BAB V

KESIMPULAN DAN SARAN

A. Kesimpulan

Dari hasil penelitian dapat disimpulkan bahwa :

1. Perbandingan matriks mukoadhesif antara xanthan gum dan HPMC K15M berpengaruh pada waktu alir, daya serap air, kelembapan, swelling index dan daya lekat mukoadhesif serta memperlambat pelepasan propranolol HCl.
2. Pola pelepasan tablet mukoadhesif propranolol HCl terjadi secara difusi dan erosi yang mengikuti kinetika model higuchi.
3. Kombinasi matriks mukoadhesif xanthan gum dan HPMC K15M pada formula I dengan proporsi xanthan gum 75 mg dan HPMC K15M 37,5 mg mempunyai sifat fisik tablet yang baik.

B. Saran

1. Perlu dilakukan penelitian optimasi tablet mukoadhesif propranolol HCl dengan menggunakan matriks xanthan gum dan HPMC K15M.
2. Perlu dilakukan penelitian tentang penetapan kadar propranolol HCl dalam tablet mukoadhesif menggunakan kromatografi cair kinerja tinggi (KCKT) sesuai yang tertera dalam Farmakope Indonesia IV.

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BANCA CARIGE ITALIA
C/C 24440/80 – ABI: 03431 – CAB: 37851
Swift: CARIITGG
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

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 1. Waktu alir granul

Formula I

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)
	1,50		6,0
25,165	1,65	100,660	6,6
	1,70		6,8
Rata-rata			6,45
SD			0,42

Formula II

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)
	1,64		8,2
20,195	1,47	100,975	7,35
	1,50		7,5
Rata-rata			7,68
SD			0,45

Formula III

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)
	1,50		7,5
20,814	1,75	104,670	8,75
	1,76		8,8
Rata-rata			8,35
SD			0,74

Formula IV

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)

	1,77		8,85
20,163	1,80	100,815	9
	1,87		9,35
Rata-rata			9,07
SD			0,26

Formula V

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)
	1,78		8,9
20,135	1,60	100,675	8
	1,67		8,35
Rata-rata			8,42
SD			0,45

Lampiran 2. Kelembaban granul

Replikasi	Kelembaban (%)				
	F1	F2	F3	F4	F5
1	6,40	6,50	7,00	7,50	8,50
2	5,70	6,50	6,50	7,50	9,00
3	6,10	6,50	6,50	6,50	9,00
Rata-rata	6,07	6,50	6,67	7,17	8,83
SD	0,35	0	0,29	0,58	0

Lampiran 3. Daya serap granul

Replikasi	Daya serap air (%)				
	F1	F2	F3	F4	F5
1	0,28	2,78	5,57	10,74	8,95
2	0,31	2,89	5,96	11,03	9,16
3	0,22	2,67	5,32	10,94	8,89
Rata-rata	0,27	2,78	5,62	10,90	9,00
SD	0,05	0,11	0,32	0,15	0,14

Lampiran 4. Keseragaman bobot

Tablet	Bobot tabletb(mg)				
	F I	F II	F III	F IV	FV
1	251,2	251,1	254,7	253,1	253,3
2	251,3	254,1	254,3	254	251,1
3	251,4	254,2	250,3	255	254,6
4	251,1	253,8	253,9	252,2	252,5
5	249,5	253,5	252,3	255,1	252,7

6	254,3	253,6	251,7	253	249,9
7	250,1	253,7	252,4	251	253,5
8	250,6	252,9	254,5	255,1	253,8
9	249,5	253,8	254,8	252,1	253,1
10	251,7	252	252,5	250,2	252,3
11	250,9	253,1	254,2	254	254,2
12	249,5	253	254	253,1	253
13	248,8	254,9	253,9	255,3	253,9
14	251,1	253,8	253,2	255,1	252,2
15	251,3	253	254,5	255,2	254,5
16	249,9	254,7	253,6	253	254,6
17	250,7	254,5	250	252,3	252
18	251,2	254,7	252,3	252	254,3
19	252,1	254,8	252,5	254,1	253,5
20	250,6	252	254,9	255	254,9
Bobot rata	250,84	253,56	253,22	253,5	253,2
SD	1,18	1,02	1,44	1,53	1,28
CV	0,47%	0,40%	0,56%	0,60%	0,51%

Hasil perhitungan rentang keseragaman bobot:

Formula	Kolom A	Kolom B
I	232,02 – 269,65	213,21 – 288,47
II	234,54 – 272,58	215,53 – 291,60
III	234,23 – 272,21	215,24 – 291,20
IV	234,49 – 272,51	215,48 – 291,53
V	234,21 – 272,19	215,22 – 291,18

Keterangan:
Kolom A : penyimpangan 7,5% dari bobot rata-ratanya
Kolom B : penyimpangan 15% dari bobot rata-ratanya

Lampiran 5. Kekerasan tablet

Replikasi	F I	F II	F III	F IV	F V
1	10,8	11,2	10,8	10,7	10,1
2	10,9	10,9	10,9	10,5	10
3	10,7	11	11,1	10,2	11
Rata-rata	10,8	11,03	10,93	10,47	10,37
SD	0,1	0,15	0,15	0,25	0,55

Lampiran 6. Kerapuhan tablet

$$\% \text{ kerapuhan} = \frac{\text{bobot awal} - \text{bobot akhir}}{\text{bobot awal}} \times 100\%$$

Formula	Replikasi	Bobot awal	Bobot akhir	% kerapuhan	Rata-rata	SD
I	1	5,024	4,995	0,56	0,54	0,12
	2	5,067	5,046	0,41		
	3	5,049	5,016	0,65		
II	1	5,115	5,090	0,49	0,55	0,05
	2	5,221	5,192	0,55		
	3	5,201	5,178	0,59		
III	1	5,075	5,039	0,47	0,51	0,04
	2	5,103	5,075	0,54		
	3	5,089	5,062	0,53		

IV	1	5,075	5,045	0,59	0,55	0,03
	2	5,060	5,033	0,54		
	3	5,067	5,040	0,53		
V	1	5,061	5,029	0,63	0,65	0,03
	2	5,075	5,042	0,65		
	3	5,080	5,045	0,68		

Lampiran 7. Swelling index

Formula I

Replikasi	% Swelling Index			
	1 jam	2 jam	3 jam	4 jam
1	124,21	174,84	296,31	374,42
2	125,40	175,38	297,98	374,45
3	124,43	176,95	298,08	375,01
Rata-rata	124,68	175,72	297,46	374,29
SD	0,63	1,1	0,99	0,24

Formula II

Replikasi	% Swelling Index			
	1 jam	2 jam	3 jam	4 jam
1	125,57	202,51	253,45	361,35
2	124,69	200,98	254,10	360,43
3	124,99	201,61	255,26	362,98
Rata-rata	125,08	201,7	254,27	361,59
SD	0,45	0,77	0,92	1,29

Formula III

Replikasi	% Swelling Index			
	1 jam	2 jam	3 jam	4 jam
1	118,09	179,40	271,40	310,92
2	117,80	180,61	272,02	311,33
3	117,16	181,36	272,07	310,92
Rata-rata	117,68	180,45	271,83	311,06
SD	0,48	0,99	0,37	0,24

Formula IV

Replikasi	% Swelling Index			
	1 jam	2 jam	3 jam	4 jam
1	95,75	147,97	247,10	354,13
2	96,15	146,87	246,76	355,15
3	96,28	147,76	245,95	355,23
Rata-rata	96,06	147,53	246,60	354,84
SD	0,28	0,58	0,59	0,61

Formula V

Replikasi	% Swelling Index			
	1 jam	2 jam	3 jam	4 jam
1	92,55	190,09	284,47	299,45
2	91,91	189,78	273,65	298,82
3	92,45	190,54	275,38	297,76
Rata-rata	92,3	190,13	277,83	298,68
SD	0,34	0,38	5,8	0,85

Lampiran 8. Hasil daya lekat mukoadhesif

Replikasi	Waktu daya lekat (menit)				
	F I	F II	F III	F IV	F V
1	34,5	20,9	10,9	3,6	2,2
2	31,1	19,4	11,3	3,5	2,6
3	32,8	21,8	10,5	3,3	2,4
Rata-rata	32,8	20,7	10,9	3,5	2,4
SD	1,7	1,2	0,4	0,15	0,2

Lampiran 9. Operating time dan pembuatan kurva baku keseragaman kandungan

- Operating time

- Pembuatan kurva baku keseragaman kandungan

Konsentrasi (ppm)	Absorbansi
10	0,261
15	0,372
20	0,472
25	0,565
30	0,683
35	0,768

Data regresi linier:
A= 6,23 x 10^{-2}
B= 2,03 x 10^{-2}
r= 0,9993
Persamaan regresi linier:
$Y= 6{,}23x10^{-2} + 2{,}03x10^{-3}X$

Lampiran 10. Perhitungan keseragaman kandungan

Rumus kadar propranolol HCl :

$$\frac{\text{kadar (mg/ml) X faktor pembuatan x fx}}{\text{dosis propranolol HCl dalam 1 tablet}} \text{ x } 100\%$$

Volum faktor pembuatan : 50 ml

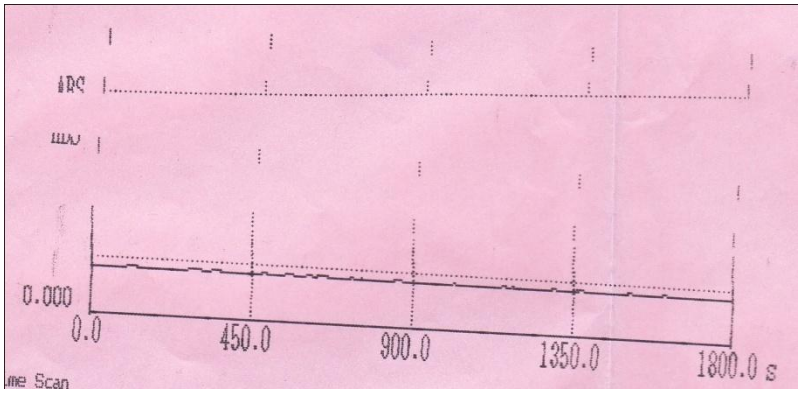
Dosisi propranolol HCl 1 tablet : 80 mg

Fx : faktor pengenceran

Replikasi	Penetapan kadar formula (%)				
	I	II	III	IV	V
1	98,13	100,95	101,7	101,7	102,83
2	99,17	103,4	93,8	102,1	106,27
3	100,63	103,1	104,5	92,08	95,06
Rata-rata	99,31	102,48	100	98,87	101,39
SD	1,26	1,34	5,55	5,25	5,74

Lampiran 11. Penentuan panjang gelombang, Operating time dan Pembuatan Kurva Baku disolusi

- Operating time

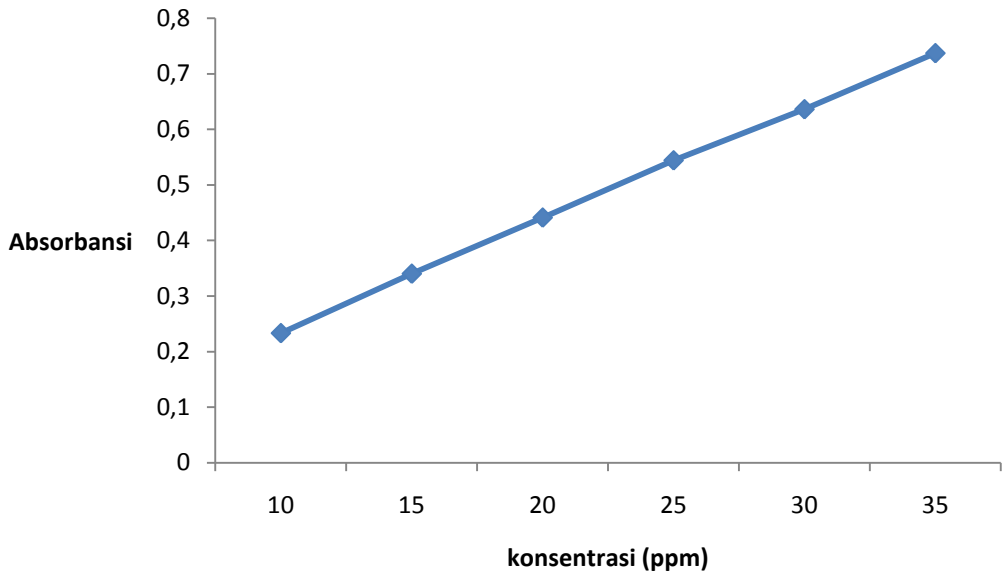


- Pembuatan kurva baku disolusi

Konsentrasi (ppm)	Absorbansi
10	0,233
15	0,340
20	0,441
25	0,544
30	0,636
35	0,737

Data regresi linier:
A= 3,7 x 10^{-2}
B= 2,0 x 10^{-2}
r= 0,9997
Persamaan regresi linier:

$$\mathbf{Y = 3{,}7x10^{-2} + 2{,}0x10^{-2}X}$$



Lampiran 12. Perhitungan kadar Propranolol HCl

Rumus kadarpropranolol HCl :

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

Volum media disolusi : 900 ml

Dosisi tramadol HCl 1 tablet : 80 mg

Fx : faktor pengenceran

Koreksi :

$$\frac{\text{zat aktif terdisolusi X volum sampling (ml)}}{\text{volum media disolusi (ml)}}$$

Total koreksi : jumlah koreksi antar waktu

Formula I replikasi 1

abs	Fp	kadar (%)	koreksi	Total koreksi	terdisolusi (mg)	% Disolusi
0	0	0	0	0	0	0
0,127	1	4,50	0,045	0,112	4,05	5,20
0,170	1	6,65	0,066	0,146	5,99	7,66
0,195	1	7,90	0,079	0,201	7,11	9,14
0,281	1	12,20	0,122	0,293	10,98	14,09
0,378	1	17,05	0,171	0,395	15,34	19,68
0,486	1	22,45	0,224	0,489	20,21	25,87
0,565	1	26,40	0,264	0,566	23,76	30,41
0,641	1	30,20	0,302	0,634	27,18	34,77
0,700	1	33,15	0,332	0,698	29,84	38,17
0,770	1	36,65	0,367	0,757	32,99	42,18
0,817	1	39,00	0,390	0,808	35,10	44,89
0,873	1	41,80	0,418	0,884	37,62	48,13
0,503	2	46,60	0,466	0,938	41,94	53,60
0,509	2	47,20	0,472	0,967	42,48	54,31
0,532	2	49,50	0,495	0,495	44,55	56,31

Formula I replikasi 2

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,142	1	5,25	0,053	0,128	4,85	6,07
10	0,188	1	7,55	0,076	0,161	6,96	8,70
15	0,208	1	8,55	0,086	0,199	7,89	9,87
30	0,264	1	11,35	0,114	0,262	10,48	13,10
60	0,333	1	14,80	0,148	0,330	13,65	17,06
90	0,401	1	18,20	0,182	0,393	16,77	20,97
120	0,459	1	21,10	0,211	0,455	19,44	24,31
150	0,524	1	24,35	0,244	0,511	22,43	28,03
180	0,571	1	26,70	0,267	0,556	24,59	30,73
210	0,614	1	28,85	0,289	0,602	26,57	33,21
240	0,664	1	31,35	0,314	0,647	28,86	36,08
270	0,704	1	33,35	0,334	0,682	30,70	38,37
300	0,734	1	34,85	0,349	0,715	32,08	40,10
330	0,769	2	36,60	0,366	0,748	33,69	42,11
360	0,800	2	38,15	0,382	0,382	34,72	43,40

Formula I replikasi 3

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,138	1	5,05	0,051	0,123	4,67	5,84
10	0,182	1	7,25	0,073	0,156	6,68	8,35
15	0,203	1	8,30	0,083	0,194	7,66	9,58
30	0,258	1	11,05	0,111	0,256	10,20	12,75
60	0,328	1	14,55	0,146	0,326	13,42	16,78
90	0,397	1	18,00	0,180	0,389	16,59	20,74
120	0,454	1	20,85	0,209	0,452	19,22	24,02
150	0,525	1	24,38	0,244	0,510	22,45	28,06
180	0,569	1	26,58	0,266	0,553	24,47	30,59
210	0,611	1	28,70	0,287	0,599	26,43	33,04
240	0,661	1	31,20	0,312	0,644	28,72	35,90
270	0,700	1	33,15	0,332	0,680	30,52	38,14
300	0,734	1	34,85	0,349	0,714	32,08	40,10
330	0,768	2	36,53	0,365	0,748	33,62	42,03
360	0,803	2	38,30	0,383	0,383	34,85	43,57

Formula II replikasi 1

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,136	1	4,95	0,050	0,117	4,57	5,72
10	0,172	1	6,75	0,068	0,162	6,24	7,80
15	0,226	1	9,45	0,095	0,211	8,72	10,89
30	0,269	1	11,60	0,116	0,266	10,71	13,38
60	0,337	1	15,00	0,150	0,342	13,84	17,30
90	0,420	1	19,15	0,192	0,407	17,64	22,05
120	0,467	1	21,50	0,215	0,486	19,84	24,80
150	0,579	1	27,10	0,271	0,572	24,96	31,20
180	0,638	1	30,05	0,301	0,633	27,68	34,60
210	0,702	1	33,25	0,333	0,694	30,62	38,27
240	0,759	1	36,10	0,361	0,748	33,24	41,55
270	0,810	1	38,65	0,387	0,812	35,60	44,50
300	0,462	2	42,50	0,425	0,871	39,12	48,90
330	0,483	2	44,60	0,446	0,914	41,05	51,32
360	0,505	2	46,80	0,468	0,468	42,59	53,24

Formula II replikasi 2

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,135	1	4,90	0,049	0,117	4,53	5,66
10	0,172	1	6,75	0,068	0,164	6,24	7,80
15	0,230	1	9,65	0,097	0,229	8,91	11,14
30	0,302	1	13,25	0,133	0,307	12,23	15,29
60	0,385	1	17,40	0,174	0,400	16,06	20,07
90	0,488	1	22,55	0,226	0,482	20,78	25,97
120	0,549	1	25,60	0,256	0,553	23,59	29,49
150	0,630	1	29,65	0,297	0,617	27,30	34,13
180	0,678	1	32,05	0,321	0,673	29,52	36,90
210	0,741	1	35,20	0,352	0,728	32,41	40,51
240	0,789	1	37,60	0,376	0,779	34,62	43,27
270	0,843	1	40,30	0,403	0,839	37,11	46,39
300	0,473	2	43,60	0,436	0,903	40,14	50,18
330	0,504	2	46,70	0,467	0,947	42,98	53,72
360	0,517	2	48,00	0,480	0,480	43,68	54,60

Formula II replikasi 3

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,134	1	4,85	0,049	0,115	4,48	5,60
10	0,170	1	6,65	0,067	0,161	6,15	7,68
15	0,226	1	9,45	0,095	0,218	8,72	10,90
30	0,284	1	12,33	0,123	0,284	11,38	14,22
60	0,359	1	16,10	0,161	0,369	14,86	18,57
90	0,452	1	20,75	0,208	0,442	19,12	23,90
120	0,506	1	23,45	0,235	0,517	21,62	27,03
150	0,603	1	28,28	0,283	0,592	26,04	32,55
180	0,656	1	30,95	0,310	0,651	28,51	35,63
210	0,720	1	34,13	0,341	0,709	31,42	39,28
240	0,772	1	36,75	0,368	0,761	33,84	42,30
270	0,825	1	39,38	0,394	0,822	36,26	45,32
300	0,466	2	42,85	0,429	0,883	39,45	49,31
330	0,492	2	45,45	0,455	0,927	41,83	52,29
360	0,509	2	47,20	0,472	0,472	42,95	53,69

Formula III replikasi 1

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,160	1	6,15	0,062	0,136	5,67	7,09
10	0,185	1	7,40	0,074	0,173	6,83	8,54
15	0,235	1	9,90	0,099	0,230	9,14	11,43
30	0,299	1	13,10	0,131	0,296	12,09	15,11
60	0,366	1	16,45	0,165	0,380	15,18	18,98
90	0,467	1	21,50	0,215	0,457	19,81	24,76
120	0,521	1	24,20	0,242	0,526	22,31	27,88
150	0,604	1	28,35	0,284	0,590	26,11	32,63
180	0,650	1	30,65	0,307	0,640	28,22	35,28
210	0,703	1	33,30	0,333	0,693	30,66	38,33
240	0,756	1	35,95	0,360	0,738	33,09	41,37
270	0,794	1	37,85	0,379	0,793	34,86	43,57
300	0,451	2	41,40	0,414	0,843	38,10	47,63
330	0,466	2	42,90	0,429	0,888	39,50	49,37
360	0,496	2	45,90	0,459	0,459	41,77	52,21

Formula III replikasi 2

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,137	1	5,00	0,050	0,123	4,62	5,78
10	0,182	1	7,25	0,073	0,159	6,68	8,36
15	0,210	1	8,65	0,087	0,212	8,00	10,00
30	0,287	1	12,50	0,125	0,296	11,55	14,43
60	0,378	1	17,05	0,171	0,390	15,74	19,67
90	0,476	1	21,95	0,220	0,476	20,23	25,29
120	0,550	1	25,65	0,257	0,555	23,64	29,55
150	0,633	1	29,80	0,298	0,621	27,44	34,30
180	0,683	1	32,30	0,323	0,677	29,75	37,18
210	0,744	1	35,35	0,354	0,732	32,55	40,68
240	0,794	1	37,85	0,379	0,782	34,85	43,56
270	0,843	1	40,30	0,403	0,842	37,11	46,39
300	0,476	2	43,90	0,439	0,898	40,41	50,51
330	0,496	2	45,90	0,459	0,947	42,26	52,82
360	0,525	2	48,80	0,488	0,488	44,41	55,51

Formula III replikasi 3

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,147	1	5,48	0,055	0,127	5,05	6,32
10	0,182	1	7,23	0,072	0,164	6,67	8,33
15	0,221	1	9,18	0,092	0,219	8,48	10,60
30	0,291	1	12,70	0,127	0,294	11,72	14,65
60	0,370	1	16,65	0,167	0,383	15,37	19,21
90	0,470	1	21,63	0,216	0,465	19,93	24,91
120	0,534	1	24,83	0,248	0,538	22,88	28,60
150	0,617	1	28,98	0,290	0,604	26,68	33,35
180	0,665	1	31,38	0,314	0,656	28,89	36,12
210	0,722	1	34,23	0,342	0,710	31,51	39,39
240	0,773	1	36,80	0,368	0,758	33,88	42,35
270	0,817	1	38,98	0,390	0,814	35,89	44,86
300	0,462	2	42,45	0,425	0,867	39,07	48,84
330	0,479	2	44,20	0,442	0,914	40,69	50,87
360	0,509	2	47,15	0,472	0,472	42,91	53,63

Formula IV replikasi 1

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,131	1	4,70	0,047	0,118	4,35	5,44
10	0,179	1	7,10	0,071	0,155	6,55	8,18
15	0,205	1	8,40	0,084	0,202	7,76	9,70
30	0,272	1	11,75	0,118	0,278	10,85	13,57
60	0,357	1	16,00	0,160	0,373	14,77	18,47
90	0,463	1	21,30	0,213	0,474	19,64	24,55
120	0,558	1	26,05	0,261	0,567	24,01	30,01
150	0,649	1	30,60	0,306	0,634	28,17	35,22
180	0,693	1	32,80	0,328	0,682	30,20	37,75
210	0,745	1	35,40	0,354	0,740	32,60	40,75
240	0,808	1	38,55	0,386	0,795	35,49	44,36
270	0,856	1	40,95	0,410	0,863	37,72	47,15
300	0,490	1	45,30	0,453	0,922	41,69	52,12
330	0,506	2	46,90	0,469	0,978	43,19	53,99
360	0,546	2	50,90	0,509	0,509	46,32	57,90

Formula IV replikasi 2

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,130	1	4,65	0,047	0,119	4,30	5,38
10	0,181	1	7,20	0,072	0,155	6,63	8,29
15	0,202	1	8,25	0,083	0,191	7,62	9,52
30	0,253	1	10,80	0,108	0,248	9,97	12,46
60	0,317	1	14,00	0,140	0,310	12,91	16,14
90	0,377	1	17,00	0,170	0,368	15,67	19,58
120	0,432	1	19,75	0,198	0,402	18,18	22,72
150	0,445	1	20,40	0,204	0,455	18,82	23,52
180	0,539	1	25,10	0,251	0,520	23,11	28,89
210	0,574	1	26,85	0,269	0,562	24,73	30,91
240	0,624	1	29,35	0,294	0,607	27,02	33,78
270	0,663	1	31,30	0,313	0,671	28,84	36,05
300	0,395	1	35,80	0,358	0,720	32,94	41,18
330	0,399	2	36,20	0,362	0,745	33,33	41,66
360	0,420	2	38,30	0,383	0,383	34,85	43,57

Formula IV replikasi 3

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,131	1	4,70	0,047	0,118	4,35	5,43
10	0,178	1	7,05	0,071	0,153	6,50	8,12
15	0,202	1	8,23	0,082	0,194	7,60	9,50
30	0,261	1	11,18	0,112	0,261	10,32	12,90
60	0,335	1	14,90	0,149	0,340	13,75	17,19
90	0,418	1	19,05	0,191	0,419	17,56	21,95
120	0,493	1	22,80	0,228	0,482	21,00	26,25
150	0,545	1	25,40	0,254	0,543	23,40	29,25
180	0,614	1	28,85	0,289	0,599	26,56	33,20
210	0,658	1	31,03	0,310	0,649	28,57	35,71
240	0,714	1	33,85	0,339	0,699	31,16	38,95
270	0,758	1	36,03	0,360	0,764	33,19	41,48
300	0,441	1	40,35	0,404	0,817	37,13	46,42
330	0,451	2	41,35	0,414	0,858	38,07	47,59
360	0,481	2	44,40	0,444	0,444	40,40	50,51

Formula V replikasi 1

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,138	1	5,05	0,051	0,122	4,67	5,83
10	0,180	1	7,15	0,072	0,154	6,59	8,24
15	0,202	1	8,25	0,083	0,192	7,62	9,52
30	0,256	1	10,95	0,110	0,255	10,11	12,64
60	0,327	1	14,50	0,145	0,325	13,38	16,72
90	0,397	1	18,00	0,180	0,388	16,59	20,74
120	0,453	1	20,80	0,208	0,454	19,17	23,97
150	0,529	1	24,60	0,246	0,513	22,65	28,32
180	0,570	1	26,65	0,267	0,554	24,54	30,67
210	0,612	1	28,75	0,288	0,600	26,48	33,09
240	0,662	1	31,25	0,313	0,644	28,77	35,96
270	0,700	1	33,15	0,332	0,682	30,52	38,15
300	0,738	1	35,05	0,351	0,717	32,26	40,33
330	0,770	2	36,65	0,367	0,753	33,74	42,17
360	0,810	2	38,65	0,387	0,387	35,17	43,96

Formula V replikasi 2

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,142	1	5,25	0,053	0,128	4,85	6,07
10	0,188	1	7,55	0,076	0,161	6,96	8,70
15	0,208	1	8,55	0,086	0,199	7,89	9,87
30	0,264	1	11,35	0,114	0,262	10,48	13,10
60	0,333	1	14,80	0,148	0,330	13,65	17,06
90	0,401	1	18,20	0,182	0,393	16,77	20,97
120	0,459	1	21,10	0,211	0,455	19,44	24,31
150	0,524	1	24,35	0,244	0,511	22,43	28,03
180	0,571	1	26,70	0,267	0,556	24,59	30,73
210	0,614	1	28,85	0,289	0,602	26,57	33,21
240	0,664	1	31,35	0,314	0,647	28,86	36,08
270	0,704	1	33,35	0,334	0,682	30,70	38,37
300	0,734	1	34,85	0,349	0,715	32,08	40,10
330	0,769	2	36,60	0,366	0,748	33,69	42,11
360	0,800	2	38,15	0,382	0,382	34,72	43,40

Formula V replikasi 3

Menit	Abs	Fp	kadar (%)	koreksi	total koreksi	terdisolusi (mg)	% Disolusi
0	0,000	0	0,00	0,000	0,000	0,00	0,00
5	0,138	1	5,05	0,051	0,123	4,67	5,84
10	0,182	1	7,25	0,073	0,156	6,68	8,35
15	0,203	1	8,30	0,083	0,194	7,66	9,58
30	0,258	1	11,05	0,111	0,256	10,20	12,75
60	0,328	1	14,55	0,146	0,326	13,42	16,78
90	0,397	1	18,00	0,180	0,389	16,59	20,74
120	0,454	1	20,85	0,209	0,452	19,22	24,02
150	0,525	1	24,38	0,244	0,510	22,45	28,06
180	0,569	1	26,58	0,266	0,553	24,47	30,59
210	0,611	1	28,70	0,287	0,599	26,43	33,04
240	0,661	1	31,20	0,312	0,644	28,72	35,90
270	0,700	1	33,15	0,332	0,680	30,52	38,14
300	0,734	1	34,85	0,349	0,714	32,08	40,10
330	0,768	2	36,53	0,365	0,748	33,62	42,03
360	0,803	2	38,30	0,383	0,383	34,85	43,57

Lampiran 13. Foto alat-alat yang digunakan

Timbangan analitik

Mesin pencampur modifikasi

Friabilator tester

Hardness tester

Disolution tester

Spektrofotomer UV-Vis

Alat cetak tablet

Lampiran 14. Analisa statistika Anova

a. Waktu alir granul

One-Sample Kolmogorov-Smirnov Test

		waktualir
N		15
Normal Parameters[a,,b]	Mean	7.9967
	Std. Deviation	1.00151
Most Extreme Differences	Absolute	.174
	Positive	.092
	Negative	-.174
Kolmogorov-Smirnov Z		.674
Asymp. Sig. (2-tailed)		.754

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Waktualir

Levene Statistic	df1	df2	Sig.
1.572	4	10	.256

ANOVA

Waktualir

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.656	4	2.914	12.209	.001
Within Groups	2.387	10	.239		
Total	14.042	14			

Multiple Comparisons

Waktualir
Tukey HSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula I	formula II	-1.21667	.39889	.073	-2.5294	.0961
	formula III	-1.88333*	.39889	.006	-3.1961	-.5706
	formula IV	-2.60000*	.39889	.000	-3.9128	-1.2872
	formlua V	-1.95000*	.39889	.004	-3.2628	-.6372
formula II	formula I	1.21667	.39889	.073	-.0961	2.5294
	formula III	-.66667	.39889	.490	-1.9794	.6461
	formula IV	-1.38333*	.39889	.038	-2.6961	-.0706
	formlua V	-.73333	.39889	.405	-2.0461	.5794
formula III	formula I	1.88333*	.39889	.006	.5706	3.1961
	formula II	.66667	.39889	.490	-.6461	1.9794
	formula IV	-.71667	.39889	.426	-2.0294	.5961
	formlua V	-.06667	.39889	1.000	-1.3794	1.2461
formula IV	formula I	2.60000*	.39889	.000	1.2872	3.9128
	formula II	1.38333*	.39889	.038	.0706	2.6961
	formula III	.71667	.39889	.426	-.5961	2.0294
	formlua V	.65000	.39889	.513	-.6628	1.9628
formlua V	formula I	1.95000*	.39889	.004	.6372	3.2628
	formula II	.73333	.39889	.405	-.5794	2.0461
	formula III	.06667	.39889	1.000	-1.2461	1.3794
	formula IV	-.65000	.39889	.513	-1.9628	.6628

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

b. Kelembaban

One-Sample Kolmogorov-Smirnov Test

		kelembaban
N		15
Normal Parameters[a,,b]	Mean	7.0467
	Std. Deviation	1.03776
Most Extreme Differences	Absolute	.301
	Positive	.301
	Negative	-.133
Kolmogorov-Smirnov Z		1.165
Asymp. Sig. (2-tailed)		.132

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

kelembaban

Levene Statistic	df1	df2	Sig.
4.166	4	10	.031

ANOVA

kelembaban

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.831	4	3.458	27.735	.000
Within Groups	1.247	10	.125		
Total	15.077	14			

Multiple Comparisons

kelembaban

Tukey HSD

(I) formula (J)	Mean	Std. Error	Sig.	95% Confidence Interval

	formula	Difference (I-J)			Lower Bound	Upper Bound
formula I	formula II	-.43333	.28829	.583	-1.3821	.5155
	formula III	-.60000	.28829	.298	-1.5488	.3488
	formula IV	-1.10000*	.28829	.022	-2.0488	-.1512
	formula V	-2.76667*	.28829	.000	-3.7155	-1.8179
formula II	formula I	.43333	.28829	.583	-.5155	1.3821
	formula III	-.16667	.28829	.975	-1.1155	.7821
	formula IV	-.66667	.28829	.218	-1.6155	.2821
	formula V	-2.33333*	.28829	.000	-3.2821	-1.3845
formula III	formula I	.60000	.28829	.298	-.3488	1.5488
	formula II	.16667	.28829	.975	-.7821	1.1155
	formula IV	-.50000	.28829	.457	-1.4488	.4488
	formula V	-2.16667*	.28829	.000	-3.1155	-1.2179
formula IV	formula I	1.10000*	.28829	.022	.1512	2.0488
	formula II	.66667	.28829	.218	-.2821	1.6155
	formula III	.50000	.28829	.457	-.4488	1.4488
	formula V	-1.66667*	.28829	.001	-2.6155	-.7179
formula V	formula I	2.76667*	.28829	.000	1.8179	3.7155
	formula II	2.33333*	.28829	.000	1.3845	3.2821
	formula III	2.16667*	.28829	.000	1.2179	3.1155
	formula IV	1.66667*	.28829	.001	.7179	2.6155

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

c. Daya serap air

One-Sample Kolmogorov-Smirnov Test

		dayaserapair
N		15
Normal Parameters[a,,b]	Mean	5.7213

	Std. Deviation	4.04419
Most Extreme Differences	Absolute	.188
	Positive	.158
	Negative	-.188
Kolmogorov-Smirnov Z		.727
Asymp. Sig. (2-tailed)		.666

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Dayaserapair

Levene Statistic	df1	df2	Sig.
2.290	4	10	.131

ANOVA

Dayaserapair

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	228.672	4	57.168	1876.822	.000
Within Groups	.305	10	.030		
Total	228.977	14			

Multiple Comparisons

dayaserapair

Tukey HSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formmula I	formula II	-2.51000*	.14250	.000	-2.9790	-2.0410
	formula III	-5.34667*	.14250	.000	-5.8157	-4.8777

	formula IV	-10.63333*	.14250	.000	-11.1023	-10.1643
	formula V	-8.76667*	.14250	.000	-9.2357	-8.2977
formula II	formmula I	2.51000*	.14250	.000	2.0410	2.9790
	formula III	-2.83667*	.14250	.000	-3.3057	-2.3677
	formula IV	-8.12333*	.14250	.000	-8.5923	-7.6543
	formula V	-6.25667*	.14250	.000	-6.7257	-5.7877
formula III	formmula I	5.34667*	.14250	.000	4.8777	5.8157
	formula II	2.83667*	.14250	.000	2.3677	3.3057
	formula IV	-5.28667*	.14250	.000	-5.7557	-4.8177
	formula V	-3.42000*	.14250	.000	-3.8890	-2.9510
formula IV	formmula I	10.63333*	.14250	.000	10.1643	11.1023
	formula II	8.12333*	.14250	.000	7.6543	8.5923
	formula III	5.28667*	.14250	.000	4.8177	5.7557
	formula V	1.86667*	.14250	.000	1.3977	2.3357
formula V	formmula I	8.76667*	.14250	.000	8.2977	9.2357
	formula II	6.25667*	.14250	.000	5.7877	6.7257
	formula III	3.42000*	.14250	.000	2.9510	3.8890
	formula IV	-1.86667*	.14250	.000	-2.3357	-1.3977

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

d. Kekerasan

One-Sample Kolmogorov-Smirnov Test

		kekerasantablet
N		15
Normal Parameters[a,,b]	Mean	10.7200
	Std. Deviation	.36489
Most Extreme Differences	Absolute	.211
	Positive	.123
	Negative	-.211
Kolmogorov-Smirnov Z		.819
Asymp. Sig. (2-tailed)		.513

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Kekerasantablet

Levene Statistic	df1	df2	Sig.
4.686	4	10	.022

ANOVA

Kekerasantablet

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.017	4	.254	3.004	.072
Within Groups	.847	10	.085		
Total	1.864	14			

e. *Swelling index*

One-Sample Kolmogorov-Smirnov Test

		swellingindex
N		15
Normal Parameters[a,,b]	Mean	340.1567
	Std. Deviation	30.81844
Most Extreme Differences	Absolute	.275
	Positive	.225
	Negative	-.275
Kolmogorov-Smirnov Z		1.065
Asymp. Sig. (2-tailed)		.207

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Swellingindex

Levene Statistic	df1	df2	Sig.
2.217	4	10	.140

ANOVA

Swellingindex

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13290.986	4	3322.746	5651.570	.000
Within Groups	5.879	10	.588		
Total	13296.865	14			

Multiple Comparisons

swellingindex

Tukey HSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula I	formula II	13.04000*	.62606	.000	10.9796	15.1004
	formula III	63.57000*	.62606	.000	61.5096	65.6304
	formula IV	19.79000*	.62606	.000	17.7296	21.8504
	formula V	75.95000*	.62606	.000	73.8896	78.0104
formula II	formula I	-13.04000*	.62606	.000	-15.1004	-10.9796
	formula III	50.53000*	.62606	.000	48.4696	52.5904
	formula IV	6.75000*	.62606	.000	4.6896	8.8104
	formula V	62.91000*	.62606	.000	60.8496	64.9704
formula III	formula I	-63.57000*	.62606	.000	-65.6304	-61.5096
	formula II	-50.53000*	.62606	.000	-52.5904	-48.4696
	formula IV	-43.78000*	.62606	.000	-45.8404	-41.7196
	formula V	12.38000*	.62606	.000	10.3196	14.4404
formula IV	formula I	-19.79000*	.62606	.000	-21.8504	-17.7296
	formula II	-6.75000*	.62606	.000	-8.8104	-4.6896
	formula III	43.78000*	.62606	.000	41.7196	45.8404
	formula V	56.16000*	.62606	.000	54.0996	58.2204
formula V	formula I	-75.95000*	.62606	.000	-78.0104	-73.8896
	formula II	-62.91000*	.62606	.000	-64.9704	-60.8496
	formula III	-12.38000*	.62606	.000	-14.4404	-10.3196
	formula IV	-56.16000*	.62606	.000	-58.2204	-54.0996

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

f. daya lekat mukoadhesif

One-Sample Kolmogorov-Smirnov Test

		dayalekat
N		15
Normal Parameters[a,,b]	Mean	14.0533
	Std. Deviation	11.86073
Most Extreme Differences	Absolute	.211
	Positive	.211
	Negative	-.159
Kolmogorov-Smirnov Z		.817
Asymp. Sig. (2-tailed)		.517

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Dayalekat

Levene Statistic	df1	df2	Sig.
2.383	4	10	.121

ANOVA

Dayalekat

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1960.311	4	490.078	534.630	.000
Within Groups	9.167	10	.917		
Total	1969.477	14			

Multiple Comparisons

Dayalekat
Tukey HSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula I	formula II	12.10000*	.78174	.000	9.5272	14.6728
	formula III	21.90000*	.78174	.000	19.3272	24.4728
	formula IV	29.33333*	.78174	.000	26.7606	31.9061
	formula V	30.40000*	.78174	.000	27.8272	32.9728
formula II	formula I	-12.10000*	.78174	.000	-14.6728	-9.5272
	formula III	9.80000*	.78174	.000	7.2272	12.3728
	formula IV	17.23333*	.78174	.000	14.6606	19.8061
	formula V	18.30000*	.78174	.000	15.7272	20.8728
formula III	formula I	-21.90000*	.78174	.000	-24.4728	-19.3272
	formula II	-9.80000*	.78174	.000	-12.3728	-7.2272
	formula IV	7.43333*	.78174	.000	4.8606	10.0061
	formula V	8.50000*	.78174	.000	5.9272	11.0728
formula IV	formula I	-29.33333*	.78174	.000	-31.9061	-26.7606
	formula II	-17.23333*	.78174	.000	-19.8061	-14.6606
	formula III	-7.43333*	.78174	.000	-10.0061	-4.8606
	formula V	1.06667	.78174	.661	-1.5061	3.6394
formula V	formula I	-30.40000*	.78174	.000	-32.9728	-27.8272
	formula II	-18.30000*	.78174	.000	-20.8728	-15.7272

	formula III	-8.50000*	.78174	.000	-11.0728	-5.9272
	formula IV	-1.06667	.78174	.661	-3.6394	1.5061

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