

BAB V

PENUTUP

A. Kesimpulan

Pertama, *xanthan gum*, komponen *effervescent*, dan kekerasan memberikan pengaruh terhadap *floating lag time* dan pelepasan obat. Faktor kekerasan berpengaruh dominan terhadap kemampuan mengapung tablet *floating* kaptopril. Peningkatan aras faktor *xanthan gum* dan kekerasan menurunkan jumlah pelepasan di awal dan kecepatan pelepasan obat, peningkatan asam sitrat dapat meningkatkan pelepasan obat di awal dan peningkatan natrium bikarbonat meningkatkan jumlah obat yang dilepaskan. Interaksi antara *xanthan gum* dan kekerasan menurunkan *floating lag time* dan meningkatkan kecepatan pelepasan obat, interaksi antara *xanthan gum* dan komponen *effervescent* meningkatkan *floating lag time* dan kecepatan pelepasan obat, interaksi antara komponen *effervescent* dengan kekerasan menurunkan *floating lag time*, pelepasan obat di awal, dan jumlah obat yang dilepaskan. Interaksi semua faktor memberikan pengaruh terhadap penurunan *floating lag time*.

Kedua, berdasarkan *superimposed contour plot* diperoleh formula tablet *floating* kaptopril yang optimum dengan kekerasan 7,00 – 9,80 kg, *xanthan gum* 58 – 100 mg, natrium bikarbonat 45 – 63 mg, dan asam sitrat 7 – 25 mg. Persamaan jumlah obat yang dilepaskan dan kecepatan pelepasan obat telah terverifikasi, sedangkan persamaan $\ln(\textit{floating lag time})$ tidak terverifikasi.

B. Saran

Pertama, perlu dilakukan studi pengaruh kekerasan terhadap *floating lag time* dengan penambahan aras tengah pada faktor kekerasan agar diperoleh suatu fungsi yang mencerminkan hasil *floating lag time*.

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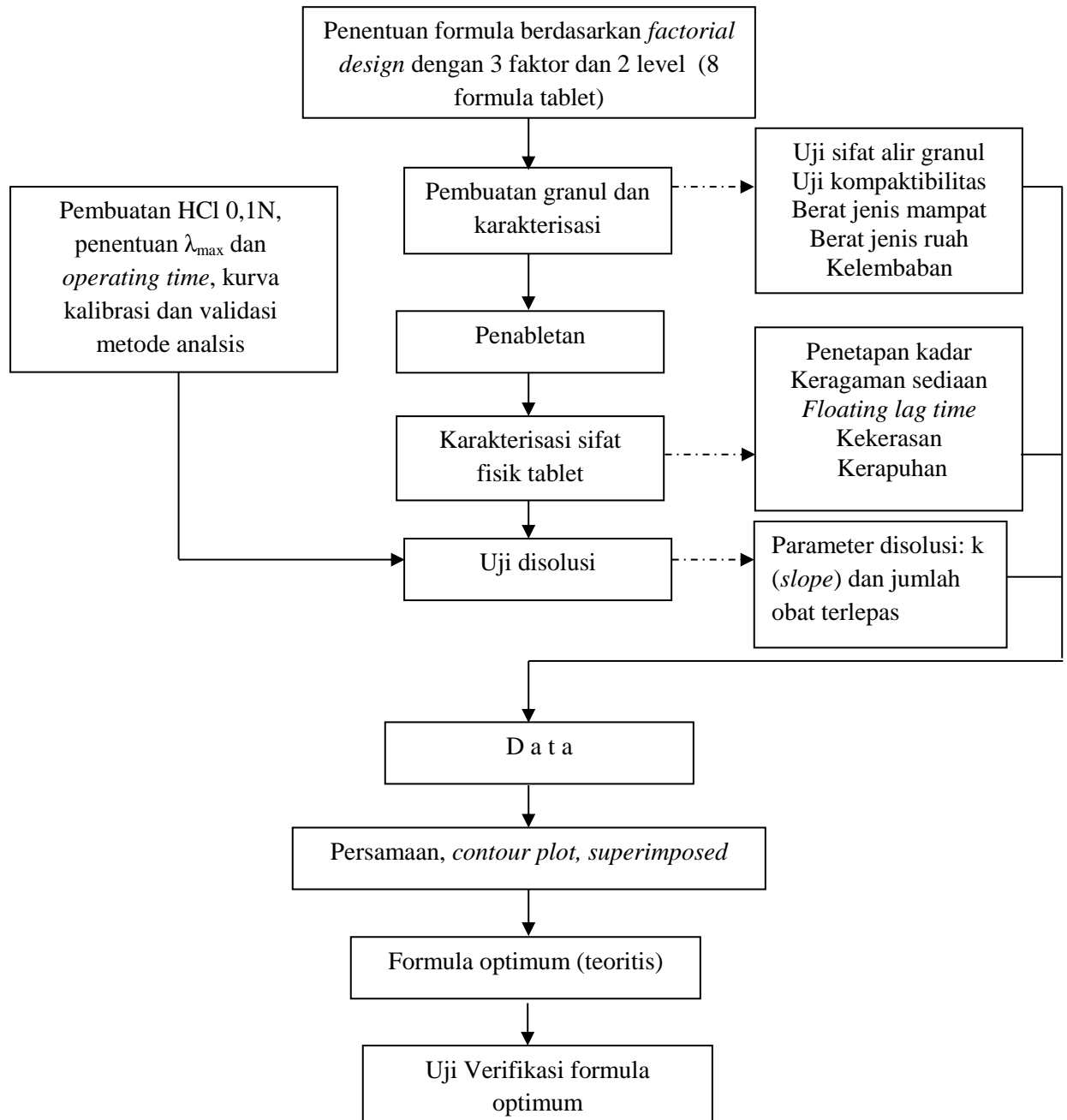
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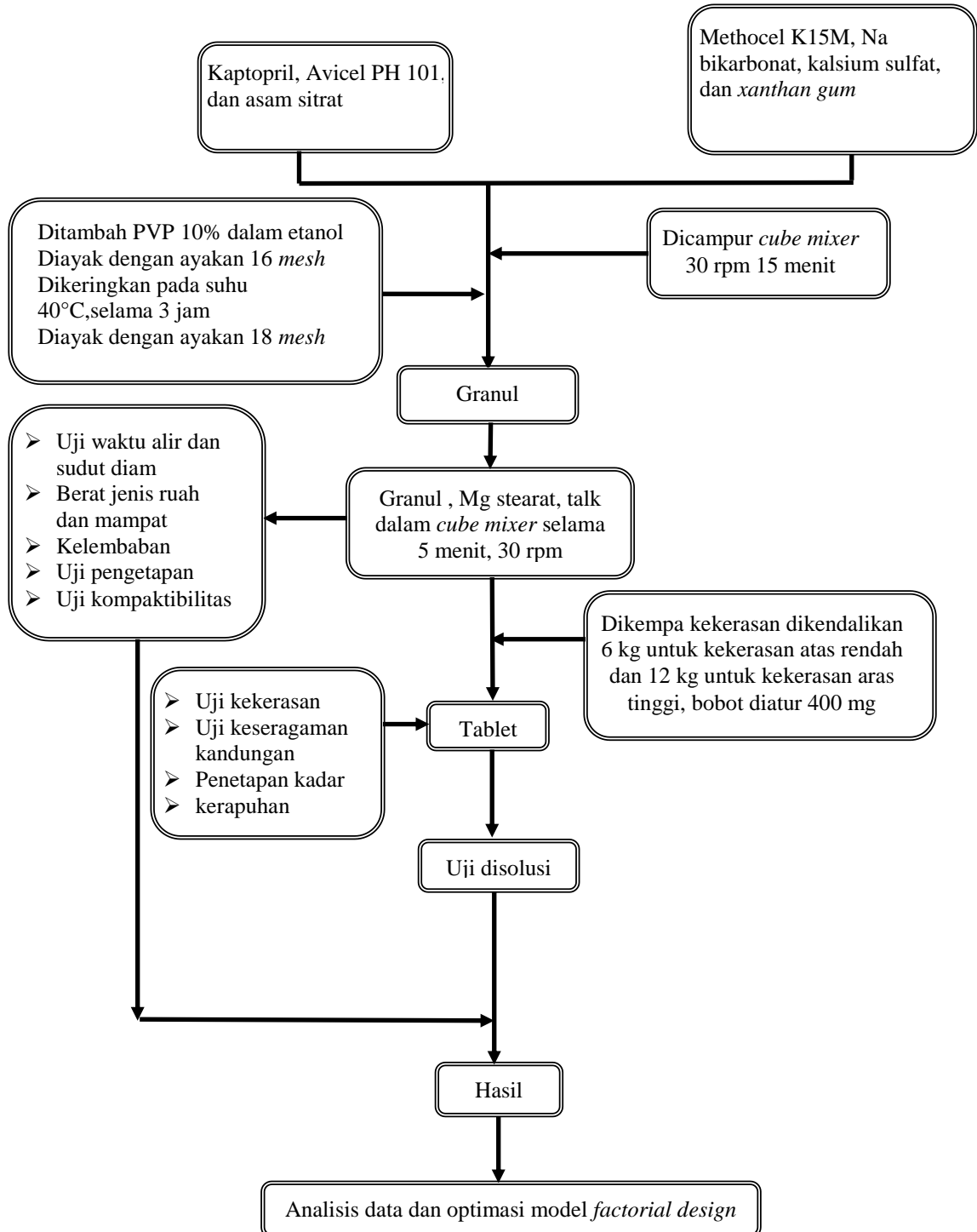
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Lampiran 1. Skema jalannya penelitian dan diagram alir pembuatan tablet *floating* kaptopril

a. Skema jalannya penelitian



b. Skema pembuatan tablet *floating* kaptopril



Lampiran 2. Pemeriksaan sifat fisik granul tablet *floating* kaptopril

a. Berat jenis

- Berat jenis ruah (g/ml)

Replikasi	Berat jenis ruah (g/ml)			
	F1	Fa	Fb	Fab
1	0,208	0,238	0,208	0,222
2	0,211	0,237	0,208	0,222
3	0,211	0,238	0,206	0,225
Rata-rata	0,210	0,238	0,208	0,223
SD	0,001	0,001	0,001	0,001

- Berat jenis mampat (g/ml)

Replikasi	Berat jenis mampat (g/ml)			
	F1	Fa	Fb	Fab
1	0,242	0,282	0,244	0,256
2	0,247	0,278	0,241	0,253
3	0,253	0,276	0,241	0,256
Rata-rata	0,248	0,278	0,242	0,255
SD	0,005	0,003	0,002	0,002

b. Kandungan lembab (%)

Replikasi	Kandungan lembab (%)			
	F1	Fa	Fb	Fab
1	5,10	5,40	4,10	5,00
2	4,60	4,60	4,20	4,80
3	4,60	5,10	4,70	4,60
Rata-rata	4,77	5,03	4,33	4,80
SD	0,29	0,40	0,32	0,20

c. Kecepatan alir (gram/detik)

Replikasi	Kecepatan alir (gram/detik)			
	F1	Fa	Fb	Fab
1	9,56	10,28	10,70	10,60
2	9,43	10,36	10,78	10,83
3	9,35	10,95	10,44	10,60
4	9,32	10,58	10,33	10,83
5	9,54	10,83	10,81	10,78
6	9,45	10,95	10,49	10,70
Rata-rata	9,44	10,66	10,59	10,72
SD	0,10	0,30	0,20	0,11

d. Sudut diam (°)

Replikasi	Sudut diam (°)			
	F1	Fa	Fb	Fab
1	30,96	33,03	29,78	30,91
2	31,93	30,75	29,64	30,95
3	30,35	30,41	28,83	30,31
4	30,42	29,83	29,82	30,89
5	34,46	29,86	29,49	29,77
6	34,96	28,97	30,28	31,91
Rata-rata	32,18	30,48	29,64	30,79
SD	2,05	1,39	0,48	0,72

e. Penetapan

• Indeks Carr's (%)

Replikasi	Indeks Carr's (%)			
	F1	Fa	Fb	Fab
1	14,06	15,48	14,58	13,33
2	14,74	14,79	13,54	12,22
3	16,84	13,69	14,43	12,36
Rata-rata	15,21	14,65	14,19	12,64
SD	1,45	0,90	0,56	0,61

• Hausner ratio

Replikasi	Hausner ratio			
	F1	Fa	Fb	Fab
1	1,164	1,183	1,171	1,154
2	1,173	1,174	1,157	1,139
3	1,203	1,159	1,169	1,141
Rata-rata	1,180	1,172	1,165	1,145
SD	0,020	0,012	0,008	0,008

f. Kompaktibilitas (kg)

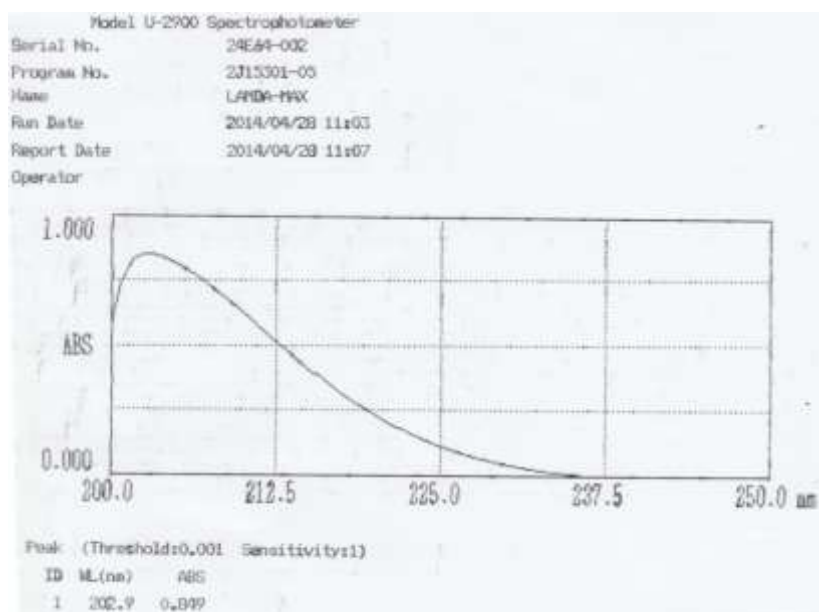
Kedalaman *punch* atas : 6,00 mmKedalaman *punch* bawah : 7,00 mm

Tebal tablet : 4,00 mm

Replikasi	Kompaktibilitas (kg)			
	F1	Fa	Fb	Fab
1	11,2	10,3	9,4	8
2	10,9	10,4	9,1	7,8
3	11,1	10,5	9,2	8,3
4	11,4	10,6	9,5	8,1
5	11,2	10,2	9,6	7,9
6	11,6	10,4	9,4	8,2
Rata-rata	11,23	10,40	9,37	8,05
SD	0,18	0,16	0,21	0,19

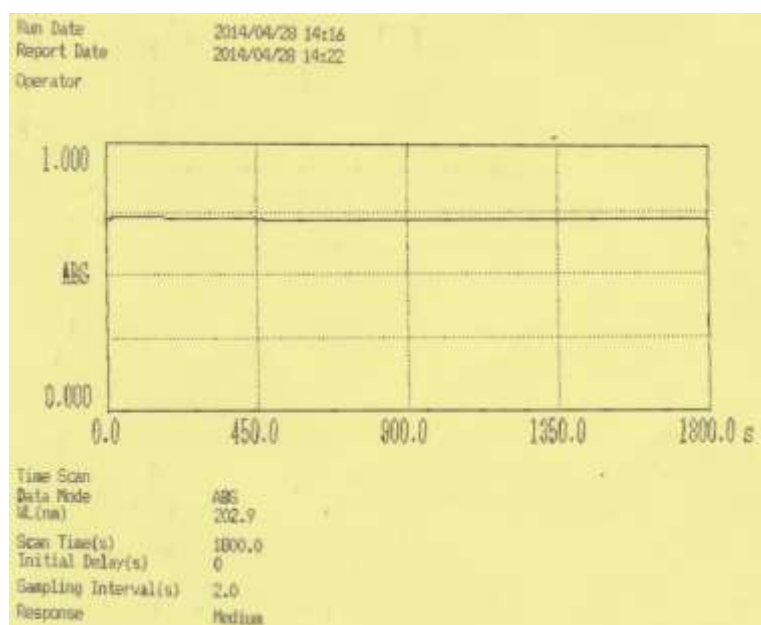
Lampiran 3. Pembuatan kurva kalibrasi dan validasi metode analisis

a. Penentuan panjang gelombang maksimum



Panjang gelombang maksimum yang diperoleh dari *scanning* larutan kaptopril 20 $\mu\text{g/ml}$ diperoleh panjang gelombang maksimum sebesar 202,9 nm dengan serapan 0,849.

b. Penentuan *operating time*



Data List (List Interval(s):60.0)

ID	TIME(s)	ABS	ID	TIME(s)	ABS	ID	TIME(s)	ABS
1	0.0	0.729	2	60.0	0.732	3	120.0	0.733
4	180.0	0.730	5	240.0	0.729	6	300.0	0.727
7	360.0	0.726	8	420.0	0.725	9	480.0	0.724
10	540.0	0.724	11	600.0	0.723	12	660.0	0.723
13	720.0	0.723	14	780.0	0.723	15	840.0	0.723
16	900.0	0.723	17	960.0	0.722	18	1020.0	0.722
19	1080.0	0.722	20	1140.0	0.722	21	1200.0	0.722
22	1260.0	0.722	23	1320.0	0.722	24	1380.0	0.722
25	1440.0	0.722	26	1500.0	0.723	27	1560.0	0.722
28	1620.0	0.722	29	1680.0	0.722	30	1740.0	0.722
31	1800.0	0.722						

Scanning operating time menunjukkan bahwa larutan kaptopril stabil ditunjukkan dengan serapan yang stabil

c. Kurva kalibrasi

Konsentrasi ($\mu\text{g/ml}$)	Serapan		
	Pembacaan 1	Pembacaan 2	Rata-rata
2	0,106	0,103	0,105
4	0,195	0,197	0,196
8	0,370	0,378	0,374
12	0,546	0,543	0,545
16	0,727	0,725	0,726
20	0,892	0,899	0,896

Persamaan regresi linear antara konsentrasi ($\mu\text{g/ml}$) dan serapan diperoleh nilai :

$$a = 0,0193$$

$$b = 0,0439$$

$$r = 0,9999$$

$$y = 0,0439x + 0,0193$$

keterangan:

x = konsentrasi ($\mu\text{g/ml}$)

y = serapan

d. Penentuan LOQ dan LOQ

Konsentrasi ($\mu\text{g/ml}$)	Serapan (y)	\hat{y}	$y - \hat{y}$	$ y - \hat{y} ^2$
2	0,1045	0,1071	-0,0026	0,000007
4	0,1960	0,1949	0,0011	0,000001
8	0,3740	0,3705	0,0035	0,000012
12	0,5445	0,5461	-0,0016	0,000003
16	0,7260	0,7217	0,0043	0,000018
20	0,8955	0,8973	-0,0018	0,000003
Jumlah total ($\sum y - \hat{y} ^2$)				0,00004451

Nilai \hat{y} diperoleh dari substitusi konsentrasi dalam persamaan $\hat{y} = 0,0439x + 0,0193$

dengan x adalah konsentrasi ($\mu\text{g/ml}$) dan y adalah serapan (\hat{y})

$$S_{x/y} = \sqrt{\frac{\sum |y - \hat{y}|^2}{N-2}}$$

$S_{x/y}$ = simpangan baku residual,

N = jumlah data

$\sum |y - \hat{y}|^2$ = jumlah kuadrat total residual

$$S_{x/y} = \sqrt{\frac{0,00004451}{6-2}} = 0,003358$$

$$\text{LOD} = 3,3 \times \frac{S_{x/y}}{b}$$

$$\text{LOD} = 3,3 \times \frac{0,003358}{0,0439}$$

$$\text{LOD} = 0,2524 \mu\text{g/ml}$$

$$y = (0,2524 \times 0,0439) + 0,0193$$

$$\text{Serapan LOD} = 0,030$$

$$\text{LOD} = 10 \times \frac{S_{x/y}}{b}$$

$$\text{LOQ} = 10 \times \frac{0,003358}{0,0439}$$

$$\text{LOQ} = 0,7649 \mu\text{g/ml}$$

$$y = (0,7649 \times 0,0439) + 0,0193$$

$$\text{Serapan LOQ} = 0,053$$

e. Penentuan perolehan kembali (*recovery*)

Penambahan (mg)	Serapan				Kadar ($\mu\text{g/ml}$)	Jumlah terukur (mg)	<i>Recovery</i> (%)
	Rep 1	Rep 2	Rep 3	Rata-rata			
40	0,581	0,579	0,580	0,580	12,772	39,913	99,78
	0,579	0,580	0,579	0,579	12,757	39,866	99,66
	0,574	0,573	0,573	0,573	12,620	39,439	98,60
50	0,716	0,717	0,717	0,717	15,883	49,634	99,27
	0,718	0,716	0,716	0,717	15,888	49,650	99,30
	0,713	0,716	0,714	0,714	15,835	49,484	98,97
60	0,868	0,866	0,868	0,867	19,317	60,367	100,61
	0,864	0,866	0,868	0,866	19,287	60,272	100,45
	0,870	0,871	0,872	0,871	19,401	60,628	101,05
Rata-rata (%)							99,74
Simpangan baku (SD)							0,81
Simpangan baku relatif (RSD) (%)							0,82

Keterangan :

Kadar = (rata-rata serapan - 0,0193)/0,0439

$$\begin{aligned} \text{Jumlah terukur} &= \frac{\text{kadar}}{1000} \times \text{volume pembuatan} \times \text{faktor pengenceran} \\ &= \frac{\text{kadar}}{1000} \times 50 \text{ ml} \times \frac{25}{0,4} \end{aligned}$$

$$\% \text{ recovery} = \frac{\text{kadar terukur}}{\text{penambahan}} \times 100\%$$

Lampiran 4. Pemeriksaan sifat fisik tablet

a. Kekerasan tablet

Replikasi	Kekerasan tablet (kg)							
	F1	Fa	Fb	Fab	Fc	Fac	Fbc	Fabc
1	6,30	6,05	6,10	6,30	11,60	12,20	12,40	11,80
2	6,10	6,10	5,90	6,20	12,10	11,90	11,80	11,70
3	6,05	6,20	6,20	6,00	11,80	11,60	12,00	11,85
4	6,00	5,90	6,15	6,10	11,85	11,80	11,90	11,65
5	6,00	6,00	5,95	6,05	11,60	12,00	11,60	11,90
6	6,20	5,90	6,00	6,10	11,80	12,10	11,90	12,10
Rata-rata	6,11	6,03	6,05	6,13	11,79	11,93	11,93	11,83
SD	0,12	0,11	0,13	0,12	0,21	0,22	0,30	0,10

b. Tebal dan diameter tablet

Replikasi	Tebal tablet (mm)							
	F1	Fa	Fb	Fab	Fc	Fac	Fbc	Fabc
1	4,64	4,38	4,64	4,34	4,10	4,14	3,96	4,12
2	4,66	4,36	4,66	4,36	4,16	4,10	4,00	4,22
3	4,68	4,36	4,70	4,34	4,18	4,16	3,98	4,16
4	4,62	4,38	4,68	4,30	4,16	4,18	4,00	4,22
5	4,58	4,34	4,68	4,32	4,20	4,12	4,02	4,24
6	4,60	4,36	4,62	4,36	4,14	4,16	3,98	4,18
7	4,56	4,38	4,68	4,40	4,18	4,18	4,02	4,18
8	4,62	4,32	4,70	4,34	4,20	4,18	3,98	4,2
9	4,64	4,36	4,68	4,38	4,20	4,20	4,02	4,16
10	4,58	4,38	4,70	4,38	4,12	4,16	4,00	4,2
Rata-rata	4,62	4,36	4,66	4,34	4,16	4,16	4,00	4,19
SD	0,04	0,02	0,02	0,02	0,04	0,03	0,02	0,04

Diameter tablet : 10,20 mm

c. Floating lag time

Replikasi	Floating lag time (detik)							
	F1	Fa	Fb	Fab	Fc	Fac	Fbc	Fabc
1	19	24	9	23	4847	3681	1965	1171
2	18	23	11	26	4726	3720	1989	1198
3	19	21	12	28	4989	3554	1901	1119
4	20	23	9	29	4935	3516	1871	966
5	22	26	10	30	4772	3543	1943	1108
6	19	32	10,5	33	5017	3711	1814	1051
Rata-rata	19,50	24,83	10,25	28,17	4881	3620,83	1913,83	1102,17
SD	1,38	3,87	1,17	3,43	118,44	92,84	64,94	84,14

d. Kerapuhan (%)

Replikasi	Kerapuhan (%)							
	F1	Fa	Fb	Fab	Fc	Fac	Fbc	Fabc
1	0,10	0,12	0,10	0,05	0,00	0,00	0,00	0,00
2	0,07	0,02	0,10	0,07	0,02	0,00	0,00	0,00
3	0,10	0,05	0,07	0,05	0,00	0,00	0,00	0,00
Rata-rata	0,09	0,07	0,09	0,06	0,01	0,00	0,00	0,00
SD	0,01	0,05	0,01	0,01	0,01	0,00	0,00	0,00

e. Penetapan kadar

Formula 1 (F1)

Replikasi	Serapan	Kadar ($\mu\text{g/ml}$)	Faktor pengenceran	Terukur (mg)
1	0,693	15,35	62,5	47,96
2	0,706	15,64	62,5	48,88
3	0,699	15,48	62,5	48,38
4	0,712	15,78	62,5	49,31
5	0,723	16,03	62,5	50,09
6	0,700	15,51	62,5	48,46
Rata-rata				48,85
Simpangan baku (SD)				0,77

Formula a (Fa)

Replikasi	Serapan	Kadar ($\mu\text{g/ml}$)	Faktor pengenceran	Terukur (mg)
1	0,721	15,98	62,5	49,95
2	0,701	15,53	62,5	48,53
3	0,723	16,03	62,5	50,09
4	0,702	15,55	62,5	48,60
5	0,711	15,76	62,5	49,24
6	0,728	16,14	62,5	50,45
Rata-rata				49,48
Simpangan baku (SD)				0,81

Formula b (Fb)

Replikasi	Serapan	Kadar ($\mu\text{g/ml}$)	Faktor pengenceran	Terukur (mg)
1	0,691	15,30	62,5	47,81
2	0,697	15,44	62,5	48,24
3	0,699	15,48	62,5	48,38
4	0,678	15,00	62,5	46,89
5	0,686	15,19	62,5	47,46
6	0,685	15,16	62,5	47,39
Rata-rata				47,70
Simpangan baku (SD)				0,56

Formula ab (Fab)

Replikasi	Serapan	Kadar ($\mu\text{g/ml}$)	Faktor pengenceran	Terukur (mg)
1	0,738	16,37	62,5	51,16
2	0,734	16,28	62,5	50,88
3	0,728	16,14	62,5	50,45
4	0,726	16,10	62,5	50,31
5	0,731	16,21	62,5	50,66
6	0,736	16,33	62,5	51,02
Rata-rata				50,75
Simpangan baku (SD)				0,33

Formula c (Fc)

Replikasi	Serapan	Kadar ($\mu\text{g/ml}$)	Faktor pengenceran	Terukur (mg)
1	0,729	16,17	62,5	50,52
2	0,724	16,05	62,5	50,16
3	0,713	15,80	62,5	49,38
4	0,709	15,71	62,5	49,10
5	0,701	15,53	62,5	48,53
6	0,697	15,44	62,5	48,24
Rata-rata				49,32
Simpangan baku (SD)				0,89

Formula ac (Fac)

Replikasi	Serapan	Kadar ($\mu\text{g/ml}$)	Faktor pengenceran	Terukur (mg)
1	0,71	15,73	62,5	49,17
2	0,709	15,71	62,5	49,10
3	0,716	15,87	62,5	49,59
4	0,698	15,46	62,5	48,31
5	0,722	16,01	62,5	50,02
6	0,721	15,98	62,5	49,95
Rata-rata				49,36
Simpangan baku (SD)				0,64

Formula bc (Fbc)

Replikasi	Serapan	Kadar ($\mu\text{g/ml}$)	Faktor pengenceran	Terukur (mg)
1	0,689	15,26	62,5	47,67
2	0,708	15,69	62,5	49,02
3	0,697	15,44	62,5	48,24
4	0,691	15,30	62,5	47,81
5	0,681	15,07	62,5	47,10
6	0,688	15,23	62,5	47,60
Rata-rata				47,91
Simpangan baku (SD)				0,66

Formula abc (Fabc)

Replikasi	Serapan	Kadar ($\mu\text{g/ml}$)	Faktor pengenceran	Terukur (mg)
1	0,738	16,37	62,5	51,16
2	0,732	16,23	62,5	50,73
3	0,716	15,87	62,5	49,59
4	0,734	16,28	62,5	50,88
5	0,729	16,17	62,5	50,52
6	0,738	16,37	62,5	51,16
Rata-rata				50,67
Simpangan baku (SD)				0,58

Keterangan :

Kadar = (rata-rata serapan - 0,0193)/0,0439

$$\begin{aligned} \text{Jumlah terukur} &= \frac{\text{kadar}}{1000} \times \text{volume pembuatan} \times \text{faktor pengenceran} \\ &= \frac{\text{kadar}}{1000} \times 50 \text{ ml} \times \frac{25}{0,4} \end{aligned}$$

f. Keseragaman sediaan

1) Keragaman bobot

Replikasi	Berat (mg)							
	F1	Fa	Fb	Fab	Fc	Fac	Fbc	Fabc
1	411	411	403	401	404	409	404	407
2	411	409	406	410	408	405	409	406
3	409	413	407	405	403	411	402	403
4	407	408	408	409	409	405	405	406
5	409	405	414	411	402	408	409	407
6	408	400	399	409	410	406	407	404
7	408	408	412	412	408	405	411	407
8	397	411	410	408	401	410	405	412
9	408	407	403	400	407	406	409	411
10	407	413	415	412	403	405	408	411
11	400	408	401	409	401	406	411	412
12	400	409	402	403	406	410	407	407
13	407	403	411	404	401	407	403	405
14	409	411	413	411	408	407	409	412
15	404	408	408	415	405	408	407	405
16	406	413	409	411	402	403	405	410
17	411	412	407	409	406	403	407	408
18	412	405	412	415	409	406	409	406
19	410	403	411	405	408	408	406	408
20	413	408	413	408	403	422	403	410
Rata-rata	407,35	408,25	408,20	408,35	405,20	407,50	406,80	407,85
SD	4,22	3,64	4,65	4,20	3,05	4,06	2,63	2,80
RSD	1,04	0,89	1,14	1,03	0,75	1,00	0,65	0,69

2) Keseragaman kandungan

Formula 1 (F1)

Tablet	Serapan	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Bobot (mg)	Kandungan (mg)	Kandungan (%)
1	0,656	14,50	24,17	400	48,34	98,97
2	0,648	14,32	23,87	404	48,21	98,70
3	0,639	14,12	23,53	414	48,70	99,69
4	0,643	14,21	23,68	409	48,42	99,13
5	0,636	14,05	23,41	407	47,65	97,53
6	0,731	16,21	27,02	399	53,90	110,35
7	0,653	14,44	24,06	406	48,84	99,98
8	0,668	14,78	24,63	404	49,75	101,84
9	0,735	16,30	27,17	395	53,66	109,85
10	0,638	14,09	23,49	412	48,39	99,05
	Rata-rata			405	49,59	101,51
	SD			5,91	2,28	4,66
	RSD			1,46	4,59	4,59

Formula a (Fa)

Tablet	Serapan	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Bobot (mg)	Kandungan (mg)	Kandungan (%)
1	0,698	15,46	25,77	407	52,44	105,97
2	0,677	14,98	24,97	411	51,31	103,70
3	0,699	15,48	25,80	403	52,00	105,09
4	0,645	14,25	23,75	408	48,46	97,94
5	0,686	15,19	25,31	407	51,51	104,10
6	0,681	15,07	25,12	405	50,87	102,81
7	0,660	14,59	24,32	401	48,77	98,57
8	0,689	15,26	25,43	401	50,98	103,03
9	0,675	14,94	24,89	405	50,41	101,88
10	0,701	15,53	25,88	399	51,63	104,35
	Rata-rata			404,7	50,84	102,74
	SD			3,71	1,31	2,64
	RSD			0,92	2,57	2,57

Formula b (Fb)

Tablet	Serapan	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Bobot (mg)	Kandungan (mg)	Kandungan (%)
1	0,660	14,59	24,32	402	48,89	102,50
2	0,681	15,07	25,12	399	50,12	105,07
3	0,698	15,46	25,77	398	51,28	107,50
4	0,670	14,82	24,70	402	49,65	104,10
5	0,707	15,67	26,11	408	53,26	111,66
6	0,703	15,57	25,96	399	51,78	108,56
7	0,681	15,07	25,12	406	51,00	106,91
8	0,693	15,35	25,58	404	51,67	108,31
9	0,690	15,28	25,46	400	50,93	106,76
10	0,657	14,53	24,21	409	49,51	103,79
Rata-rata				402,7	50,81	106,52
SD				3,92	1,30	2,72
RSD				0,97	2,55	2,55

Formula ab (Fab)

Tablet	Serapan	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Bobot (mg)	Kandungan (mg)	Kandungan (%)
1	0,681	15,07	25,12	410	51,50	101,48
2	0,653	14,44	24,06	409	49,20	96,94
3	0,644	14,23	23,72	412	48,86	96,27
4	0,637	14,07	23,45	408	47,84	94,27
5	0,629	13,89	23,15	401	46,41	91,45
6	0,624	13,77	22,96	407	46,72	92,06
7	0,648	14,32	23,87	405	48,33	95,24
8	0,623	13,75	22,92	414	47,44	93,48
9	0,656	14,50	24,17	408	49,31	97,17
10	0,620	13,68	22,81	409	46,64	91,90
Rata-rata				408,3	48,23	95,02
SD				3,59	1,57	3,09
RSD				0,88	3,25	3,25

Formula c (Fc)

Tablet	Serapan	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Bobot (mg)	Kandungan (mg)	Kandungan (%)
1	0,667	14,75	24,59	403	49,55	100,46
2	0,654	14,46	24,10	407	49,04	99,42
3	0,651	14,39	23,98	409	49,04	99,44
4	0,669	14,80	24,67	410	50,57	102,52
5	0,638	14,09	23,49	402	47,21	95,73
6	0,668	14,78	24,63	405	49,87	101,12
7	0,676	14,96	24,93	403	50,24	101,86
8	0,651	14,39	23,98	404	48,44	98,23
9	0,721	15,98	26,64	395	52,61	106,68
10	0,737	16,35	27,25	394	53,68	108,84
Rata-rata				403,2	50,03	101,43
SD				5,29	1,91	3,88
RSD				1,31	3,83	3,83

Formula ac (Fac)

Tablet	Serapan	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Bobot (mg)	Kandungan (mg)	Kandungan (%)
1	0,705	15,62	26,03	403	52,46	106,27
2	0,672	14,87	24,78	406	50,30	101,91
3	0,682	15,10	25,16	407	51,20	103,73
4	0,644	14,23	23,72	411	48,74	98,74
5	0,682	15,10	25,16	405	50,95	103,22
6	0,680	15,05	25,08	406	50,92	103,16
7	0,672	14,87	24,78	406	50,30	101,91
8	0,643	14,21	23,68	412	48,78	98,82
9	0,686	15,19	25,31	395	49,99	101,28
10	0,708	15,69	26,15	400	52,29	105,94
Rata-rata				405,1	50,59	102,50
SD				4,95	1,26	2,55
RSD				1,22	2,49	2,49

Formula bc (Fbc)

Tablet	Serapan	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Bobot (mg)	Kandungan (mg)	Kandungan (%)
1	0,655	14,48	24,13	404	48,75	101,76
2	0,683	15,12	25,20	400	50,39	105,19
3	0,706	15,64	26,07	403	52,53	109,65
4	0,669	14,80	24,67	402	49,58	103,48
5	0,698	15,46	25,77	399	51,40	107,29
6	0,673	14,89	24,82	405	50,26	104,90
7	0,699	15,48	25,80	400	51,61	107,72
8	0,683	15,12	25,20	404	50,90	106,24
9	0,684	15,14	25,24	402	50,72	105,87
10	0,651	14,39	23,98	408	48,92	102,12
Rata-rata				402,7	50,51	105,42
SD				2,71	1,19	2,49
RSD				0,67	2,37	2,37

Formula abc (Fabc)

Tablet	Serapan	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Bobot (mg)	Kandungan (mg)	Kandungan (%)
1	0,657	14,53	24,21	407	49,27	97,23
2	0,626	13,82	23,03	406	46,76	92,28
3	0,653	14,44	24,06	411	49,44	97,57
4	0,641	14,16	23,60	412	48,62	95,96
5	0,635	14,03	23,38	407	47,57	93,88
6	0,651	14,39	23,98	408	48,92	96,55
7	0,668	14,78	24,63	406	49,99	98,67
8	0,635	14,03	23,38	410	47,92	94,57
9	0,632	13,96	23,26	405	47,10	92,96
10	0,636	14,05	23,41	404	47,29	93,34
Rata-rata				407,6	48,29	95,30
SD				2,63	1,11	2,19
RSD				0,65	2,30	2,30

Keterangan :

$$\text{Kadar} = \frac{(\text{serapan} - 0,0193)}{0,0439}, \text{ Jumlah} = \text{kadar} / 1000 \times 10 / 0,3 \times 50 \text{ ml}$$

$$\text{Kandungan kaptopril dalam tablet} = \frac{(\text{bobot tablet})}{(\text{bobot sampel})} \times \text{jumlah, bobot sampel} = 200 \text{ mg}$$

$$\% \text{ Kandungan kaptopril dalam tablet} = \left(\frac{\text{kandungan}}{\text{hasil penetapan kadar}} \right) \times 100\%$$

Lampiran 5. Uji disolusi

Formula 1 (F1)

Replikasi 1

Bobot tablet = 403 mg (mengandung kaptopril 49,22 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel (µg/ml)	Kadar (µg/ml)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,164	1	3,296	3,296	2,967	0,00	0,00	2,97	6,03
15	0,379	1	8,194	8,194	7,374	0,03	0,03	7,41	15,05
30	0,568	1	12,499	12,499	11,249	0,08	0,11	11,36	23,09
60	0,392	2	8,490	16,979	15,282	0,12	0,24	15,52	31,53
90	0,473	2	10,335	20,670	18,603	0,17	0,41	19,01	38,63
120	0,612	2	13,501	27,002	24,302	0,21	0,62	24,92	50,63
180	0,516	3	11,314	33,943	30,549	0,27	0,89	31,44	63,87
240	0,556	3	12,226	36,677	33,009	0,34	1,23	34,23	69,55
300	0,610	3	13,456	40,367	36,330	0,37	1,59	37,92	77,05
360	0,659	3	14,572	43,715	39,344	0,40	2,00	41,34	83,99

Kecepatan pelepasan = 0,1035 mg/menit

Koefisien korelasi = 0,968

Replikasi 2

Bobot tablet = 404 mg (mengandung kaptopril 49,34 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel (µg/ml)	Kadar (µg/ml)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,159	1	3,182	3,182	2,864	0,00	0,00	2,86	5,80
15	0,371	1	8,011	8,011	7,210	0,03	0,03	7,24	14,68
30	0,520	1	11,405	11,405	10,265	0,08	0,11	10,38	21,03
60	0,364	2	7,852	15,704	14,133	0,11	0,23	14,36	29,10
90	0,489	2	10,699	21,399	19,259	0,16	0,38	19,64	39,81
120	0,594	2	13,091	26,182	23,564	0,21	0,60	24,16	48,97
180	0,498	3	10,904	32,713	29,442	0,26	0,86	30,30	61,41
240	0,561	3	12,339	37,018	33,316	0,33	1,19	34,50	69,93
300	0,601	3	13,251	39,752	35,777	0,37	1,56	37,33	75,66
360	0,657	3	14,526	43,579	39,221	0,40	1,95	41,17	83,45

Kecepatan pelepasan = 0,1040 mg/menit

Koefisien korelasi = 0,971

Replikasi 3

Bobot tablet = 405 mg (mengandung kaptopril 49,46 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,161	1	3,228	3,228	2,905	0,00	0,00	2,91	5,87
15	0,385	1	8,330	8,330	7,497	0,03	0,03	7,53	15,22
30	0,550	1	12,089	12,089	10,880	0,08	0,12	11,00	22,23
60	0,399	2	8,649	17,298	15,569	0,12	0,24	15,81	31,96
90	0,499	2	10,927	21,854	19,669	0,17	0,41	20,08	40,59
120	0,623	2	13,752	27,503	24,753	0,22	0,63	25,38	51,32
180	0,509	3	11,155	33,465	30,118	0,28	0,90	31,02	62,72
240	0,568	3	12,499	37,497	33,747	0,33	1,24	34,98	70,73
300	0,613	3	13,524	40,572	36,515	0,37	1,61	38,13	77,09
360	0,668	3	14,777	44,330	39,897	0,41	2,02	41,92	84,75

Kecepatan pelepasan = 0,1047 mg/menit

Koefisien korelasi = 0,968

Formula a (Fa)

Replikasi 1

Bobot tablet = 404 mg (mengandung kaptopril 49,97 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,165	1	3,319	3,319	2,987	0,00	0,00	2,99	5,98
15	0,348	1	7,487	7,487	6,739	0,03	0,03	6,77	13,55
30	0,483	1	10,563	10,563	9,506	0,07	0,11	9,61	19,24
60	0,340	2	7,305	14,610	13,149	0,11	0,21	13,36	26,74
90	0,390	2	8,444	16,888	15,200	0,15	0,36	15,56	31,14
120	0,481	2	10,517	21,034	18,931	0,17	0,53	19,46	38,94
180	0,416	3	9,036	27,109	24,398	0,21	0,74	25,14	50,31
240	0,468	3	10,221	30,663	27,597	0,27	1,01	28,61	57,25
300	0,530	3	11,633	34,900	31,410	0,31	1,32	32,73	65,49
360	0,560	3	12,317	36,950	33,255	0,35	1,67	34,92	69,88

Kecepatan pelepasan = 0,0870 mg/menit

Koefisien korelasi = 0,979

Replikasi 2

Bobot tablet = 405 mg (mengandung kaptopril 50,10 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,113	1	2,134	2,134	1,921	0,00	0,00	1,92	3,83
15	0,336	1	7,214	7,214	6,493	0,02	0,02	6,51	13,00
30	0,518	1	11,360	11,360	10,224	0,07	0,09	10,32	20,59
60	0,342	2	7,351	14,702	13,231	0,11	0,21	13,44	26,82
90	0,410	2	8,900	17,800	16,020	0,15	0,35	16,37	32,68
120	0,493	2	10,790	21,581	19,423	0,18	0,53	19,95	39,83
180	0,415	3	9,014	27,041	24,337	0,22	0,75	25,08	50,07
240	0,477	3	10,426	31,278	28,150	0,27	1,02	29,17	58,22
300	0,520	3	11,405	34,216	30,795	0,31	1,33	32,13	64,12
360	0,548	3	12,043	36,130	32,517	0,34	1,67	34,19	68,24

Kecepatan pelepasan = 0,0856 mg/menit

Koefisien korelasi = 0,968

Replikasi 3

Bobot tablet = 403 mg (mengandung kaptopril 49,85 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,117	1	2,226	2,226	2,003	0,00	0,00	2,00	4,02
15	0,286	1	6,075	6,075	5,468	0,02	0,02	5,49	11,01
30	0,402	1	8,718	8,718	7,846	0,06	0,08	7,93	15,91
60	0,301	2	6,417	12,834	11,550	0,09	0,17	11,72	23,51
90	0,398	2	8,626	17,253	15,528	0,13	0,30	15,83	31,75
120	0,501	2	10,973	21,945	19,751	0,17	0,47	20,22	40,57
180	0,415	3	9,014	27,041	24,337	0,22	0,69	25,03	50,21
240	0,467	3	10,198	30,595	27,535	0,27	0,96	28,50	57,16
300	0,496	3	10,859	32,576	29,319	0,31	1,27	30,59	61,36
360	0,544	3	11,952	35,856	32,271	0,33	1,59	33,86	67,93

Kecepatan pelepasan = 0,0871 mg/menit

Koefisien korelasi = 0,969

Formula b (Fb)

Replikasi 1

Bobot tablet = 403 mg (mengandung kaptopril 48,06 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,223	1	4,640	4,640	4,176	0,00	0,00	4,18	8,69
15	0,451	1	9,834	9,834	8,850	0,05	0,05	8,90	18,51
30	0,542	1	11,907	11,907	10,716	0,10	0,14	10,86	22,60
60	0,435	2	9,469	18,938	17,045	0,12	0,26	17,31	36,01
90	0,566	2	12,453	24,907	22,416	0,19	0,45	22,87	47,58
120	0,678	2	15,005	30,009	27,008	0,25	0,70	27,71	57,66
180	0,538	3	11,815	35,446	31,902	0,30	1,00	32,90	68,46
240	0,598	3	13,182	39,547	35,592	0,35	1,36	36,95	76,88
300	0,657	3	14,526	43,579	39,221	0,40	1,75	40,97	85,25
360	0,715	3	15,847	47,542	42,788	0,44	2,19	44,98	93,58

Kecepatan pelepasan = 0,1101 mg/menit

Koefisien korelasi = 0,968

Replikasi 2

Bobot tablet = 405 mg (mengandung kaptopril 48,30 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,246	1	5,164	5,164	4,648	0,00	0,00	4,65	9,62
15	0,413	1	8,968	8,968	8,071	0,05	0,05	8,12	16,82
30	0,576	1	12,681	12,681	11,413	0,09	0,14	11,55	23,92
60	0,389	2	8,421	16,843	15,159	0,13	0,27	15,43	31,94
90	0,512	2	11,223	22,446	20,202	0,17	0,44	20,64	42,73
120	0,602	2	13,273	26,547	23,892	0,22	0,66	24,55	50,83
180	0,489	3	10,699	32,098	28,888	0,27	0,93	29,81	61,73
240	0,561	3	12,339	37,018	33,316	0,32	1,25	34,56	71,56
300	0,654	3	14,458	43,374	39,036	0,37	1,62	40,65	84,17
360	0,703	3	15,574	46,722	42,050	0,43	2,05	44,10	91,31

Kecepatan pelepasan = 0,1078 mg/menit

Koefisien korelasi = 0,984

Replikasi 3

Bobot tablet = 404 mg (mengandung kaptopril 48,18 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,254	1	5,346	5,346	4,812	0,00	0,00	4,81	9,99
15	0,431	1	9,378	9,378	8,440	0,05	0,05	8,49	17,63
30	0,559	1	12,294	12,294	11,064	0,09	0,15	11,21	23,27
60	0,428	2	9,310	18,620	16,758	0,12	0,27	17,03	35,34
90	0,554	2	12,180	24,360	21,924	0,19	0,46	22,38	46,45
120	0,634	2	14,002	28,005	25,204	0,24	0,70	25,90	53,77
180	0,521	3	11,428	34,285	30,856	0,28	0,98	31,84	66,08
240	0,628	3	13,866	41,597	37,437	0,34	1,32	38,76	80,45
300	0,674	3	14,913	44,740	40,266	0,42	1,74	42,01	87,18
360	0,712	3	15,779	47,337	42,603	0,45	2,19	44,79	92,96

Kecepatan pelepasan = 0,1120 mg/menit

Koefisien korelasi = 0,976

Formula ab (Fab)

Replikasi 1

Bobot tablet = 406 mg (mengandung kaptopril 51,51 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,157	1	3,137	3,137	2,823	0,00	0,00	2,82	5,59
15	0,339	1	7,282	7,282	6,554	0,03	0,03	6,59	13,04
30	0,401	1	8,695	8,695	7,825	0,07	0,10	7,93	15,70
60	0,337	2	7,237	14,474	13,026	0,09	0,19	13,22	26,17
90	0,438	2	9,538	19,075	17,168	0,14	0,34	17,50	34,65
120	0,546	2	11,998	23,995	21,596	0,19	0,53	22,12	43,80
180	0,447	3	9,743	29,228	26,305	0,24	0,77	27,07	53,60
240	0,499	3	10,927	32,781	29,503	0,29	1,06	30,56	60,51
300	0,539	3	11,838	35,515	31,963	0,33	1,39	33,35	66,03
360	0,614	3	13,547	40,640	36,576	0,36	1,74	38,32	75,86

Kecepatan pelepasan = 0,0955 mg/menit

Koefisien korelasi = 0,975

Replikasi 2

Bobot tablet = 405 mg (mengandung kaptopril 51,38 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,230	1	4,800	4,800	4,320	0,00	0,00	4,32	8,57
15	0,313	1	6,690	6,690	6,021	0,05	0,05	6,07	12,05
30	0,394	1	8,535	8,535	7,682	0,07	0,11	7,80	15,48
60	0,342	2	7,351	14,702	13,231	0,09	0,20	13,43	26,66
90	0,466	2	10,175	20,351	18,316	0,15	0,35	18,66	37,04
120	0,545	2	11,975	23,950	21,555	0,20	0,55	22,11	43,88
180	0,422	3	9,173	27,519	24,767	0,24	0,79	25,56	50,73
240	0,481	3	10,517	31,551	28,396	0,28	1,07	29,46	58,48
300	0,553	3	12,157	36,472	32,824	0,32	1,38	34,21	67,89
360	0,612	3	13,501	40,503	36,453	0,36	1,75	38,20	75,82

Kecepatan pelepasan = 0,0937 mg/menit

Koefisien korelasi = 0,978

Replikasi 3

Bobot tablet = 406 mg (mengandung kaptopril 51,51 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,172	1	3,478	3,478	3,131	0,00	0,00	3,13	6,08
15	0,296	1	6,303	6,303	5,673	0,03	0,03	5,71	11,08
30	0,386	1	8,353	8,353	7,518	0,06	0,10	7,62	14,78
60	0,332	2	7,123	14,246	12,821	0,08	0,18	13,00	25,24
90	0,455	2	9,925	19,850	17,865	0,14	0,32	18,19	35,31
120	0,533	2	11,702	23,403	21,063	0,20	0,52	21,59	41,90
180	0,443	3	9,651	28,954	26,059	0,23	0,76	26,82	52,06
240	0,516	3	11,314	33,943	30,549	0,29	1,05	31,59	61,34
300	0,594	3	13,091	39,273	35,346	0,34	1,39	36,73	71,31
360	0,639	3	14,116	42,349	38,114	0,39	1,78	39,89	77,44

Kecepatan pelepasan = 0,1032 mg/menit

Koefisien korelasi = 0,983

Formula c (Fc)

Replikasi 1

Bobot tablet = 405 mg (mengandung kaptopril 49,90 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,176	1	3,569	3,569	3,213	0,00	0,00	3,21	6,44
15	0,376	1	8,125	8,125	7,313	0,04	0,04	7,35	14,73
30	0,622	1	13,729	13,729	12,356	0,08	0,12	12,47	25,00
60	0,348	2	7,487	14,975	13,477	0,14	0,25	13,73	27,52
90	0,436	2	9,492	18,984	17,086	0,15	0,40	17,49	35,05
120	0,523	2	11,474	22,948	20,653	0,19	0,59	21,25	42,58
180	0,648	2	14,321	28,642	25,778	0,23	0,82	26,60	53,31
240	0,455	3	9,925	29,774	26,797	0,29	1,11	27,91	55,93
300	0,528	3	11,588	34,763	31,287	0,30	1,41	32,69	65,52
360	0,598	3	13,182	39,547	35,592	0,35	1,76	37,35	74,84

Kecepatan pelepasan = 0,0865 mg/menit

Koefisien korelasi = 0,972

Replikasi 2

Bobot tablet = 404 mg (mengandung kaptopril 49,80 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,180	1	3,661	3,661	3,295	0,00	0,00	3,29	6,62
15	0,439	1	9,560	9,560	8,604	0,04	0,04	8,64	17,35
30	0,571	1	12,567	12,567	11,310	0,10	0,13	11,44	22,98
60	0,826	1	18,376	18,376	16,538	0,13	0,26	16,80	33,73
90	0,485	2	10,608	21,216	19,095	0,18	0,44	19,54	39,23
120	0,558	2	12,271	24,542	22,088	0,21	0,65	22,74	45,67
180	0,650	2	14,367	28,733	25,860	0,25	0,90	26,76	53,73
240	0,502	3	10,995	32,986	29,688	0,29	1,19	30,87	62,00
300	0,577	3	12,704	38,112	34,300	0,33	1,52	35,82	71,92
360	0,632	3	13,957	41,870	37,683	0,38	1,90	39,58	79,48

Kecepatan pelepasan = 0,0926 mg/menit

Koefisien korelasi = 0,974

Replikasi 3

Bobot tablet = 403 mg (mengandung kaptopril 49,70 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,168	1	3,387	3,387	3,049	0,00	0,00	3,05	6,13
15	0,426	1	9,264	9,264	8,338	0,03	0,03	8,37	16,84
30	0,634	1	14,002	14,002	12,602	0,09	0,13	12,73	25,61
60	0,792	1	17,601	17,601	15,841	0,14	0,27	16,11	32,41
90	0,461	2	10,062	20,123	18,111	0,18	0,44	18,55	37,33
120	0,539	2	11,838	23,677	21,309	0,20	0,64	21,95	44,17
180	0,643	2	14,207	28,415	25,573	0,24	0,88	26,45	53,23
240	0,469	3	10,244	30,731	27,658	0,28	1,16	28,82	57,99
300	0,565	3	12,431	37,292	33,562	0,31	1,47	35,03	70,49
360	0,591	3	13,023	39,068	35,162	0,37	1,84	37,01	74,46

Kecepatan pelepasan = 0,0864 mg/menit

Koefisien korelasi = 0,967

Formula ac (Fac)

Replikasi 1

Bobot tablet = 404 mg (mengandung kaptopril 49,85 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,177	1	3,592	3,592	3,233	0,00	0,00	3,23	6,49
15	0,282	1	5,984	5,984	5,386	0,04	0,04	5,42	10,88
30	0,385	1	8,330	8,330	7,497	0,06	0,10	7,59	15,23
60	0,611	1	13,478	13,478	12,131	0,08	0,18	12,31	24,69
90	0,737	1	16,349	16,349	14,714	0,13	0,31	15,03	30,15
120	0,416	2	9,036	18,073	16,266	0,16	0,48	16,74	33,59
180	0,488	2	10,677	21,353	19,218	0,18	0,66	19,88	39,87
240	0,381	3	8,239	24,718	22,246	0,21	0,87	23,12	46,37
300	0,470	3	10,267	30,800	27,720	0,25	1,12	28,84	57,85
360	0,522	3	11,451	34,353	30,918	0,31	1,43	32,34	64,88

Kecepatan pelepasan = 0,0770 mg/menit

Koefisien korelasi = 0,985

Replikasi 2

Bobot tablet = 405 mg (mengandung kaptopril 49,98 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,181	1	3,683	3,683	3,315	0,00	0,00	3,32	6,63
15	0,380	1	8,216	8,216	7,395	0,04	0,04	7,43	14,87
30	0,478	1	10,449	10,449	9,404	0,08	0,12	9,52	19,05
60	0,703	1	15,574	15,574	14,017	0,10	0,22	14,24	28,49
90	0,759	1	16,850	16,850	15,165	0,16	0,38	15,54	31,10
120	0,431	2	9,378	18,756	16,881	0,17	0,55	17,43	34,87
180	0,516	2	11,314	22,629	20,366	0,19	0,74	21,10	42,22
240	0,390	3	8,444	25,333	22,799	0,23	0,96	23,76	47,54
300	0,470	3	10,267	30,800	27,720	0,25	1,21	28,93	57,89
360	0,518	3	11,360	34,080	30,672	0,31	1,52	32,19	64,42

Kecepatan pelepasan = 0,0728 mg/menit

Koefisien korelasi = 0,978

Replikasi 3

Bobot tablet = 403 mg (mengandung kaptopril 49,73 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,172	1	3,478	3,478	3,131	0,00	0,00	3,13	6,30
15	0,301	1	6,417	6,417	5,775	0,03	0,03	5,81	11,68
30	0,442	1	9,629	9,629	8,666	0,06	0,10	8,76	17,62
60	0,572	1	12,590	12,590	11,331	0,10	0,20	11,53	23,18
90	0,734	1	16,280	16,280	14,652	0,13	0,32	14,97	30,11
120	0,423	2	9,196	18,392	16,553	0,16	0,48	17,04	34,26
180	0,485	2	10,608	21,216	19,095	0,18	0,67	19,76	39,74
240	0,390	3	8,444	25,333	22,799	0,21	0,88	23,68	47,62
300	0,464	3	10,130	30,390	27,351	0,25	1,13	28,48	57,28
360	0,539	3	11,838	35,515	31,963	0,30	1,44	33,40	67,16

Kecepatan pelepasan = 0,0781 mg/menit

Koefisien korelasi = 0,987

Formula bc (Fbc)

Replikasi 1

Bobot tablet = 403 mg (mengandung kaptopril 48,27 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,200	1	4,116	4,116	3,705	0,00	0,00	3,70	7,67
15	0,351	1	7,556	7,556	6,800	0,04	0,04	6,84	14,17
30	0,526	1	11,542	11,542	10,388	0,08	0,12	10,50	21,76
60	0,306	2	6,531	13,062	11,755	0,12	0,23	11,99	24,83
90	0,419	2	9,105	18,210	16,389	0,13	0,36	16,75	34,70
120	0,484	2	10,585	21,171	19,054	0,18	0,54	19,60	40,60
180	0,355	3	7,647	22,941	20,647	0,21	0,76	21,40	44,34
240	0,411	3	8,923	26,768	24,091	0,23	0,99	25,08	51,95
300	0,471	3	10,289	30,868	27,781	0,27	1,25	29,03	60,15
360	0,573	3	12,613	37,838	34,054	0,31	1,56	35,62	73,79

Kecepatan pelepasan = 0,0791 mg/menit

Koefisien korelasi = 0,980

Replikasi 2

Bobot tablet = 405 mg (mengandung kaptopril 48,51 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,176	1	3,569	3,569	3,213	0,00	0,00	3,21	6,62
15	0,383	1	8,285	8,285	7,456	0,04	0,04	7,49	15,44
30	0,514	1	11,269	11,269	10,142	0,08	0,12	10,26	21,15
60	0,622	1	13,729	13,729	12,356	0,11	0,23	12,59	25,95
90	0,374	2	8,080	16,159	14,544	0,14	0,37	14,91	30,74
120	0,462	2	10,084	20,169	18,152	0,16	0,53	18,68	38,51
180	0,376	3	8,125	24,376	21,938	0,20	0,73	22,67	46,73
240	0,437	3	9,515	28,544	25,690	0,24	0,98	26,67	54,97
300	0,497	3	10,882	32,645	29,380	0,29	1,26	30,64	63,16
360	0,565	3	12,431	37,292	33,562	0,33	1,59	35,15	72,46

Kecepatan pelepasan = 0,0822 mg/menit

Koefisien korelasi = 0,987

Replikasi 3

Bobot tablet = 404 mg (mengandung kaptopril 49,39 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,221	1	4,595	4,595	4,135	0,00	0,00	4,14	8,55
15	0,413	1	8,968	8,968	8,071	0,05	0,05	8,12	16,77
30	0,497	1	10,882	10,882	9,793	0,09	0,14	9,93	20,52
60	0,616	1	13,592	13,592	12,233	0,11	0,24	12,48	25,79
90	0,358	2	7,715	15,431	13,887	0,14	0,38	14,27	29,49
120	0,444	2	9,674	19,349	17,414	0,15	0,53	17,95	37,09
180	0,350	3	7,533	22,599	20,339	0,19	0,73	21,07	43,54
240	0,407	3	8,831	26,494	23,845	0,23	0,95	24,80	51,25
300	0,502	3	10,995	32,986	29,688	0,26	1,22	30,91	63,87
360	0,561	3	12,339	37,018	33,316	0,33	1,55	34,87	72,05

Kecepatan pelepasan = 0,0795 mg/menit

Koefisien korelasi = 0,992

Formula abc (Fabc)

Replikasi 1

Bobot tablet = 406 mg (mengandung kaptopril 51,43 mg)

waktu (menit)	serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,159	1	3,182	3,182	2,864	0,00	0,00	2,86	5,57
15	0,211	1	4,367	4,367	3,930	0,03	0,03	3,96	7,70
30	0,386	1	8,353	8,353	7,518	0,04	0,08	7,59	14,76
60	0,264	2	5,574	11,148	10,033	0,08	0,16	10,19	19,82
90	0,324	2	6,941	13,882	12,493	0,11	0,27	12,76	24,82
120	0,399	2	8,649	17,298	15,569	0,14	0,41	15,98	31,07
180	0,289	3	6,144	18,431	16,587	0,17	0,58	17,17	33,38
240	0,356	3	7,670	23,009	20,708	0,18	0,77	21,47	41,76
300	0,438	3	9,538	28,613	25,751	0,23	1,00	26,75	52,01
360	0,491	3	10,745	32,235	29,011	0,29	1,28	30,29	58,90

Kecepatan pelepasan = 0,0730 mg/menit

Koefisien korelasi = 0,987

Replikasi 2

Bobot tablet = 405 mg (mengandung kaptopril 51,30 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,135	1	2,636	2,636	2,372	0,00	0,00	2,37	4,62
15	0,213	1	4,412	4,412	3,971	0,03	0,03	4,00	7,79
30	0,332	1	7,123	7,123	6,411	0,04	0,07	6,48	12,63
60	0,228	2	4,754	9,508	8,557	0,07	0,14	8,70	16,96
90	0,361	2	7,784	15,567	14,010	0,10	0,24	14,25	27,77
120	0,416	2	9,036	18,073	16,266	0,16	0,39	16,66	32,47
180	0,326	3	6,986	20,959	18,863	0,18	0,57	19,44	37,89
240	0,341	3	7,328	21,984	19,786	0,21	0,78	20,57	40,09
300	0,405	3	8,786	26,358	23,722	0,22	1,00	24,72	48,20
360	0,508	3	11,132	33,396	30,057	0,26	1,27	31,32	61,06

Kecepatan pelepasan = 0,0739 mg/menit

Koefisien korelasi = 0,976

Replikasi 3

Bobot tablet = 406 mg (mengandung kaptopril 51,43 mg)

Waktu (menit)	Serapan	Fp	Kadar sampel ($\mu\text{g/ml}$)	Kadar ($\mu\text{g/ml}$)	Jumlah (mg)	Koreksi (mg)	Total koreksi (mg)	Terdisolusi (mg)	Disolusi (%)
5	0,176	1	3,569	3,569	3,213	0,00	0,00	3,21	6,25
15	0,275	1	5,825	5,825	5,242	0,04	0,04	5,28	10,26
30	0,324	1	6,941	6,941	6,247	0,06	0,09	6,34	12,33
60	0,207	2	4,276	8,551	7,696	0,07	0,16	7,86	15,28
90	0,294	2	6,257	12,515	11,263	0,09	0,25	11,51	22,38
120	0,369	2	7,966	15,932	14,338	0,13	0,37	14,71	28,61
180	0,269	3	5,688	17,064	15,357	0,16	0,53	15,89	30,90
240	0,338	3	7,260	21,779	19,601	0,17	0,70	20,31	39,48
300	0,416	3	9,036	27,109	24,398	0,22	0,92	25,32	49,23
360	0,500	3	10,950	32,850	29,565	0,27	1,19	30,76	59,80

Kecepatan pelepasan = 0,0724 mg/menit

Koefisien korelasi = 0,993

Rata-rata terdisolusi

Waktu (menit)	Rata-rata terdisolusi (%)							
	F1	Fa	Fb	Fab	Fc	Fac	Fbc	Fabc
5	5,90	4,61	9,43	6,75	6,40	6,47	7,61	5,48
15	14,98	12,52	17,65	12,06	16,31	12,48	15,46	8,59
30	22,12	18,58	23,26	15,32	24,53	17,30	21,14	13,24
60	30,86	25,69	34,43	26,02	31,22	25,45	25,52	17,35
90	39,68	31,86	45,59	35,67	37,20	30,45	31,64	24,99
120	50,30	39,78	54,09	43,19	44,14	34,24	38,73	30,72
180	62,67	50,19	65,42	52,13	53,42	40,61	44,87	34,06
240	70,07	57,54	76,30	60,11	58,64	47,18	52,72	40,44
300	76,60	63,66	85,54	68,41	69,31	57,67	62,40	49,81
360	84,06	68,69	92,62	76,38	76,26	65,49	72,77	59,92

Simpangan baku jumlah obat yang terdisolusi

Waktu (menit)	Simpangan baku (%)							
	F1	Fa	Fb	Fab	Fc	Fac	Fbc	Fabc
5	0,11	1,19	0,67	1,60	0,24	0,17	0,96	0,81
15	0,28	1,34	0,85	0,98	1,39	2,11	1,30	1,45
30	1,03	2,41	0,66	0,48	1,38	1,93	0,62	1,33
60	1,54	1,89	2,18	0,72	3,27	2,74	0,60	2,29
90	0,99	0,78	2,54	1,24	2,09	0,56	2,72	2,70
120	1,21	0,81	3,42	1,12	1,54	0,64	1,77	1,96
180	1,23	0,12	3,42	1,43	0,27	1,40	1,66	3,54
240	0,60	0,59	4,47	1,47	3,09	0,70	1,98	1,18
300	0,81	2,11	1,53	2,68	3,36	0,34	1,98	1,97
360	0,65	1,05	1,18	0,93	2,79	1,47	0,91	1,08

Keterangan :

- fp = faktor pengenceran sampel
 kadar sampel = kadar kaptopril dalam sampel ($\mu\text{g/ml}$)
 kadar = kadar kaptopril dalam larutan disolusi ($\mu\text{g/ml}$)
 jumlah = banyaknya kaptopril dalam medium disolusi (900 ml)
 koreksi = jumlah kaptopril dalam cuplikan sampel (mg)
 total koreksi = jumlah kumulatif koreksi (mg)
 terdisolusi = jumlah obat yang terlarut (mg)
 % disolusi = persentase jumlah obat yang terlarut (%)

Dissolution efficiency (DE₃₆₀)

Menit	<i>Area under curve (AUC) (% menit)</i>					
	F1			Fa		
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	15,07	14,51	14,68	14,94	9,59	10,04
15	105,38	102,41	105,48	97,65	84,18	75,15
30	286,03	267,82	280,91	245,94	251,97	201,89
60	819,34	752,02	812,80	689,74	711,26	591,25
90	1052,43	1033,68	1088,25	868,19	892,58	828,88
120	1338,81	1331,66	1378,67	1051,19	1087,68	1084,69
180	3434,80	3311,40	3421,09	2677,42	2696,99	2723,12
240	4002,63	3940,18	4003,59	3226,58	3248,70	3221,07
300	4398,05	4367,76	4434,60	3682,20	3670,32	3555,56
360	4831,13	4773,43	4855,00	4061,27	3971,02	3878,58
AUC total	20283,67	19894,89	20395,08	16615,14	16624,27	16170,24
Luas total	36000,00	36000,00	36000,00	36000,00	36000,00	36000,00
DE ₃₆₀ (%)	56,34	55,26	56,65	46,15	46,18	44,92

Menit	<i>Area under curve (AUC) (% menit)</i>					
	Fb			Fab		
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	21,72	24,06	24,97	13,97	21,44	15,19
15	136,01	132,20	138,08	93,14	103,10	85,79
30	308,32	305,55	306,75	215,53	206,42	193,99
60	879,19	837,92	879,19	628,01	632,05	600,42
90	1253,98	1120,03	1226,90	912,33	955,58	908,31
120	1578,64	1403,46	1503,25	1176,78	1213,83	1158,23
180	3783,68	3376,88	3595,29	2921,84	2838,23	2818,90
240	4360,36	3998,67	4395,78	3423,10	3276,26	3401,86
300	4864,04	4671,91	5028,96	3796,00	3791,20	3979,38
360	5365,11	5264,29	5404,41	4256,66	4311,48	4462,61
AUC total	22551,05	21134,96	22503,58	17437,35	17349,59	17624,68
Luas total	36000,00	36000,00	36000,00	36000,00	36000,00	36000,00
DE ₃₆₀ (%)	62,64	58,71	62,51	48,44	48,19	48,96

Menit	<i>Area under curve (AUC) (% menit)</i>					
	Fc			Fac		
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	16,09	16,54	15,33	16,21	16,58	15,74
15	105,82	119,83	114,89	86,81	107,51	89,89
30	297,92	302,46	318,41	195,81	254,42	219,81
60	787,72	850,57	870,31	598,88	713,17	612,04
90	938,52	1094,35	1046,11	822,58	893,88	799,30
120	1164,42	1273,44	1222,51	955,98	989,56	965,51
180	2876,64	2981,99	2921,91	2203,74	2312,69	2219,94
240	3277,05	3471,90	3336,61	2587,35	2692,80	2620,67
300	3643,35	4017,54	3854,56	3126,72	3162,99	3146,79
360	4210,91	4542,02	4348,54	3682,02	3669,22	3733,23
AUC total	17318,42	18670,65	18049,19	14276,10	14812,82	14422,91
Luas total	36000,00	36000,00	36000,00	36000,00	36000,00	36000,00
DE ₃₆₀ (%)	48,11	51,86	50,14	39,66	41,15	40,06

Menit	<i>Area under curve (AUC) (% menit)</i>					
	Fbc			Fabc		
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
5	19,19	16,56	21,36	13,92	11,56	15,62
15	109,24	110,33	126,60	66,36	62,08	82,54
30	269,52	274,47	279,70	168,51	153,20	169,43
60	698,95	706,48	694,56	518,73	443,86	414,16
90	893,07	850,32	829,05	669,54	670,94	564,99
120	1129,58	1038,77	998,64	838,28	903,66	764,87
180	2548,28	2557,32	2418,83	1933,56	2110,78	1785,14
240	2888,76	3051,06	2843,54	2254,20	2339,46	2111,36
300	3363,06	3544,01	3453,55	2812,93	2648,71	2661,40
360	4018,12	4068,71	4077,63	3327,37	3277,63	3271,11
AUC total	15937,75	16218,03	15743,47	12603,40	12621,87	11840,62
Luas total	36000,00	36000,00	36000,00	36000,00	36000,00	36000,00
DE ₃₆₀ (%)	44,27	45,05	43,73	35,01	35,06	32,89

Rata-rata *Dissolution efficiency* (DE₃₆₀) (%)

Replikasi	<i>Dissolution efficiency (%)</i>							
	F1	Fa	Fb	Fab	Fc	Fac	Fbc	Fabc
1	56,34	46,15	62,64	48,44	48,11	39,66	44,27	35,01
2	55,26	46,18	58,71	48,19	51,86	41,15	45,05	35,06
3	56,65	44,92	52,51	48,96	50,14	40,06	43,73	32,89
Rata-rata	56,08	45,75	57,95	48,53	50,04	40,29	44,35	34,32
SD	0,73	0,72	5,11	0,39	1,88	0,77	0,66	1,24

Lampiran 6. Contoh perhitungan disolusi

F-1 replikasi 3

Bobot tablet = 405 mg, penetapan kadar = 48,85 mg

Kandungan kaptopril = $\frac{\text{bobot tablet}}{\text{bobot total tablet dalam formula}} \times \text{hasil penetapan kadar}$

Kandungan kaptopril = $\frac{405}{400} \times 48,85 \text{ mg} = 49,46 \text{ mg}$

Menit ke-	Absorbansi	Faktor pengenceran
5	0,161	1
15	0,385	1
30	0,55	1
60	0,399	2
90	0,499	2
120	0,623	2
180	0,509	3
240	0,568	3
300	0,613	3
360	0,668	3

Kadar kaptopril dapat dihitung dengan menggunakan persamaan kurva baku

kaptopril dalam medium HCl 0,1N sebagai berikut,

$$X = \frac{(A-0,0193)}{0,0439} \times \text{faktor pengenceran}$$

$W = X \times \text{volume medium disolusi}$

$$K = \frac{\text{volume sampling}}{\text{volume medium disolusi}} \times W_{n-1}$$

$$\text{TKW} = \text{TKW}_{n-1} + K$$

$$W_{\text{tot}} = W + \text{TKW}$$

$$\% W = \frac{W_{\text{tot}}}{\text{kandungan kaptopril}} \times 100\%$$

Keterangan :

X	= Kadar kaptopril ($\mu\text{g/ml}$)
A	= Serapan sampel
Fp	= Faktor pengenceran
W	= Jumlah obat yang terdisolusi (mg)
Medium disolusi	= 900 ml HCl 0,1N
Volume sampling	= 10 ml
K	= Koreksi (mg)
W_{n-1}	= jumlah obat terdisolusi pada pengambilan sampling sebelumnya (mg)
TKW	= Total koreksi (mg)
TKW_{n-1}	= total koreksi pada sampling sebelumnya (mg)
W_{tot}	= jumlah obat yang terdisolusi total (mg)
%W	= persen disolusi (%)

$$X_5 = \frac{(0,161-0,0193)}{0,0439} \times 1 = 3,228 \mu\text{g/ml} \rightarrow W_5 = 3,23 \times 900 = 2,905 \text{ mg}$$

$$X_{15} = \frac{(0,385-0,0193)}{0,0439} \times 1 = 8,330 \mu\text{g/ml} \rightarrow W_{15} = 8,33 \times 900 = 7,497 \text{ mg}$$

$$X_{30} = \frac{(0,550-0,0193)}{0,0439} \times 1 = 12,089 \mu\text{g/ml} \rightarrow W_{30} = 12,09 \times 900 = 10,880 \text{ mg}$$

$$X_{60} = \frac{(0,399-0,0193)}{0,0439} \times 2 = 17,298 \mu\text{g/ml} \rightarrow W_{60} = 17,30 \times 900 = 15,569 \text{ mg}$$

$$X_{90} = \frac{(0,499-0,0193)}{0,0439} \times 2 = 21,854 \mu\text{g/ml} \rightarrow W_{90} = 21,85 \times 900 = 19,669 \text{ mg}$$

$$X_{120} = \frac{(0,623-0,0193)}{0,0439} \times 2 = 27,503 \mu\text{g/ml} \rightarrow W_{120} = 27,50 \times 900 = 24,753 \text{ mg}$$

$$X_{180} = \frac{(0,509-0,0193)}{0,0439} \times 3 = 33,465 \mu\text{g/ml} \rightarrow W_{180} = 33,47 \times 900 = 30,118 \text{ mg}$$

$$X_{240} = \frac{(0,568-0,0193)}{0,0439} \times 3 = 37,497 \mu\text{g/ml} \rightarrow W_{240} = 37,50 \times 900 = 33,747 \text{ mg}$$

$$X_{300} = \frac{(0,613-0,0193)}{0,0439} \times 3 = 40,572 \mu\text{g/ml} \rightarrow W_{300} = 40,57 \times 900 = 36,515 \text{ mg}$$

$$X_{360} = \frac{(0,668-0,0193)}{0,0439} \times 3 = 44,330 \mu\text{g/ml} \rightarrow W_{360} = 44,33 \times 900 = 39,897 \text{ mg}$$

$$K_5 = 0, \text{TKW}_5 = 0$$

$$Q_5 = 2,905 + 0 = 2,905 \text{ mg} \rightarrow \%W_5 = \frac{2,91}{49,46} \times 100\% = 5,87\%$$

$$K_{15} = \frac{10}{900} \times 2,905 = 0,03 \text{ mg} \rightarrow \text{TKW}_{15} = 0,03 + 0 = 0,03 \text{ mg}$$

$$Q_{15} = 7,497 + 0,003 = 7,53 \text{ mg} \rightarrow \%W_{15} = \frac{7,53}{49,46} \times 100\% = 15,22\%$$

$$K_{30} = \frac{10}{900} \times 7,497 = 0,08 \text{ mg} \rightarrow \text{TKW}_{30} = 0,08 + 0,03 = 0,12 \text{ mg}$$

$$Q_{30} = 10,880 + 0,12 = 11,00 \text{ mg} \rightarrow \%W_{30} = \frac{11,00}{49,46} \times 100\% = 22,23\%$$

$$K_{60} = \frac{10}{900} \times 10,880 = 0,12 \text{ mg} \rightarrow \text{TKW}_{60} = 0,12 + 0,12 = 0,24 \text{ mg}$$

$$Q_{60} = 15,569 + 0,24 = 15,81 \text{ mg} \rightarrow \%W_{60} = \frac{15,81}{49,46} \times 100\% = 31,96\%$$

$$K_{90} = \frac{10}{900} \times 15,569 = 0,17 \text{ mg} \rightarrow \text{TKW}_{90} = 0,17 + 0,24 = 0,41 \text{ mg}$$

$$Q_{90} = 19,669 + 0,41 = 20,08 \text{ mg} \rightarrow \%W_{90} = \frac{20,08}{49,46} \times 100\% = 40,59\%$$

$$K_{120} = \frac{10}{900} \times 19,669 = 0,22 \text{ mg} \rightarrow \text{TKW}_{120} = 0,22 + 0,41 = 0,63 \text{ mg}$$

$$Q_{120} = 24,753 + 0,63 = 25,38 \text{ mg} \rightarrow \%W_{120} = \frac{25,38}{49,46} \times 100\% = 51,32\%$$

$$K_{180} = \frac{10}{900} \times 24,753 = 0,28 \text{ mg} \rightarrow \text{TKW}_{180} = 0,28 + 0,63 = 0,90 \text{ mg}$$

$$Q_{180} = 30,118 + 0,90 = 31,02 \text{ mg} \rightarrow \%W_{180} = \frac{31,02}{49,46} \times 100\% = 62,72\%$$

$$K_{240} = \frac{10}{900} \times 30,118 = 0,33 \text{ mg} \rightarrow \text{TKW}_{240} = 0,33 + 0,90 = 1,24 \text{ mg}$$

$$Q_{240} = 33,747 + 1,24 = 34,98 \text{ mg} \rightarrow \%W_{240} = \frac{34,98}{49,46} \times 100\% = 70,73\%$$

$$K_{300} = \frac{10}{900} \times 33,747 = 0,37 \text{ mg} \rightarrow \text{TKW}_{300} = 0,37 + 1,24 = 1,61 \text{ mg}$$

$$Q_{300} = 36,515 + 1,61 = 38,13 \text{ mg} \rightarrow \%W_{300} = \frac{38,13}{49,46} \times 100\% = 77,09\%$$

$$K_{360} = \frac{10}{900} \times 36,515 = 0,41 \text{ mg} \rightarrow \text{TKW}_{360} = 0,41 + 1,61 = 2,20 \text{ mg}$$

$$Q_{360} = 39,897 + 2,02 = 41,92 \text{ mg} \rightarrow \%W_{360} = \frac{41,92}{49,46} \times 100\% = 84,75\%$$

Dissolution Efficiency

$$\text{Luas}_5 = \frac{1}{2} \text{ alas} \times (\% W_{15}) = \frac{1}{2} \times 5 \times 5,87 = 14,68$$

$$\text{Luas}_n (L) = \frac{1}{2} \text{ alas} \times (\% W_{n-1} + \% W_n)$$

$$L_{15} = \frac{1}{2} \times (15-5) \times (5,87 + 15,22) = 105,48$$

$$L_{30} = \frac{1}{2} \times (30-15) \times (15,22 + 22,23) = 280,91$$

$$L_{60} = \frac{1}{2} \times (60-30) \times (22,23 + 31,96) = 812,80$$

$$L_{90} = \frac{1}{2} \times (90-60) \times (31,96 + 40,59) = 1088,25$$

$$L_{120} = \frac{1}{2} \times (120-90) \times (40,59 + 51,32) = 1378,67$$

$$L_{180} = \frac{1}{2} \times (180-120) \times (51,32 + 62,72) = 3421,09$$

$$L_{240} = \frac{1}{2} \times (240-180) \times (62,72 + 70,73) = 4003,59$$

$$L_{300} = \frac{1}{2} \times (300-240) \times (70,73 + 77,09) = 4434,60$$

$$L_{360} = \frac{1}{2} \times (360-300) \times (77,09 + 84,75) = 4855,00$$

$$\text{Luas total (AUC)} = L_5 + L_{15} + L_{30} + L_{60} + L_{90} + L_{120} + L_{180} + L_{240} + L_{300} + L_{360}$$

$$= 14,68 + 105,48 + 280,91 + 812,80 + 1088,25 + 1378,67 + 3421,09 + 4003,59 +$$

$$4434,60 + 4855$$

$$= 20395,08$$

$$\text{Luas total} = 360 \times 100 = 36000$$

$$DE_{360} = \frac{\text{Luas AUC Total}}{\text{Luas Total}} \times 100\% = \frac{20395,08}{36000} \times 100\% = 56,65 \%$$

Lampiran 7. Perhitungan profil farmakokinetik kaptopril

Kadar efektif mulai bekerja = 0,05 mg/l (Shargel *et al.* 2005)

Steady state pemberian oral = 0,14 mg/l (25 mg 3x sehari) (Moffat *et al.* 2011)

Kadar yang dikehendaki = 0,25 mg/l (Patchett *et al.* 1980)

Kadar toksik = 60,4 mg/l (Moffat *et al.* 2011)

Volume distribusi = 0,71 l/kg BB (berat badan 60 kg = 42,6 L)
(Shargel *et al.* 2005)

Waktu eliminasi = 2 jam (Shargel *et al.* 2005)

K_{el} = 0,3465/jam (Shargel *et al.* 2005)

F (*bioavailabilty*) = 0,65 (Shargel *et al.*, 2005)

Kecepatan disolusi (kadar efektif) = $(C_p \times V_d \times K_{el})/F$
= $(0,05 \times 42,6 \times 0,3465)/0,65$
= 1,1354 mg/jam (0,0189mg/menit)

Kecepatan disolusi (kadar toksik) = $(C_p \times V_d \times K_{el})/F$
= $(60,4 \times 42,6 \times 0,3465)/0,65$
= 1,372 g/jam (22,867 mg/menit)

Kecepatan disolusi (kadar *steady state*) = $(C_p \times V_d \times K_{el})/F$
= $(0,14 \times 42,6 \times 0,3465)/0,65$
= 3,179 mg/jam = 0,0530 mg/menit

Kecepatan disolusi yang dikehendaki = $(C_p \times V_d \times K_{el})/F$
= $(0,25 \times 42,6 \times 0,3465)/0,65$
= 5,677 mg/jam = 0,0946 mg/menit

Target kecepatan pelepasan kaptopril 0,0530 – 0,0946 mg/menit

Lampiran 9. Optimasi model faktorial desain dengan Design Expert®

a. Parameter kecepatan alir

Pemilihan model

Selection:	Manual	Order:	2FI
Term	Stdized Effects	Sum of Squares	% Contribution
Intercept			
M A-Xanthan Gum	0.68	2.74	36.80
M B-Komponen Effervescent	0.61	2.21	29.60
M AB	-0.54	1.76	23.65
e Lack Of Fit		0.000	0.000
e Pure Error		0.74	9.95
Lenth's ME	0.44		
Lenth's SME	0.55		

ANOVA

Response 1 kecepatan alir

ANOVA for selected factorial model

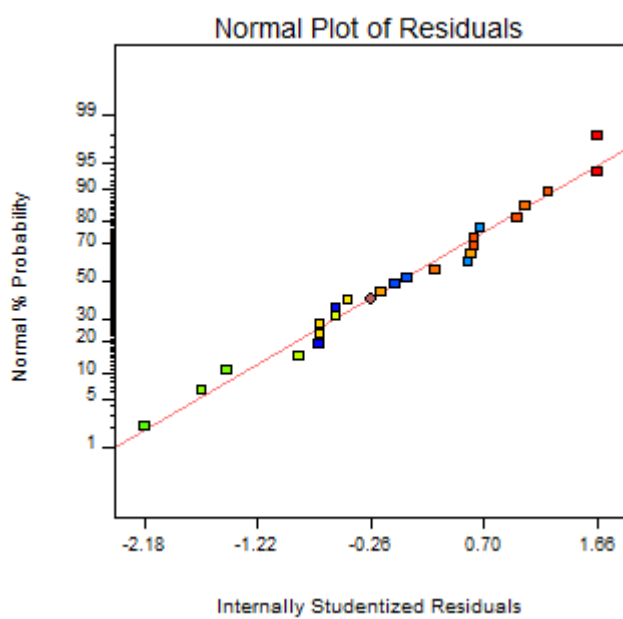
Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F
Model	6.71	3	2.24	60.34	< 0.0001
A-Xanthan Gum	2.74	1	2.74	73.98	< 0.0001
B-Komponen E	2.21	1	2.21	59.51	< 0.0001
AB	1.76	1	1.76	47.55	< 0.0001
Pure Error	0.74	20	0.037		
Cor Total	7.45	23			

Std. Dev.	0.19	R-Squared	0.9005
Mean	10.35	Adj R-Squared	0.8856
C.V. %	1.86	Pred R-Squared	0.8567
PRESS	1.07	Adeq Precision	16.315

Factor	Coefficient		Standard Error	95% CI		VIF
	Estimate	df		Low	High	
Intercept	10.35	1	0.039	10.27	10.44	
A-Xanthan Gum	0.34	1	0.039	0.26	0.42	1.00
B-Komponen Efi	0.30	1	0.039	0.22	0.39	1.00
AB	-0.27	1	0.039	-0.35	-0.19	1.00

Final Equation in Terms of Coded Factors:

$$\text{kecepatan alir} = +10.35 + 0.34 * A + 0.30 * B - 0.27 * A * B$$


b. Parameter kompaktibilitas

Pemilihan model

y ^A Transform		Effects	ANOVA	Diagnostics	Model Graphs
Selection:	Manual			Order:	2FI
Term	Stdized Effects	Sum of Squares	% Contribution		
Intercept					
M A-Xanthan Gum	-1.08	6.93	19.98		
M B-Komponen Effervescent	-2.11	26.67	76.87		
M AB	-0.24	0.35	1.01		
e Lack Of Fit		0.000	0.000		
e Pure Error		0.74	2.14		
Lenth's ME	0.75				
Lenth's SME	0.93				

ANOVA

Response 2 kompaktibilitas

ANOVA for selected factorial model

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

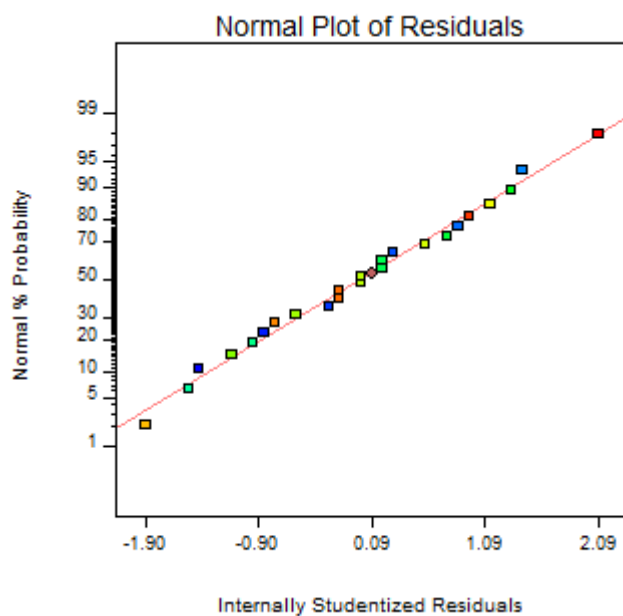
Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F
Model	33.95	3	11.32	305.21	< 0.0001
A-Xanthan Gum	6.93	1	6.93	186.98	< 0.0001
B-Komponen E	26.67	1	26.67	719.20	< 0.0001
AB	0.35	1	0.35	9.45	0.0060
Pure Error	0.74	20	0.037		
Cor Total	34.70	23			

Std. Dev.	0.19	R-Squared	0.9786
Mean	9.76	Adj R-Squared	0.9754
C.V. %	1.97	Pred R-Squared	0.9692
PRESS	1.07	Adeq Precision	40.492

Factor	Coefficient	df	Standard	95% CI		VIF
	Estimate		Error	Low	High	
Intercept	9.76	1	0.039	9.68	9.84	
A-Xanthan Gum	-0.54	1	0.039	-0.62	-0.46	1.00
B-Komponen Eft	-1.05	1	0.039	-1.14	-0.97	1.00
AB	-0.12	1	0.039	-0.20	-0.039	1.00

Final Equation in Terms of Coded Factors:

$$\begin{aligned}
 \text{kompaktibilitas} = & \\
 & +9.76 \\
 & -0.54 * A \\
 & -1.05 * B \\
 & -0.12 * A * B
 \end{aligned}$$



c. Parameter *floating lag time*

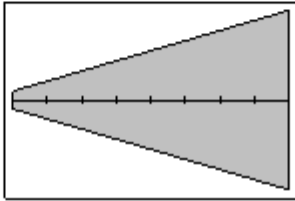
Transformasi

y^{\wedge} Transform
Effects
ANOVA
Diagnostics
Model Graphs

To analyze this response, click on the above icons in succession.

Transformation
 None
 Square root
Natural log
 Base 10 log
 Inverse sqrt
 Inverse
 Power
 Logit
 ArcSin sqrt

Equation
Natural Log (lambda = 0.0)
 $y' = \ln(y + k)$



Constant, k

Use when the response is a variance or represents growth data.
 Required: $(y + k) > 0$.

Response ranges from 10 to 4962.
 Ratio of max to min is 496.2

A ratio greater than 10 usually indicates a transformation is required. For ratios less than 3 the power transforms have little effect.

Pemilihan model

y^{\wedge} Transform
Effects
ANOVA
Diagnostics
Model Graphs

Selection:
 Order:

	Term	Stdized Effects	Sum of Squares	% Contribution
	Intercept			
M	A-Xanthan Gum	0.097	0.057	0.039
M	B-Komponen Effervescent	-0.66	2.62	1.78
M	C-Kekerasan	4.85	141.32	96.01
M	AB	0.13	0.100	0.068
M	AC	-0.52	1.64	1.12
M	BC	-0.40	0.97	0.66
M	ABC	-0.26	0.39	0.27
e	Lack Of Fit		0.000	0.000
e	Pure Error		0.092	0.063
	Lenth's ME	0.38		
	Lenth's SME	0.54		

ANOVA

Response 1 floating lag time

Transform: Natural log Constant: 0.000000

ANOVA for selected factorial model

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

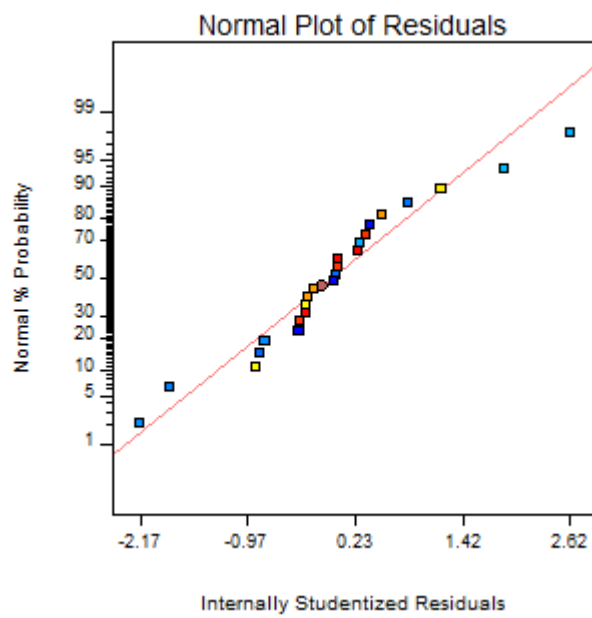
Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F
Model	147.11	7	21.02	3648.97	< 0.0001
A-Xanthan Gum	0.057	1	0.057	9.88	0.0063
B-Komponen E	2.62	1	2.62	454.44	< 0.0001
C-Kekerasan	141.32	1	141.32	24538.27	< 0.0001
AB	0.100	1	0.100	17.33	0.0007
AC	1.64	1	1.64	285.26	< 0.0001
BC	0.97	1	0.97	169.28	< 0.0001
ABC	0.39	1	0.39	68.34	< 0.0001
Pure Error	0.092	16	5.759E-003		
Cor Total	147.20	23			

Std. Dev.	0.076	R-Squared	0.9994
Mean	5.39	Adj R-Squared	0.9991
C.V. %	1.41	Pred R-Squared	0.9986
PRESS	0.21	Adeq Precision	140.726

Factor	Coefficient		Standard Error	95% CI		VIF
	Estimate	df		Low	High	
Intercept	5.39	1	0.015	5.35	5.42	
A-Xanthan Gum	0.049	1	0.015	0.016	0.082	1.00
B-Komponen Efl	-0.33	1	0.015	-0.36	-0.30	1.00
C-Kekerasan	2.43	1	0.015	2.39	2.46	1.00
AB	0.064	1	0.015	0.032	0.097	1.00
AC	-0.26	1	0.015	-0.29	-0.23	1.00
BC	-0.20	1	0.015	-0.23	-0.17	1.00
ABC	-0.13	1	0.015	-0.16	-0.095	1.00

Final Equation in Terms of Coded Factors:

$$\begin{aligned} \text{Ln}(\text{floating lag time}) = & \\ & +5.39 \\ & +0.049 * A \\ & -0.33 * B \\ & +2.43 * C \\ & +0.064 * A * B \\ & -0.26 * A * C \\ & -0.20 * B * C \\ & -0.13 * A * B * C \end{aligned}$$



d. Parameter Q₆₀

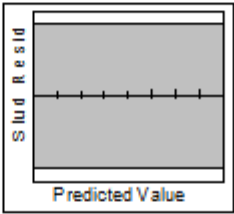
Transformasi

y^{λ} Transform
Effects
ANOVA
Diagnostics
Model Graphs

To analyze this response, click on the above icons in succession.

Transformation
 None
 Square root
 Natural log
 Base 10 log
 Inverse sqrt
 Inverse
 Power
 Logit
 ArcSin sqrt

Equation
None (lambda = 1.0)
 $y' = y$



Use with a typical response.

Response ranges from 15.28 to 36.01.
Ratio of max to min is 2.35668

A ratio greater than 10 usually indicates a transformation is required. For ratios less than 3 the power transforms have little effect.

Pemilihan model

Selection: Manual Order: 3FI

	Term	Stdized Effects	Sum of Squares	% Contribution
	Intercept			
M	A-Xanthan Gum	-6.88	283.94	44.74
M	B-Komponen Effervescent	-2.47	36.73	5.79
M	C-Kekerasan	-4.36	114.28	18.00
M	AB	-1.41	11.91	1.88
M	AC	-0.089	0.048	7.516E-003
M	BC	-4.42	117.44	18.50
M	ABC	0.21	0.26	0.041
e	Lack Of Fit		0.000	0.000
e	Pure Error		70.10	11.05
	Lenth's ME	3.24		
	Lenth's SME	4.66		

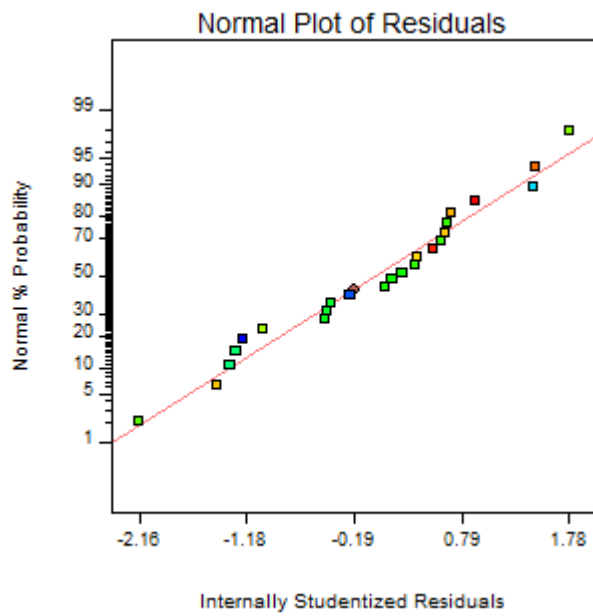
ANOVA

Response	2	Q60			
ANOVA for selected factorial model					
Analysis of variance table [Partial sum of squares - Type III]					
Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F
Model	564.60	7	80.66	18.41	< 0.0001
<i>A-Xanthan Gur</i>	283.94	1	283.94	64.80	< 0.0001
<i>B-Komponen E</i>	36.73	1	36.73	8.38	0.0105
<i>C-Kekerasan</i>	114.28	1	114.28	26.08	0.0001
<i>AB</i>	11.91	1	11.91	2.72	0.1186
<i>AC</i>	0.048	1	0.048	0.011	0.9182
<i>BC</i>	117.44	1	117.44	26.80	< 0.0001
<i>ABC</i>	0.26	1	0.26	0.059	0.8112
Pure Error	70.10	16	4.38		
Cor Total	634.71	23			
Std. Dev.	2.09		R-Squared	0.8895	
Mean	27.07		Adj R-Squared	0.8412	
C.V. %	7.73		Pred R-Squared	0.7515	
PRESS	157.73		Adeq Precision	14.130	

Factor	Coefficient		Standard Error	95% CI		VIF
	Estimate	df		Low	High	
Intercept	27.07	1	0.43	26.16	27.98	
A-Xanthan Gum	-3.44	1	0.43	-4.35	-2.53	1.00
B-Komponen Efl	-1.24	1	0.43	-2.14	-0.33	1.00
C-Kekerasan	-2.18	1	0.43	-3.09	-1.28	1.00
AB	-0.70	1	0.43	-1.61	0.20	1.00
AC	-0.045	1	0.43	-0.95	0.86	1.00
BC	-2.21	1	0.43	-3.12	-1.31	1.00
ABC	0.10	1	0.43	-0.80	1.01	1.00

Final Equation in Terms of Coded Factors:

$$\begin{aligned} Q60 = & \\ & +27.07 \\ & -3.44 * A \\ & -1.24 * B \\ & -2.18 * C \\ & -0.70 * A * B \\ & -0.045 * A * C \\ & -2.21 * B * C \\ & +0.10 * A * B * C \end{aligned}$$



e. Parameter kecepatan pelepasan disolusi

Transformasi

y^λ Transform
Effects
ANOVA
Diagnostics
Model Graphs

To analyze this response, click on the above icons in succession.

Transformation
Equation

None

Square root

Natural log

Base 10 log

Inverse sqrt

Inverse

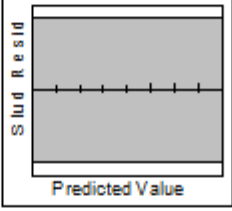
Power

Logit

ArcSin sqrt

None (lambda = 1.0)

$y' = y$



Use with a typical response.

Response ranges from 0.0724 to 0.112.
Ratio of max to min is 1.54696

A ratio greater than 10 usually indicates a transformation is required. For ratios less than 3 the power transforms have little effect.

Pemilihan model

Selection: Manual Order: 3FI

	Term	Stdized Effects	Sum of Squares	% Contribution
	Intercept			
M	A-Xanthan Gum	-0.012	9.263E-004	24.16
M	B-Komponen Effervescent	1.425E-003	1.218E-005	0.32
M	C-Kekerasan	-0.020	2.414E-003	62.96
M	AB	2.592E-003	4.030E-005	1.05
M	AC	2.575E-003	3.978E-005	1.04
M	BC	-6.975E-003	2.919E-004	7.61
M	ABC	9.167E-005	5.042E-008	1.315E-003
e	Lack Of Fit		0.000	0.000
e	Pure Error		1.096E-004	2.86
	Lenth's ME	3.570E-003		
	Lenth's SME	5.133E-003		

ANOVA

Response 3 kecepatan pelepasan

ANOVA for selected factorial model

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

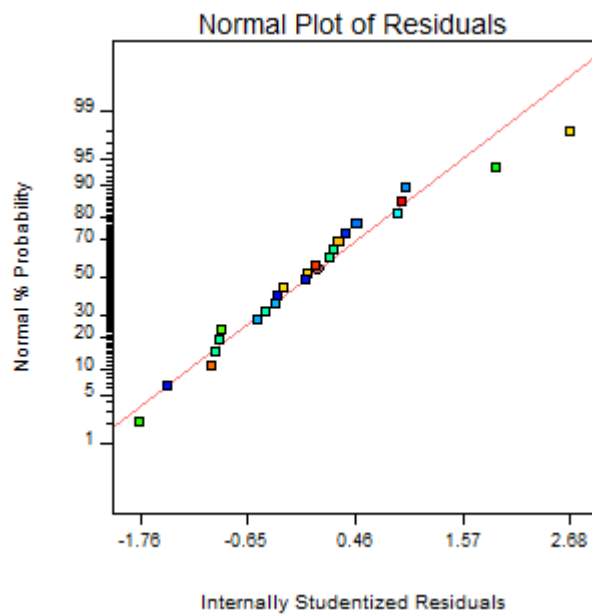
Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F
Model	3.725E-003	7	5.321E-004	77.68	< 0.0001
<i>A-Xanthan Gur</i>	9.263E-004	1	9.263E-004	135.22	< 0.0001
<i>B-Komponen E</i>	1.218E-005	1	1.218E-005	1.78	0.2010
<i>C-Kekerasan</i>	2.414E-003	1	2.414E-003	352.41	< 0.0001
<i>AB</i>	4.030E-005	1	4.030E-005	5.88	0.0275
<i>AC</i>	3.978E-005	1	3.978E-005	5.81	0.0284
<i>BC</i>	2.919E-004	1	2.919E-004	42.61	< 0.0001
<i>ABC</i>	5.042E-008	1	5.042E-008	7.360E-003	0.9327
Pure Error	1.096E-004	16	6.850E-006		
Cor Total	3.834E-003	23			

Std. Dev.	2.617E-003	R-Squared	0.9714
Mean	0.089	Adj R-Squared	0.9589
C.V. %	2.92	Pred R-Squared	0.9357
PRESS	2.466E-004	Adeq Precision	24.398

Factor	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
Intercept	0.089	1	5.342E-004	0.088	0.091	
A-Xanthan Gum	-6.213E-003	1	5.342E-004	-7.345E-003	-5.080E-003	1.00
B-Komponen Efl	7.125E-004	1	5.342E-004	-4.200E-004	1.845E-003	1.00
C-Kekerasan	-0.010	1	5.342E-004	-0.011	-8.897E-003	1.00
AB	1.296E-003	1	5.342E-004	1.633E-004	2.428E-003	1.00
AC	1.288E-003	1	5.342E-004	1.550E-004	2.420E-003	1.00
BC	-3.487E-003	1	5.342E-004	-4.620E-003	-2.355E-003	1.00
ABC	4.583E-005	1	5.342E-004	-1.087E-003	1.178E-003	1.00

Final Equation in Terms of Coded Factors:

$$\begin{aligned} \text{kecepatan pelepasan} = & \\ & +0.089 \\ & -6.213\text{E-}003 * A \\ & +7.125\text{E-}004 * B \\ & -0.010 * C \\ & +1.296\text{E-}003 * A * B \\ & +1.288\text{E-}003 * A * C \\ & -3.487\text{E-}003 * B * C \\ & +4.583\text{E-}005 * A * B * C \end{aligned}$$



f. Penentuan formula optimum

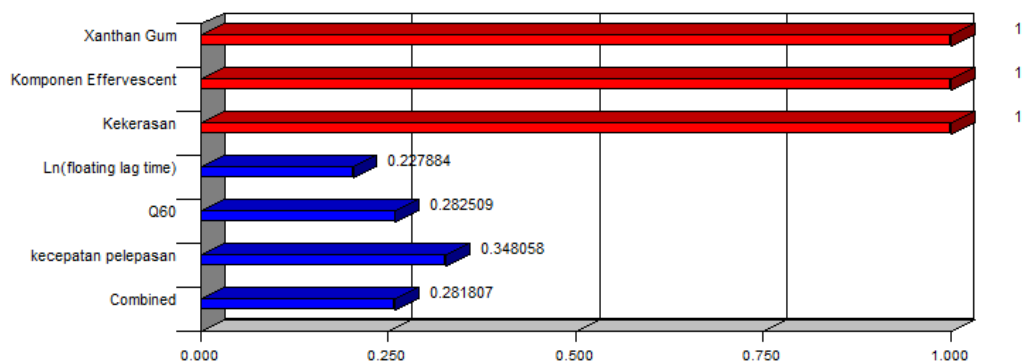
Constraints

Name	Goal	Lower Limit	Upper Limit	Lower Weight	Upper Weight	Importance
Xanthan Gum	is in range	20	100	1	1	3
Komponen Effer	is in range	42	63	1	1	3
Kekerasan	is in range	6	12	1	1	3
Ln(floating lag ti	minimize	2.30259	5.7038	1	1	4
Q60	minimize	15.28	25	1	1	2
kecepatan pelep	minimize	0.0724	0.0946	1	1	4

Solutions

Number	Xanthan Gum	Komponen Effer	Kekerasan	Ln(floating lag	Q60	kecepatan pel	Desirability	Selected
1	<u>100.00</u>	<u>63.00</u>	<u>8.61</u>	<u>4.929</u>	<u>22.254</u>	<u>0.0868731</u>	<u>0.282</u>	<u>Selected</u>
2	100.00	63.00	8.55	4.894	22.3361	0.0871038	0.282	
3	100.00	63.00	8.53	4.880	22.3693	0.0871971	0.281	
4	100.00	62.86	8.60	4.927	22.2874	0.0868737	0.281	
5	100.00	62.77	8.57	4.911	22.3423	0.0869644	0.281	

Desirability



Lampiran 10. Hasil formula optimum

a. Hasil pemeriksaan massa tablet formula optimum

Parameter	Replikasi						Rata-rata	SD
	1	2	3	4	5	6		
Kompaktibilitas (kg)	8,2	8,1	7,8	8,2	8,05	8,15	8,08	0,16
Kecepatan alir (g/detik)	10,99	10,36	10,87	10,81	10,53	11,24	10,80	0,32
Sudut diam (°)	26,03	28,54	27,11	27,99	26,93	27,11	27,29	0,88
Kelembaban (%)	5,10	5,50	4,50	-	-	-	5,03	0,50
Berat jenis ruah (g/ml)	0,227	0,225	0,227	-	-	-	0,226	0,001
Berat jenis mampat (g/ml)	0,263	0,270	0,260	-	-	-	0,264	0,005
Indeks pengetapan (%)	13,64	16,85	12,50	-	-	-	14,33	2,26

b. Hasil pemeriksaan sifat fisik formula tablet *floating* kaptopril

Parameter	Replikasi						Rata-rata	SD
	1	2	3	4	5	6		
Kekerasan (kg)	8,60	8,55	8,60	8,65	8,70	8,60	8,62	0,06
Penetapan kadar (mg)	50,36	52,06	50,64	48,93	50,50	50,78	50,55	1,00
Kecepatan pelepasan (mg/menit)	0,0868	0,0872	0,0859	0,0879	0,0864	-	0,0868	0,0008
<i>floating lag time</i> (detik)	466	494	478	462	481	505	481,00	16,37

c. Pelepasan obat formula optimum tablet *floating* kaptopril

Replikasi 1

Bobot tablet 404 mg (kaptopril 51,06)

Waktu (menit)	Serapan	fp	kadar sampel (µg/ml)	kadar (µg/ml)	jumlah (mg)	koreksi (mg)	total koreksi (mg)	Q (mg)	terdisolusi (%)
5	0,162	1	3,251	3,251	2,926	0,00	0,00	2,93	5,73
15	0,349	1	7,510	7,510	6,759	0,03	0,03	6,79	13,30
30	0,416	1	9,036	9,036	8,133	0,08	0,11	8,24	16,14
60	0,308	2	6,576	13,153	11,837	0,09	0,20	12,04	23,57
90	0,383	2	8,285	16,569	14,913	0,13	0,33	15,24	29,85
120	0,469	2	10,244	20,487	18,439	0,17	0,50	18,93	37,08
180	0,391	3	8,467	25,401	22,861	0,20	0,70	23,56	46,14
240	0,452	3	9,856	29,569	26,613	0,25	0,95	27,57	53,99
300	0,512	3	11,223	33,670	30,303	0,30	1,25	31,55	61,79
360	0,565	3	12,431	37,292	33,562	0,34	1,59	35,15	68,84

Replikasi 2

Bobot tablet 410 mg (kaptopril 51,25)

Waktu (menit)	Serapan	fp	kadar sampel ($\mu\text{g/ml}$)	kadar ($\mu\text{g/ml}$)	jumlah (mg)	koreksi (mg)	total koreksi (mg)	Q (mg)	terdisolusi (%)
5	0,171	1	3,456	3,456	3,110	0,00	0,00	3,11	6,07
15	0,35	1	7,533	7,533	6,780	0,03	0,03	6,81	13,30
30	0,477	1	10,426	10,426	9,383	0,08	0,11	9,49	18,52
60	0,31	2	6,622	13,244	11,919	0,10	0,21	12,13	23,68
90	0,412	2	8,945	17,891	16,102	0,13	0,35	16,45	32,09
120	0,465	2	10,153	20,305	18,275	0,18	0,53	18,80	36,68
180	0,397	3	8,604	25,811	23,230	0,20	0,73	23,96	46,75
240	0,455	3	9,925	29,774	26,797	0,26	0,99	27,78	54,21
300	0,502	3	10,995	32,986	29,688	0,30	1,28	30,97	60,43
360	0,582	3	12,818	38,453	34,608	0,33	1,61	36,22	70,68

Replikasi 3

Bobot tablet 408 mg (kaptopril 51,00)

Waktu (menit)	Serapan	fp	kadar sampel ($\mu\text{g/ml}$)	kadar ($\mu\text{g/ml}$)	jumlah (mg)	koreksi (mg)	total koreksi (mg)	Q (mg)	terdisolusi (%)
5	0,167	1	3,364	3,364	3,028	0,00	0,00	3,03	5,94
15	0,242	1	5,073	5,073	4,566	0,03	0,03	4,60	9,02
30	0,393	1	8,513	8,513	7,661	0,05	0,08	7,75	15,19
60	0,266	2	5,620	11,239	10,115	0,09	0,17	10,28	20,17
90	0,363	2	7,829	15,658	14,092	0,11	0,28	14,37	28,19
120	0,459	2	10,016	20,032	18,029	0,16	0,44	18,47	36,21
180	0,372	3	8,034	24,103	21,692	0,20	0,64	22,33	43,79
240	0,448	3	9,765	29,296	26,367	0,24	0,88	27,25	53,42
300	0,493	3	10,790	32,371	29,134	0,29	1,17	30,31	59,43
360	0,554	3	12,180	36,540	32,886	0,32	1,50	34,38	67,42

Replikasi 4

Bobot tablet 409 mg (kaptopril 51,13)

Waktu (menit)	Serapan	fp	kadar sampel ($\mu\text{g/ml}$)	kadar ($\mu\text{g/ml}$)	jumlah (mg)	koreksi (mg)	total koreksi (mg)	Q (mg)	terdisolusi (%)
5	0,149	1	2,954	2,954	2,659	0,00	0,00	2,66	5,20
15	0,286	1	6,075	6,075	5,468	0,03	0,03	5,50	10,75
30	0,341	1	7,328	7,328	6,595	0,06	0,09	6,69	13,08
60	0,283	2	6,007	12,014	10,812	0,07	0,16	10,98	21,47
90	0,369	2	7,966	15,932	14,338	0,12	0,28	14,62	28,60
120	0,435	2	9,469	18,938	17,045	0,16	0,44	17,49	34,20
180	0,375	3	8,103	24,308	21,877	0,19	0,63	22,51	44,02
240	0,422	3	9,173	27,519	24,767	0,24	0,88	25,64	50,15
300	0,474	3	10,358	31,073	27,966	0,28	1,15	29,12	56,95
360	0,566	3	12,453	37,360	33,624	0,31	1,46	35,09	68,62

Replikasi 5

Bobot tablet 410 mg (kaptopril 51,25)

Waktu (menit)	Serapan	fp	kadar sampel ($\mu\text{g/ml}$)	kadar ($\mu\text{g/ml}$)	jumlah (mg)	koreksi (mg)	total koreksi (mg)	Q (mg)	terdisolusi (%)
5	0,159	1	3,182	3,182	2,864	0,00	0,00	2,86	5,59
15	0,309	1	6,599	6,599	5,939	0,03	0,03	5,97	11,65
30	0,379	1	8,194	8,194	7,374	0,07	0,10	7,47	14,58
60	0,272	2	5,756	11,513	10,361	0,08	0,18	10,54	20,57
90	0,362	2	7,806	15,613	14,051	0,12	0,29	14,35	27,99
120	0,446	2	9,720	19,440	17,496	0,16	0,45	17,95	35,02
180	0,366	3	7,897	23,692	21,323	0,19	0,65	21,97	42,87
240	0,45	3	9,811	29,433	26,490	0,24	0,88	27,37	53,41
300	0,508	3	11,132	33,396	30,057	0,29	1,18	31,23	60,94
360	0,559	3	12,294	36,882	33,193	0,33	1,51	34,70	67,72

Keterangan :

Perhitungan disolusi dapat dilihat pada Lampiran 6.

Lampiran 11. Hasil uji statistik

a. Hasil uji statistik kelembaban

Uji distribusi data

		Tests of Normality					
formula		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
kelembaban	F1	.373	3	.	.779	3	.066
	Fa	.232	3	.	.980	3	.726
	Fb	.328	3	.	.871	3	.298
	Fab	.175	3	.	1.000	3	1.000

a. Lilliefors Significance Correction

Uji Homogenitas varian

Test of Homogeneity of Variances

kelembaban

Levene Statistic	df1	df2	Sig.
.689	3	8	.584

Analisis varian (ANOVA)

ANOVA

kelembaban

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.767	3	.256	2.620	.123
Within Groups	.780	8	.098		
Total	1.547	11			

b. Hasil uji statistik kekerasan aras bawah

Uji distribusi data

		Tests of Normality					
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
kekerasan	F1	.194	6	.200*	.891	6	.324
aras bawah	Fa	.190	6	.200*	.934	6	.614
	Fb	.164	6	.200*	.950	6	.739
	Fab	.258	6	.200*	.940	6	.659

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Uji homogenitas varian

Test of Homogeneity of Variances

kekerasan aras bawah

Levene Statistic	df1	df2	Sig.
.090	3	20	.964

Analisa varian (ANOVA)

ANOVA

kekerasan aras bawah

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.040	3	.013	.997	.415
Within Groups	.270	20	.013		
Total	.310	23			

c. Hasil uji statistik kekerasan aras atas

Hasil uji distribusi data

		Tests of Normality					
formula		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
kekerasan	F1	.210	6	.200*	.891	6	.326
aras atas	Fa	.121	6	.200*	.983	6	.964
	Fb	.234	6	.200*	.921	6	.514
	Fab	.172	6	.200*	.954	6	.772

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Uji homogenitas varian

Test of Homogeneity of Variances

kekerasan

Levene Statistic	df1	df2	Sig.
.299	3	20	.826

Analisa varian (ANOVA)

ANOVA

kekerasan

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.093	3	.031	.698	.564
Within Groups	.887	20	.044		
Total	.980	23			

d. Hasil uji statistik formula optimum

Kecepatan alir

Uji distribusi data

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
kecepatan alir	.179	6	.200 [*]	.978	6	.943

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

One sample t-test

	Test Value = 10.72					
	t	df	Sig. (2-tailed)	Mean Difference	99% Confidence Interval of the Difference	
					Lower	Upper
kecepatan alir	.619	5	.563	.08000	-.4412	.6012

Kompaktibilitas

Uji distribusi data

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
kompaktibilitas	.246	6	.200 [*]	.814	6	.078

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

One sample t-test

One-Sample Test						
	Test Value = 8.05					
	t	df	Sig. (2-tailed)	Mean Difference	99% Confidence Interval of the Difference	
					Lower	Upper
kompaktibilitas	.542	5	.611	.03333	-.2145	.2812

Kekerasan

Uji distribusi data

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
kekerasan optimum	.293	6	.117	.915	6	.473

a. Lilliefors Significance Correction

One sample t-test

One-Sample Test						
	Test Value = 8.61					
	t	df	Sig. (2-tailed)	Mean Difference	99% Confidence Interval of the Difference	
					Lower	Upper
kekerasan optimum	.316	5	.765	.00667	-.0783	.0917

Q₆₀ (jumlah obat yang dilepaskan selama 60 menit)

Uji distribusi data

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Q60	.205	6	.200 [*]	.902	6	.386

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

One sample t-test

One-Sample Test						
	Test Value = 22.26					
	t	df	Sig. (2-tailed)	Mean Difference	99% Confidence Interval of the Difference	
					Lower	Upper
Q60	-.611	5	.568	-.36833	-2.7992	2.0625

Kecepatan pelepasan obat

Uji distribusi data

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
kecepatan pelepasan	.121	5	.200 [*]	.994	5	.991

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

One sample t-test

One-Sample Test						
Test Value = 0.0869						
	t	df	Sig. (2-tailed)	Mean Difference	99% Confidence Interval of the Difference	
					Lower	Upper
kecepatan pelepasan	-.176	4	.869	-.0000600	-.001632	.001512

Floating lag time

Uji distribusi data

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
floating lag time	.167	6	.200*	.955	6	.780

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

One sample t-test

One-Sample Test						
Test Value = 138.10						
	t	df	Sig. (2-tailed)	Mean Difference	99% Confidence Interval of the Difference	
					Lower	Upper
floating lag time	51.307	5	.000	342.90000	315.9519	369.8481

Lampiran 12. Sertifikat analisis kaptopril

杭州华飞化工有限公司
AFINE CHEMICALS LIMITED

CERTIFICATE OF ANALYSIS

No: A3041-2013004

Product name	Captopril	According to	USP34
Source	Warehouse	Batch No.	A3041-1306-004
Package	Fibre drum	Manufacturing date	2013.06.21
Package size	25kg/drum	Report date	2013.06.22
Quantity	300kg	Retest date	2016.06.20
Items	Specification	Results	
Description	White or off- white crystalline powder	White crystalline powder	
Identification	IR Spectrum accordance with that of CRS	Complies	
Specific rotation	- 125° to - 134°	- 128.9°	
Loss on drying	Not more than 1.0%	0.08%	
Residue on ignition	Not more than 0.2%	0.06%	
Heavy metals	Not more than 0.003%	<0.003%	
Related substances	Captopril disulfide: not more than 1.0%	0.20%	
	Single impurity: not more than 0.2%	0.01%	
	Total impurities: not more than 0.5%	0.14%	
Organic volatile impurities	Meets the requirements	Complies	
Assay (Anhydrous)	97.5% to 102.0%	99.5%	
Conclusion: Complies with USP34			

QA manager: Zheng Bingpan QC manager: Dong Weijie

Lampiran 13. Sertifikat analisis Methocel® K15M Premium

Pg. 1 of 1



Certificate 6392371 The Dow Chemical Company Page 1
Date: 05.12.2013 Certificate of Analysis Shipped: 05.12.2013
File Copy
DOW CHEMICAL PACIFIC LIMITED Fax: COA ARCHIVE
SHANGHAI PUDONG AIRPORT
SHANGHAI SG 201202 CHINA
Cust P.O.: 7000033349 101241581 X Dlv Note: 72310223 20
Material: METHOCEL® K15M Premium Spec: 00053984-S
Batch: 2F28012N04 Mfgd: 28.06.2013 Retest Date: 27.06.2018
Ship from: THE DOW CHEMICAL COMPANY BAY CITY MI UNITED STATES

It is hereby certified the material indicated above has been manufactured in accordance with the FDA cGMPs, Kosher guidelines, was inspected and tested in accordance with the conditions and the requirements of current USP, EP and JP for Hypromellose as well as the current specific purity criteria for the food additive Hydroxypropyl Methyl Cellulose (E464) and unless agreed otherwise conforms in all respects to the specification relevant thereto.

Feature	Units	Results		Limits		Method
		2F28012N04	Minimum	Maximum		
Apparent Viscosity Brookfield 2% in water, @ 20degC	mPa.s	17,867	13,275	24,780	Current	USP/EP/JP
Loss on Drying	%	3.3	----	5.0	Current	USP/EP/JP
Residue on Ignition	%	0.5	----	1.5	Current	USP/JP
Ash, Sulfated	%	0.5	----	1.5	Current	EP
pH, 2% in Water	-	6.1	5.0	8.0	Current	USP/EP/JP
Assay, Methoxyl	%	22.7	19.0	24.0	Current	USP/EP/JP
Assay, Hydroxypropoxy	%	10.2	7.0	12.0	Current	USP/EP/JP
Appearance Opalescence		Passes				Current EP
Appearance solution color		Passes				Current EP

This Batch, based on audit testing and process control, is certified to be NMT 20 ppm heavy metals (as Pb) and also meets all specification requirements for harmonized identification tests, residual solvents and microbiological limits.
Batch (Lot) Number manufacture location (char 7-8): 2N = Midland, MI;
ND = Bomlitz, Germany; 24 = Plaquemine, LA; 07 = Stade, Germany


Julie Wright, PORTEFIBER, METHOCEL Quality Systems Specialist
For inquiries please contact Customer Service at 1-800-232-2436 (USA).

* Trademark of The Dow Chemical Company

Lampiran 14. Sertifikat analisis *xanthan gum*

QINGDAO ICD BIOCHEMISTRY CO., LTD.		
青岛爱史迪国际有限公司		
CERTIFICATE OF ANALYSIS		
Date of analysis: July.10, 2012	Date of report: July.11, 2012	
Description: Xanthan gum food grade 80mesh	Packing: In 25kg net drum	
Batch no.: 20120706132	Quantity : 8000kgs/320drums	
Production date: July, 2012	Expiry date: July, 2014	
ITEM	SPECIFICATION	RESULTS
VISCOSITY 1% SOLUTION IN 1% KCL	1200-1600CPS	1580CPS
PH 1% SOLUTION	6.0-8.0	7.15
MOISTURE	MAX 13%	8.12%
ASH	MAX 13%	6.82%
PARTICLE SIZE	100% THROUGH 60 MESH(250MICRO)	100%
	MIN 95% THROUGH 80MESH(180MICRO)	99.50%
V1/V2	1.02-1.45	1.08
PYRUVIC ACID	MIN 1.5%	3.1
HEAVY METALS	MAX 20PPM	2PPM
LEAD	MAX 5PPM	1PPM
ARSENIC	MAX 3PPM	0.5PPM
MICROBIOLOGICAL		
TOTAL PLATE COUNT	NOT MORE THAN 2000 CFU/G	920CFU/G
YEAST/MOULD	NOT MORE THAN 100 CFU/G	CONFORM
E.COLI	ABSENT/25G	CONFORM
SALMONELLA	ABSENT/25G	CONFORM
Approved by: SUN LI	Checked by: CHENG MOHE	Edited by: CUI GUIYING