1685	2.0381
	formula 3	-1.10000*	.19514	.000	-1.5348	-.6652
	formula 4	-1.86333*	.19514	.000	-2.2981	-1.4285
	formula 5	-2.35667*	.19514	.000	-2.7915	-1.9219
formula 3	formula1	2.70333*	.19514	.000	2.2685	3.1381
	formula 2	1.10000*	.19514	.000	.6652	1.5348
	formula 4	-.76333*	.19514	.003	-1.1981	-.3285
	formula 5	-1.25667*	.19514	.000	-1.6915	-.8219
formula 4	formula1	3.46667*	.19514	.000	3.0319	3.9015
	formula 2	1.86333*	.19514	.000	1.4285	2.2981
	formula 3	.76333*	.19514	.003	.3285	1.1981
	formula 5	-.49333*	.19514	.030	-.9281	-.0585
formula 5	formula1	3.96000*	.19514	.000	3.5252	4.3948
	formula 2	2.35667*	.19514	.000	1.9219	2.7915
	formula 3	1.25667*	.19514	.000	.8219	1.6915
	formula 4	.49333*	.19514	.030	.0585	.9281

*. The mean difference is significant at the 0.05 level.

