BAB V

KESIMPULAN DAN SARAN

A. Kesimpulan

Hasil penelitian ini dapat disimpulkan bahwa :

1. Kombinasi natrium lauril sulfat dan Mg stearat dapat meningkatkan disolusi dari tablet campuran interaktif deksametason.

2. Kombinasi natrium lauril sulfat dan Mg stearat berpengaruh terhadap mutu fisik tablet campuran interaktif deksametason. Hanya saja pada formula I memiliki kerapuhan lebih dari 1%.

3. Proporsi kombinasi *solubiliizing agent* natrium lauril sulfat sebesar 0,696% dengan pelicin Mg sterarat sebesar 0,804% dapat menghasilkan tablet campuran interaktif deksametason yang optimal.

B. Saran

Saran dari penelitian ini adalah :

1. Perlu dilakukan penelitian lebih lanjut untuk membuat tablet campuran interaktif deksametason dengan menggunakan *solubilizing agent* dan pelicin yang lain serta pengaruh ukuran granulatum simplex terhadap mutu fisik dan disolusinya.

2. Perlu dilakukan penelitian lebih lanjut untuk membuat tablet campuran interaktif deksametason dengan ukuran *host* yang berbeda-beda.

DAFTAR PUSTAKA

Anief, Moh. 1987. *Ilmu Meracik Obat*. Yogyakara: Gadjah Mada University Press.

Anonim[a]. 1979. *Farmakope Indonesia edisi ketiga*. Departemen Kesehatan Republik Indonesia.

Anonim[b]. 1995. *Farmakope Indonesia edisi keempat*. Departemen Kesehatan Republik Indonesia.

Ansel, Howard C. 1989. *Pengantar Sediaan Farmasi edisi IV*. Terjemahan Farida Ibrahim. Jakarta: Universitas Indonesia Press.

Bolhuis, G.K., 1988, *Formulation and Disintegration Aspects of Tablets Prepared by Direct Compression and Wet Granulation*, Laboratory for Pharmaceutical Technology and Dispensing, University of Groningen, Groningen the Netherlands.

Bolton, S., 1997, *Pharmaceutical Statistic : Practical and Clinical Aplication*, 3rd ed., Marcel Decker Inc., New York.

Budi A. 2005. *Optimasi Formulasi Tablet Deksametason Dengan Simpleks Sekuensial* [Tesis]. Yogyakarta: Fakultas Farmasi, Universitas Gajah Mada.

Fudholi, A., 1983, Metodologi Formulasi Dalam Kompresi Direk, *Medika.*

Kholik A. 2005. *Optimasi Proporsi Campuran PVP-K29/32-L-HPC LH-11- Na Lauril Sulfat Untuk Formula Tablet Asam Mefenamat* [Tesis]. Yogyakarta: Fakultas Farmasi, Universitas Gajah Mada.

Kuncahyo I. 2009. *Pengaruh Magnesium Stearat, Talk Atau Campurannya Terhadap Waktu Hancur Dan Disolusi Tablet Prednison Dan Klorfeniramin Maleat Pada Campuran Interaktifnya* [Tesis]. Yogyakarta: Fakultas Farmasi, Universitas Gajah Mada.

Lachman, Leon. 1994. *Teori dan Praktek Farmasi Industri edisi Ketiga*. Jakarta: Universitas Indonesia.

Lai, F. and Hersey, J.A., 1979, A Cautionary Note on The Use of Ordered Powder Mixtures in Pharmaceutical Dosage Forms, *J. Pharm. Pharmacol*.

Martin A, Bustamante P, Chun AHC. 1993. Physical Pharmacy, 4th Ed. Philadelphia: Lea and Febiger.

McGinity, J.W., Ku, C., Bodmeter, R. and Harris, H.R., 1985, Dissolution and Uniformity Properties of Ordered Mixes of Micronized Griseofulfin Directly Compressible Excipient, *Drug Dev. & Ind. Pharm*.

Noory C, Tran N, Ouderkirk L, and Shah. 2000. *Steps for Development of a Dissolution Test for Sparingly Water-Soluble Drug Products*. Dissolution Technologies, Vol. 7.

Nystrom, C. and Westerberg, M., 1986, The use of Ordered Mixtures for Improving the Dissolution rate of Low Solubility Compound, *J. Pharm. Pharmacol*.

Rosen MJ. 1978. *Surfactan and Interfacial Phenomena*. New York: Jons Willey and Sons, Inc.

Shargel L & Yu ABC. 1993. *Applied Biopharmacetics and Pharmacocinetics*, 3rd Ed. Apleton & Lance Notwolk.

Shargel L, Wu Pong S, Yu ABC. 2005. *Applied Biopharmacetics and Pharmacocinetics*, 5th Ed. Singapore: Mc. Graw and Hill.

Shek, E., Ghani, M. and Jones, R.E., 1980, Simplex Search in Optimization of capsule Formulation, *J. Pharm. Sci*., **Vol** 69, No 10, October 1980, American Pharmaceutical Association.

Sheth, B.B., Bandelin, F.J. and Shangraw, R.F., 1980, Compressed Tablets in *Pharmaceutical Dossage Form : Tablets*, **Vol** I., Marcell Dekker, Inc., New York.

Siregar, Charles Prof.Dr. 2007. *Teknologi Farmasi Sediaan Tablet*. Bandung: Penerbit Buku Kedokteran.

Soebagyo, S.S., 1986, Investigation of Drug Homogeneity and Segregation in Ternary Interactive Drug Systems, *Disertation*, University of Queensland, Australia.

Soebagyo, S.S., 1994, Pengaruh Magnesium Stearat, Polietilengglikol 4000 atau Campurannya Terhadap Sifat Fisis dan Profil Disolusi Deksametason Pada Tablet campuran Interaktif Deksametason, *Majalah Farmasi Indonesia*.

Soebagyo, S.S. dan Stewart, P.J.,1999, *Majalah Farmasi Indonesia.*

Staniforth, J.N., Rees, J.E., Lai, F.K. and Hersey, J.A., 1981, Determination of Interparticulate Forces in Ordered Powder Mixes, *J. Pharm. Pharmacol*.

Sulaiman TNS. 2007. *Teknologi dan Formulasi Sediaan Tablet*. Yogyakarta: Laboratorium Teknologi Formulasi Fakultas Farmasi Universitas Gajah Mada.

Swaminathan, V. and Kildsig, D.O., 2002, Polydisperse Powder Mixtures: Effect of Particle Size and Shape on Mixture Stability, *Drug Dev. & Ind. Pharm*.

Swarbrick J & Boylan JC. 1994. *Encyclopedia of Pharmaceutical Technology*, Vol, 14. New York: Marcell Dekker, Inc.

Thiel, W.J. and Nguyen, L.T., 1984, Fluidized Bed Film Coating of Ordered Powder Mixtures to Produce Microcapsulated Ordered Units, *Powder Tech*.

Tjay, Tan Hoan. 2002.*Obat-obat Penting*. Jakarta: PT Gramedia

Voight, Rudolf. 1995. *Buku Pelajaran Teknologi Farmasi edisi V*. Soedani Noerono, penerjemah. Yogyakarta: Gajah Mada University Press. Terjemahan dari: Lehrburch der Pharmazecutishen Technology.

LAMPIRAN

Lampiran 1. Sertifikat analisis deksametason

kɪmɪa farma

LAPORAN ANALISA BAHAN BAKU

Nama Bahan Baku : DEXAMETHASONUM	No. Batch :ND 120705 Exp. Date :06-07-2017	Kode Dokumen : FQC-01-0080/02 Tgl. Berlaku Dokumen : 16 Mei 2012

Kode Bahan :3012175 Origin :Tianjin Tianyao - China No. LA :B121039 No. SP :P123441	Supplier :PT. Cipta Prima Chemindo Tgl. Sampling :17-12-2012 Tgl. Selesai :18-12-2012	Jumlah :3.000 g Pemeriksa :Saehudin No. BTBS :B121039

No.	PEMERIKSAAN	PERSYARATAN	HASIL
1	Pemerian (R)	Serbuk kristal,warna putih sampai hampir putih, tidak berbau, stabil di udara	Serbuk, warna hampir putih, tidak berbau, stabil di udara
2	Kelarutan	Praktis tidak larut dalam air, agak sukar larut dalam alkohol	Sesuai
3	Identifikasi (R)	Spektrum serapan ultraviolet larutan uji menunjukkan maksimum dan minimum hanya pada panjang gelombang yang sama seperti pada Dexamethasonum baku	Sesuai
4	Titik Leleh	$\pm 250^0$C disertai penguraian	$248,3^0$C
5	Rotasi Jenis	Antara $+72^0$ dan $+80^0$, dihitung terhadap berat kering	$+78,9^0$
6	Susut Pengeringan (R)	Tidak lebih dari 0,5%	0,14%
7	Sisa Pemijaran	Tidak lebih dari 0,2%	0
8	Kadar (R)	Antara 97,0% - 102,0%, dihitung terhadap berat kering	99,28%

Pustaka : USP 34

Kesimpulan : Memenuhi Syarat

Bandung, 18 Desember 2012
Penanggung Jawab :
AMQC

(Diah Sofiyanti, S.Si, Apt)

Halaman 1 dari 1

Lampiran 2. Foto granul dan tablet deksametason

Granul formula I

Tablet formula I

Granul formula II

Tablet formula II

Granul formula III

Tablet formula III

Granul formula optimum

Tablet formula optimum

Lampiran 3. Foto alat-alat yang digunakan

Timbangan analitik

Mesin pencampur modifikasi

Friabilator tester
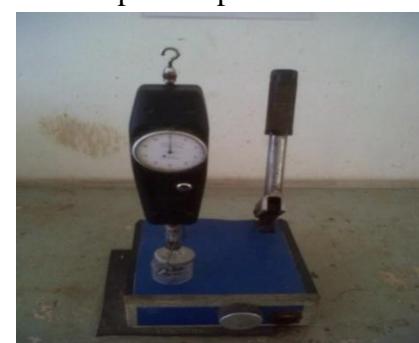
Hardness tester

Disolution tester

Spektrofotomer UV-Vis

Alat cetak tablet

Lampiran 4. Waktu alir granul

a. Formula I

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)
	2,35		9,4
25,0038	2,26	100,0152	9,04
	2,31		9,24
Rata-rata			9,23
SD			0,18

b. Formula II

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)
	2,2		8,8
25,0010	2,16	100,0040	8,64
	2,21		8,84
Rata-rata			8,76
SD			0,11

c. Formula III

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)
	1,93		7,72
25,0001	2	100,0004	8
	1,95		7,8
Rata-rata			7,84
SD			0,14

Lampiran 5. Keseragaman bobot

NO	Keseragaman Bobot Formula I (mg)		
	Replikasi I	Replikasi II	Replikasi III
1	197,5	198,3	198,0
2	196,4	198,6	197,0
3	196,0	198,7	196,1
4	197,2	198,7	196,7
5	196,8	198,1	196,0
6	197,4	198,0	198,8
7	197,1	198,3	197,3
8	196,3	198,6	197,4
9	198,0	198,7	197,3
10	197,5	198,0	196,5
11	196,4	198,7	197,1
12	197,3	198,6	198,2
13	197,8	198,1	196,9
14	196,7	197,8	197,0
15	197,3	198,1	197,2
16	196,4	198,1	197,2
17	197,0	198,0	198,0
18	196,5	197,6	197,5
19	197,6	198,0	197,3
20	196,7	198,3	196,4
X	196,99	198,63	197,19
SD	0,56	0,336	0,69
CV	0,283%	0,169%	0,35%

*Keterangan :

X   = rata-rata perhitungan
SD   = simpangan baku
CV   = *coefficient of variation*

NO	Keseragaman Bobot Formula II (mg)		
	Replikasi I	Replikasi II	Replikasi III
1	197,8	195,3	196,3
2	197,2	195,8	196,7
3	197,5	195,9	196,4
4	197,6	195,9	196,3
5	197,2	195,8	196,3
6	197,0	195,2	196,9
7	197,3	195,5	196,4
8	197,9	195,3	196,2
9	197,9	195,8	196,4
10	197,2	195,2	196,3
11	197,8	195,9	196,6
12	197,2	195,8	196,9
13	197,7	195,0	196,6
14	197,7	195,1	197,1
15	197,5	195,7	196,9
16	197,2	195,0	197,2
17	197,3	195,8	196,6
18	197,5	195,1	197,2
19	197,2	196,0	197,1
20	197,7	195,7	197,1
x	197,47	195,545	196,675
SD	0,28	0,35	0,35
CV	0,14%	0,177%	0,176%

*Keterangan :
X   = rata-rata perhitungan
SD   = simpangan baku
CV   = *coefficient of variation*

NO,	Keseragaman Bobot Formula III (mg)		
	Replikasi I	Replikasi II	Replikasi III
1	198,5	198,5	197,5
2	197,8	197,7	197,1
3	198,0	198,1	197,6
4	198,4	198,0	198,0
5	198,2	198,5	197,5
6	197,4	198,2	197,1
7	197,8	198,3	197,2
8	198,1	198,5	197,5
9	197,3	197,2	197,4
10	198,1	197,2	197,8
11	198,0	197,9	197,1
12	198,0	197,2	197,3
13	198,5	198,1	197,7
14	198,0	198,3	197,5
15	199,0	198,0	197,5
16	198,3	198,2	197,8
17	198,1	197,7	197,8
18	197,6	197,5	198,0
19	198,5	198,0	197,8
20	198,4	198,9	197,5
x	198,1	198	196,68
SD	0,41	0,47	0,28
CV	0,21%	0,24%	0,14%

*Keterangan :

X   = rata-rata perhitungan
SD   = simpangan baku
CV   = *coefficient of variation*

Hasil perhitungan rentang keseragaman bobot:

Formula	Kolom A	Kolom B
I	182,79 – 212,43	167,96 – 227,25
II	181,82 – 211,30	167,05 – 226,01
III	182,77 – 212,41	167,95 – 227,23

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

Lampiran 6. Kekerasan tablet

NO	Kekerasan Formula I (kg)		
	Replikasi I	Replikasi II	Replikasi III
1	6,2	6,4	6,1
2	6,0	6,2	5,8
3	6,2	6,0	6,2
x	6,13	6,2	6,03
SD	0,12	0,2	0,21

NO	Kekerasan Formula II (kg)		
	Replikasi I	Replikasi II	Replikasi III
1	6,1	6,7	6,7
2	6,5	6,7	6,5
3	6,5	6,5	6,5
X	6,37	6,63	6,57
SD	0,23	0,12	0,12

NO	Kekerasan Formula III (kg)		
	Replikasi I	Replikasi II	Replikasi III
1	6,4	6,4	6,4
2	6,6	6,5	6,5
3	6,6	6,4	6,3
x	6,53	6,43	6,4
SD	0,12	0,06	0,1

Lampiran 7. Kerapuhan tablet

	Kerapuhan Formula I		
	Replikasi I	Replikasi II	Replikasi III
Berat awal (g)	3,9321	3,9116	3,9247
Berat akhir (g)	3,8556	3,8415	3,8673
% Kerapuhan	1,95%	1,78%	1,46%

	Kerapuhan Formula II		
	Replikasi I	Replikasi II	Replikasi III
Berat awal (g)	3,9198	3,8985	3,9131
Berat akhir (g)	3,8823	3,8575	3,8761
% Kerapuhan	0,95%	1,04%	0,94%

	Kerapuhan Formula III		
	Replikasi I	Replikasi II	Replikasi III
Berat awal (g)	3,9510	3,9509	3,9548
Berat akhir (g)	3,9224	3,9195	3,9344
% Kerapuhan	0,72%	0,79%	0,52%

Contoh Perhitungan

$$\% \text{ Kerapuhan} = \frac{Berat\ awal - berat\ akhir\ (g)}{Berat\ awal\ (g)} \text{ x } 100\%$$

$$= \frac{3,9321 - 3,9116}{3,9321} \text{ x } 100\%$$

$$= 1,95\%$$

Lampiran 8. Waktu hancur tablet

NO	Waktu Hancur Formula I (detik)		
	Replikasi I	Replikasi II	Replikasi III
1	48	48	49
2	48	48	48
3	49	50	50
x	48,33	48,67	49
SD	0,58	1,16	1

NO	Waktu Hancur Formula II (detik)		
	Replikasi I	Replikasi II	Replikasi III
1	99	104	120
2	102	104	117
3	104	110	104
x	101,67	106	113,67
SD	0,12	3,46	8,51

NO	Waktu Hancur Formula III (detik)		
	Replikasi I	Replikasi II	Replikasi III
1	201	206	206
2	220	215	201
3	217	210	210
x	212,67	210,33	205,67
SD	10,21	4,51	4,51

Lampiran 9. Penentuan panjang gelombang maksimum kurva baku deksametason dalam metanol

Panjang Gelombang (nm)	Absorbansi (A)	Panjang Gelombang (nm)	Absorbansi (A)
200	0,786	255	0,721
205	0,781	260	0,692
210	0,755	265	0,666
215	0,745	270	0,638
220	0,753	275	0,610
225	0,771	280	0,587
230	0,791	285	0,573
235	0,803	290	0,568
240	0,805	295	0,565
245	0,785	300	0,563
250	0,754		

Lampiran 10. Penentuan panjang gelombang maksimum kurva baku deksametason dalam larutan HCl 1 : 100

Panjang Gelombang (nm)	Absorbansi (A)	Panjang Gelombang (nm)	Absorbansi (A)
200	0,647	305	0,081
205	0,533	310	0,078
210	0,495	315	0,075
215	0,514	320	0,072
220	0,585	325	0,070
225	0,698	330	0,068
230	0,833	335	0,067
235	0,956	340	0,066
240	0,1021	345	0,065
245	1,002	350	0,064
250	0,908	355	0,063
255	0,773	360	0,062
260	0,652	365	0,062
265	0,562	370	0,062
270	0,481	375	0,061
275	0,388	380	0,056
280	0,286	385	0,055
285	0,194	390	0,054
290	0,133	395	0,053
295	0,101	400	0,053
300	0,087		

Lampiran 11. Perhitungan kadar deksametason

a. Formula I

Waktu (menit)	Rep	Y (Abs)	C (mg/ml)	C Dalam 500 ml	Kadar (%)	X	SD
5	1	0,123	0,000493	0,24639	49,28	54,44	3,95
	2	0,125	0,000534	0,26701	53,40		
	3	0,127	0,000575	0,28763	57,53		
	4	0,127	0,000575	0,28763	57,53		
15	1	0,130	0,000637	0,31856	63,71	65,77	6,51
	2	0,127	0,000575	0,28763	57,53		
	3	0,134	0,000719	0,35979	71,95		
	4	0,133	0,000699	0,34945	69,89		
30	1	0,143	0,000905	0,45258	90,52	91,52	1,69
	2	0,142	0,000885	0,44227	88,45		
	3	0,143	0,000905	0,45258	90,52		
	4	0,144	0,000926	0,46289	92,58		
45	1	0,147	0,000988	0,49381	98,76	100,31	1,98
	2	0,147	0,000988	0,49381	98,76		
	3	0,148	0,001008	0,50412	100,83		
	4	0,149	0,001029	0,51443	102,89		

b. Formula II

Waktu (menit)	Rep	Y (Abs)	C (mg/ml)	C Dalam 500 ml	Kadar (%)	X	SD
5	1	0,122	0,000473	0,23608	47,22	41,55	5,42
	2	0,117	0,000369	0,18454	36,91		
	3	0,117	0,000369	0,18454	36,91		
	4	0,121	0,000452	0,22577	45,16		
15	1	0,127	0,000575	0,2876	57,53	52,89	6,60
	2	0,128	0,000596	0,29798	59,59		
	3	0,122	0,000473	0,23608	47,22		
	4	0,122	0,000473	0,23608	47,22		
30	1	0,128	0,000596	0,29798	59,59	65,77	7,34
	2	0,133	0,000699	0,34948	69,89		
	3	0,135	0,000740	0,37010	74,02		
	4	0,128	0,000596	0,29798	59,59		
45	1	0,146	0,000967	0,48351	96,70	91,03	4,57
	2	0,142	0,000885	0,44227	88,45		
	3	0,141	0,000864	0,43196	86,39		
	4	0,144	0,000926	0,46289	92,58		

c. Formula III

Waktu (menit)	Rep	Y (Abs)	C (mg/ml)	C Dalam 500 ml	Kadar (%)	X	SD
5	1	0,104	0,000101	0,05052	10,10	12,17	2,92
	2	0,105	0,000122	0,06082	12,17		
	3	0,107	0,000163	0,08144	16,29		
	4	0,104	0,000101	0,05052	10,10		
15	1	0,119	0,000410	0,20515	41,03	42,06	1,19
	2	0,119	0,000410	0,20515	41,03		
	3	0,120	0,000431	0,21546	43,09		
	4	0,120	0,000431	0,21546	43,09		
30	1	0,126	0,000555	0,27731	55,46	56,49	1,19
	2	0,127	0,000575	0,28762	57,53		
	3	0,127	0,000575	0,28762	57,53		
	4	0,126	0,000555	0,27731	55,46		
45	1	0,131	0,000658	0,32889	65,77	69,89	6,52
	2	0,134	0,000719	0,35979	71,96		
	3	0,137	0,000781	0,39072	78,14		
	4	0,130	0,000637	0,31856	63,71		

d. Tablet generik

Waktu (menit)	Rep	Y (Abs)	C (mg/ml)	C Dalam 500 ml	Kadar (%)	X	SD
5	1	0,147	0,000988	0,49381	98,76	93,09	5,68
	2	0,143	0,000905	0,45258	90,52		
	3	0,146	0,000967	0,48351	96,70		
	4	0,141	0,000864	0,43196	86,39		
15	1	0,149	0,001029	0,51443	102,89	97,73	5,19
	2	0,147	0,000988	0,49381	98,76		
	3	0,147	0,000988	0,49381	98,76		
	4	0,143	0,000905	0,45258	90,52		
30	1	0,149	0,001029	0,51443	102,89	99,28	2,59
	2	0,147	0,000988	0,49381	98,76		
	3	0,147	0,000988	0,49381	98,76		
	4	0,146	0,000967	0,48351	96,70		
45	1	0,150	0,001049	0,52474	104,95	101,86	2,66
	2	0,147	0,000988	0,49381	98,763		
	3	0,149	0,001029	0,51443	102,89		
	4	0,148	0,001008	0,50412	100,83		

Lampiran 12. Uji sifat fisik tablet formula optimum

a. Waktu alir

Bobot (gram)	Waktu (detik)	Bobot (gram)	Waktu (detik)
	2,03		8,12
25,0020	2,05	100,0080	8,15
	2,09		8,36
Rata-rata			8,21
SD			0,131

b. Keseragaman bobot

NO	Keseragaman Bobot Formula Optimum (mg)		
	Replikasi I	Replikasi II	Replikasi III
1	197,7	198,9	198,7
2	198,2	198,3	197,8
3	198,2	197,7	198,3
4	197,7	197,4	198,2
5	197,9	198,5	197,7
6	197,8	198,5	198,0
7	197,6	197,1	198,1
8	197,7	198,6	198,3
9	198,2	198,1	198,7
10	197,8	198,2	198,8
11	198,5	198,6	197,7
12	197,3	198,7	198,3
13	198,4	198,4	198,4
14	197,5	198,6	197,5
15	197,8	197,9	198,5
16	197,5	198,0	198,8
17	197,6	198,7	198,8
18	198,1	198,7	198,2
19	198,4	198,8	198,1
20	197,6	198,1	198,9
x	197,88	198,29	198,29
SD	0,3447	0,4811	0,42
CV	0,17%	0,24%	0,21%

c. Kekerasan tablet

NO	Kekerasan Formula Optimum (kg)		
	Replikasi I	Replikasi II	Replikasi III
1	6,3	6,4	6,3
2	6,4	6,5	6,5
3	6,4	6,4	6,4
x	6,37	6,43	6,4
SD	0,58	0,578	0,1

d. Kerapuhan tablet

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

Bobot awal (g)	Bobot akhir (g)	% kerapuhan
3,9707	3,9300	1,03
3,9728	3,9328	1,01
3,9640	3,9252	0,99
Rata-rata		1,00
SD		0,02

e. Waktu hancur

NO	Waktu Hancur Formula I (detik)		
	Replikasi I	Replikasi II	Replikasi III
1	127	126	126
2	127	127	127
3	129	127	127
x	127,67	126,67	126,67
SD	1,15	0,58	0,58

f. Disolusi

Waktu (menit)	Rep	Y (Abs)	C (mg/ml)	C Dalam 500 ml	Kadar (%)	x	SD
5	1	0,105	0,000122	0,06082	12,17	13,19	1,19
	2	0,106	0,000143	0,07113	14,23		
	3	0,105	0,000122	0,06082	12,17		
	4	0,106	0,000143	0,07113	14,23		
15	1	0,120	0,000431	0,21546	43,09	47,22	2,92
	2	0,123	0,000493	0,24639	49,28		
	3	0,122	0,000473	0,23608	47,22		
	4	0,123	0,000493	0,24639	49,28		
30	1	0,127	0,000575	0,28763	57,53	59,59	1,68
	2	0,129	0,000616	0,30825	61,65		
	3	0,128	0,000596	0,29794	59,59		
	4	0,128	0,000596	0,29794	59,59		
45	1	0,139	0,000823	0,41134	82,27	84,33	1,68
	2	0,141	0,000864	0,43196	86,39		
	3	0,140	0,000843	0,42165	84,32		
	4	0,140	0,000843	0,42165	84,32		

Lampiran 13. Analisa statistika Anova

a. Waktu alir granul

One-Sample Kolmogorov-Smirnov Test

		Waktu alir
N		9
Normal Parameters[a,b]	Mean	8.6089
	Std. Deviation	.62411
Most Extreme Differences	Absolute	.187
	Positive	.169
	Negative	-.187
Kolmogorov-Smirnov Z		.560
Asymp. Sig. (2-tailed)		.913

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Waktu alir

Levene Statistic	df1	df2	Sig.
.308	2	6	.746

ANOVA

Waktu alir

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.987	2	1.494	69.430	.000
Within Groups	.129	6	.022		
Total	3.116	8			

Multiple Comparisons

Waktu alir
Tukey HSD

(I) Formula tablet	(J) Formula tablet	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
formula I	formula II	.46667[*]	.11975	.019	.0992	.8341
	formula III	1.38667[*]	.11975	.000	1.0192	1.7541
formula II	formula I	-.46667[*]	.11975	.019	-.8341	-.0992
	formula III	.92000[*]	.11975	.001	.5526	1.2874
formula III	formula I	-1.38667[*]	.11975	.000	-1.7541	-1.0192
	formula II	-.92000[*]	.11975	.001	-1.2874	-.5526

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

b. CV keseragaman bobot

One-Sample Kolmogorov-Smirnov Test

		CV tablet
N		9
Normal Parameters[a,,b]	Mean	.209422
	Std. Deviation	.0705977
Most Extreme Differences	Absolute	.233
	Positive	.233
	Negative	-.163
Kolmogorov-Smirnov Z		.698
Asymp. Sig. (2-tailed)		.715

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

CV tablet

Levene Statistic	df1	df2	Sig.
2.235	2	6	.188

ANOVA

CV tablet

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.017	2	.009	2.290	.182
Within Groups	.023	6	.004		
Total	.040	8			

c. Kekerasan tablet

One-Sample Kolmogorov-Smirnov Test

		Kekerasan tablet
N		9
Normal Parameters[a,b]	Mean	6.122
	Std. Deviation	.1716
Most Extreme Differences	Absolute	.230
	Positive	.214
	Negative	-.230
Kolmogorov-Smirnov Z		.691
Asymp. Sig. (2-tailed)		.726

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Kekerasan tablet

Levene Statistic	df1	df2	Sig.
.475	2	6	.644

ANOVA

Kekerasan tablet

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.042	2	.021	.655	.553
Within Groups	.193	6	.032		
Total	.236	8			

d. Kerapuhan tablet

One-Sample Kolmogorov-Smirnov Test

		kerapuhan tablet
N		9
Normal Parameters[a,b]	Mean	1.1278
	Std. Deviation	.49195
Most Extreme Differences	Absolute	.237
	Positive	.237
	Negative	-.130
Kolmogorov-Smirnov Z		.712
Asymp. Sig. (2-tailed)		.690

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

kerapuhan tablet

Levene Statistic	df1	df2	Sig.
2.531	2	6	.160

ANOVA

kerapuhan tablet

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.767	2	.884	31.343	.001
Within Groups	.169	6	.028		
Total	1.936	8			

Post Hoc Test

Multiple Comparisons

Dependent Variable:%Kerapuhan

	(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	Formula 1	Formula 2	.75333[*]	.13709	.004	.3327	1.1740
		Formula 3	1.05333[*]	.13709	.001	.6327	1.4740
	Formula 2	Formula 1	-.75333[*]	.13709	.004	-1.1740	-.3327
		Formula 3	.30000	.13709	.152	-.1206	.7206
	Formula 3	Formula 1	-1.05333[*]	.13709	.001	-1.4740	-.6327
		Formula 2	-.30000	.13709	.152	-.7206	.1206

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

Homogeneous Subsets

%Kerapuhan

	Formula	N	Subset for alpha = 0.05	
			1	2
Tukey HSD[a]	Formula 3	3	.6767	
	Formula 2	3	.9767	
	Formula 1	3		1.7300
	Sig.		.152	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

e. Waktu hancur

One-Sample Kolmogorov-Smirnov Test

		Waktu hancur
N		9
Normal Parameters[a],[b]	Mean	121.7789
	Std. Deviation	70.61845
Most Extreme Differences	Absolute	.216
	Positive	.212
	Negative	-.216
Kolmogorov-Smirnov Z		.648
Asymp. Sig. (2-tailed)		.796

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Waktu hancur

Levene Statistic	df1	df2	Sig.
3.562	2	6	.096

ANOVA

Waktu hancur

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	39796.241	2	19898.121	1200.118	.000
Within Groups	99.481	6	16.580		
Total	39895.722	8			

Post Hoc Test

Multiple Comparisons

Waktu hancur
Tukey HSD

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Formula 1	Formula 2	-58.44667*	3.32467	.000	-68.6477	-48.2457
	Formula 3	-160.89000*	3.32467	.000	-171.0910	-150.6890
Formula 2	Formula 1	58.44667*	3.32467	.000	48.2457	68.6477
	Formula 3	-102.44333*	3.32467	.000	-112.6443	-92.2423
Formula 3	Formula 1	160.89000*	3.32467	.000	150.6890	171.0910
	Formula 2	102.44333*	3.32467	.000	92.2423	112.6443

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

Homogeneous Subsets

Waktu hancur

Tukey HSD[a]

Formula	N	Subset for alpha = 0.05		
		1	2	3
Formula 1	3	48.6667		
Formula 2	3		107.1133	
Formula 3	3			209.5567
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

f. Disolusi

One-Sample Kolmogorov-Smirnov Test

		Disolusi
N		9
Normal Parameters[a,b]	Mean	87.9456
	Std. Deviation	17.83240
Most Extreme Differences	Absolute	.191
	Positive	.154
	Negative	-.191
Kolmogorov-Smirnov Z		.572
Asymp. Sig. (2-tailed)		.899

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Disolusi

Levene Statistic	df1	df2	Sig.
2.070	2	6	.207

ANOVA

Disolusi

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2488.235	2	1244.118	133.964	.000
Within Groups	55.722	6	9.287		
Total	2543.957	8			

Post Hoc Test

Multiple Comparisons

Disolusi
Tukey HSD

(I) Formula tablet	(J) Formula tablet	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Formula I	Formula II	18.55667[*]	2.48823	.001	10.9221	26.1912
	Formula III	40.67667[*]	2.48823	.000	33.0421	48.3112
Formula II	Formula I	-18.55667[*]	2.48823	.001	-26.1912	-10.9221
	Formula III	22.12000[*]	2.48823	.000	14.4854	29.7546
Formula III	Formula I	-40.67667[*]	2.48823	.000	-48.3112	-33.0421
	Formula II	-22.12000[*]	2.48823	.000	-29.7546	-14.4854

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

Homogeneous Subsets

Disolusi

Tukey HSD[a]

Formula tablet	N	Subset for alpha = 0.05		
		1	2	3
Formula III	3	67.0133		
Formula II	3		89.1333	
Formula I	3			107.6900
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3,000.

Lampiran 14. Analisa statistika uji t

a. Kekerasan tablet

Npar Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
kekerasan	6	6.344500	.0272874	6.3000	6.3668

One-Sample Kolmogorov-Smirnov Test

		kekerasan
N		6
Normal Parameters[a,b]	Mean	6.344500
	Std. Deviation	.0272874
Most Extreme Differences	Absolute	.293
	Positive	.207
	Negative	-.293
Kolmogorov-Smirnov Z		.718
Asymp. Sig. (2-tailed)		.681

a. Test distribution is Normal.

b. Calculated from data.

T-Test

Group Statistics

	kelompok	N	Mean	Std. Deviation	Std. Error Mean
kekerasan	prediksi	3	6.366800	.0000000	.0000000
	praktek	3	6.322200	.0192258	.0111000

Independent Samples Test

| | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | | | | | | | | 95% Confidence Interval of the Difference | |
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
keker asan Equal variances assumed	16.000	.016	4.018	4	.016	.0446000	.0111000	.0137815	.0754185
Equal variances not assumed			4.018	2.000	.057	.0446000	.0111000	-.0031594	.0923594

    a.   Kerapuhan tablet

Npar Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
kerapuhan	6	1.006867	.0151650	.9788	1.0250

One-Sample Kolmogorov-Smirnov Test

		kerapuhan
N		6
Normal Parameters[a,b]	Mean	1.006867
	Std. Deviation	.0151650
Most Extreme Differences	Absolute	.332
	Positive	.246
	Negative	-.332
Kolmogorov-Smirnov Z		.812
Asymp. Sig. (2-tailed)		.524

a. Test distribution is Normal.

b. Calculated from data.

T-Test

Group Statistics

	kelompok	N	Mean	Std. Deviation	Std. Error Mean
kerapuhan	prediksi	3	1.010200	.0000000	.0000000
	praktek	3	1.003533	.0232726	.0134364

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
kerapuhan	Equal variances assumed	6.097	.069	.496	4	.646	.0066667	.0134364	-.0306389	.0439722
	Equal variances not assumed			.496	2.000	.669	.0066667	.0134364	-.0511456	.0644790

c. Waktu hancur

Npar Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
waktuhancur	6	2.116567	.0060642	2.1112	2.1278

One-Sample Kolmogorov-Smirnov Test

		waktuhancur
N		6
Normal Parameters[a,b]	Mean	2.116567
	Std. Deviation	.0060642
Most Extreme Differences	Absolute	.344
	Positive	.344
	Negative	-.188
Kolmogorov-Smirnov Z		.843
Asymp. Sig. (2-tailed)		.475

a. Test distribution is Normal.

b. Calculated from data.

T-Test

Group Statistics

	kelompok	N	Mean	Std. Deviation	Std. Error Mean
waktuhancur	prediksi	3	2.116400	.0000000	.0000000
	praktek	3	2.116733	.0095840	.0055333

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
										95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
waktuhancur	Equal variances assumed	16.000	.016	-.060	4	.955	-.0003333	.0055333	-.0156963	.0150297
	Equal variances not assumed			-.060	2.000	.957	-.0003333	.0055333	-.0241413	.0234747

d. Disolusi

Npar Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
disolusi	6	83.5216	.75910	82.27	84.32

One-Sample Kolmogorov-Smirnov Test

		disolusi
N		6
Normal Parameters[a,b]	Mean	83.5216
	Std. Deviation	.75910
Most Extreme Differences	Absolute	.273
	Positive	.227
	Negative	-.273
Kolmogorov-Smirnov Z		.669
Asymp. Sig. (2-tailed)		.762

a. Test distribution is Normal.

b. Calculated from data.

T-Test

Group Statistics

	kelompok	N	Mean	Std. Deviation	Std. Error Mean
disolusi	prediksi	3	83.4065	.00000	.00000
	praktek	3	82.9533	1.18357	.68333

Independent Samples Test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | | | | | | | | | 95% Confidence Interval of the Difference | |
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
disolusi	Equal variances assumed	16.000	.016	.663	4	.543	.45317	.68333	-1.44407	2.35040
	Equal variances not assumed			.663	2.000	.575	.45317	.68333	-2.48698	3.39331