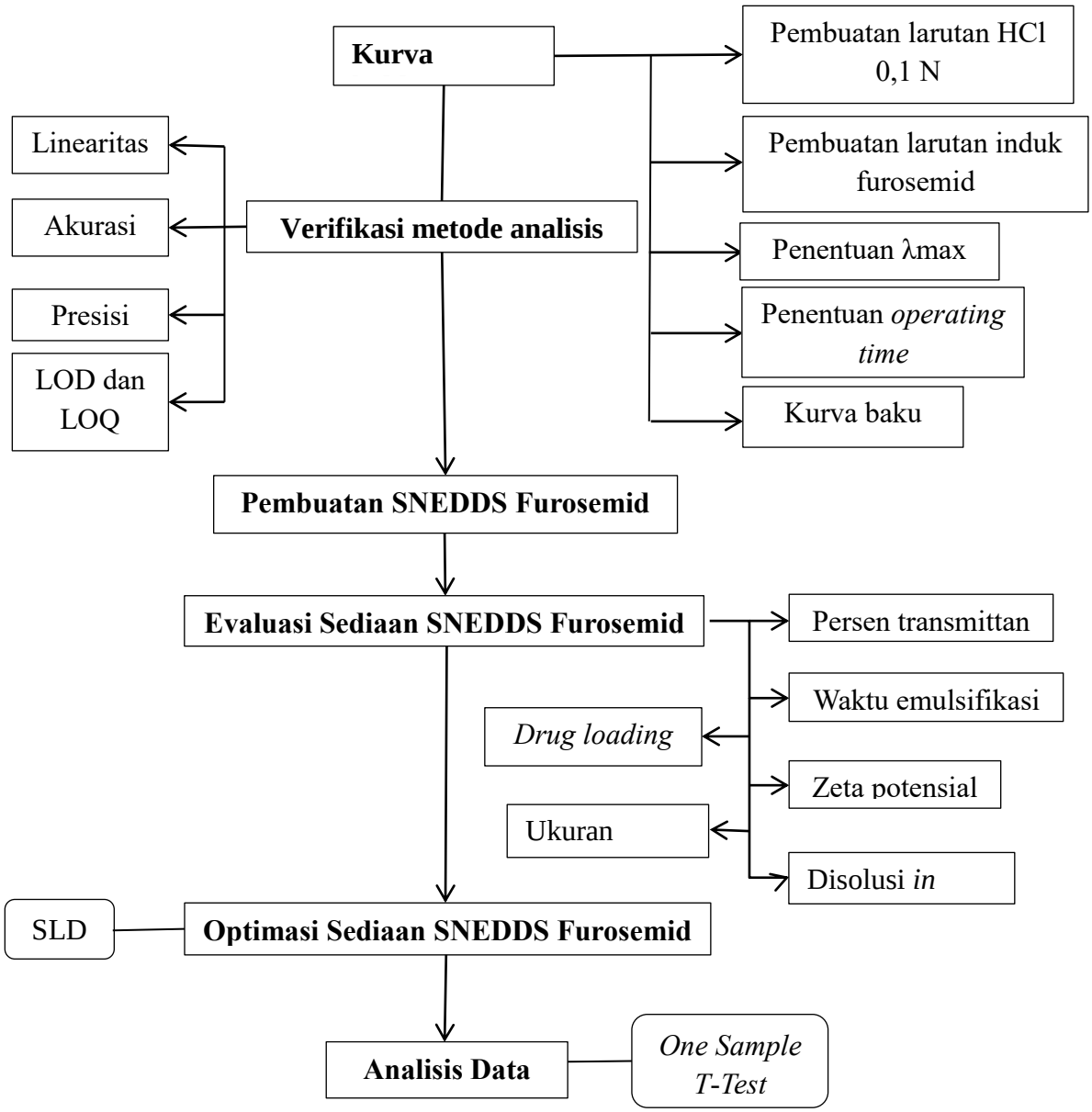
L
A
M
P
I
R
A
N

Lampiran 1. Skema Penelitian



Lampiran 2. Kurva kalibrasi dan verifikasi metode analisis dengan pelarut metanol

a. Pembuatan larutan induk

Furosemid+KS = 0,2766 gram
KS+sisa = 0,2270 gram -
Berat Furosemid = 0,0496 gram
Volume metanol pa = 100 ml
Larutan induk = 0,0496 gram / 100 ml
= 49,6 mg / 100 ml
= 496 ppm

Larutan induk furosemid 496 ppm dipipet 1 ml ke 25 ml labu takar, maka diperoleh kadar furosemid :

$V_1C_1 = V_2C_2$
1 ml · 496 ppm = 25 ml · C_2
C_2 = 19,84 ppm

b. Penetapan panjang gelombang maksimum

Wavelength nm.	RawData ...
251.00	0.1511
252.00	0.1573
253.00	0.1651
254.00	0.1751
255.00	0.1869
256.00	0.2004
257.00	0.2164
258.00	0.2341
259.00	0.2533
260.00	0.2743
261.00	0.2980
262.00	0.3234
263.00	0.3502
264.00	0.3783
265.00	0.4082
266.00	0.4390
267.00	0.4695
268.00	0.4990
269.00	0.5265
270.00	0.5516
271.00	0.5734
272.00	0.5903
273.00	0.6017
274.00	0.6063
275.00	0.6043
276.00	0.5916
277.00	0.5695
278.00	0.5367
279.00	0.4986
280.00	0.4550
281.00	0.4067
282.00	0.3576
283.00	0.3101
284.00	0.2652
285.00	0.2241
286.00	0.1879
287.00	0.1555
288.00	0.1288
289.00	0.1075
290.00	0.0910
291.00	0.0783
292.00	0.0686
293.00	0.0618
294.00	0.0571
295.00	0.0536
296.00	0.0515
297.00	0.0504
298.00	0.0506
299.00	0.0509
300.00	0.0519
301.00	0.0532

Panjang gelombang maksimum larutan furosemid dengan pelarut metanol adalah 274 nm dengan serapan sebesar 0,6063.

c. Penentuan *operating time*

Time (Minute)	RawData ...
1.000	1.336
2.000	1.800
3.000	1.800
4.000	1.800
5.000	1.689
6.000	1.590
7.000	1.000
8.000	1.800
9.000	1.800
10.000	1.800
11.000	1.687
12.000	1.800
13.000	1.800
14.000	1.800
15.000	1.800
16.000	1.800
17.000	1.800
18.000	1.800
19.000	1.800
20.000	1.800
21.000	1.800
22.000	1.800
23.000	1.800
24.000	1.800
25.000	1.800
26.000	1.800
27.000	1.800
28.000	1.800
29.000	1.800
30.000	1.800
31.000	1.800
32.000	1.800
33.000	1.800
34.000	1.800
35.000	1.686
36.000	1.800
37.000	1.800
38.000	1.800
39.000	1.800
40.000	1.800
41.000	1.800
42.000	1.800
43.000	1.800
44.000	1.800
45.000	1.800

Scanning operating time menunjukkan bahwa larutan furosemid stabil pada menit ke-12 hinga menit ke-34.

d. Penentuan kurva baku

Konsentrasi (ppm)	Absorbansi
1,984	0,225
2,976	0,277
3,968	0,334
4,96	0,385
5,952	0,432
6,944	0,484
7,936	0,54
8,928	0,601

a = 0,1183

b = 0,0534

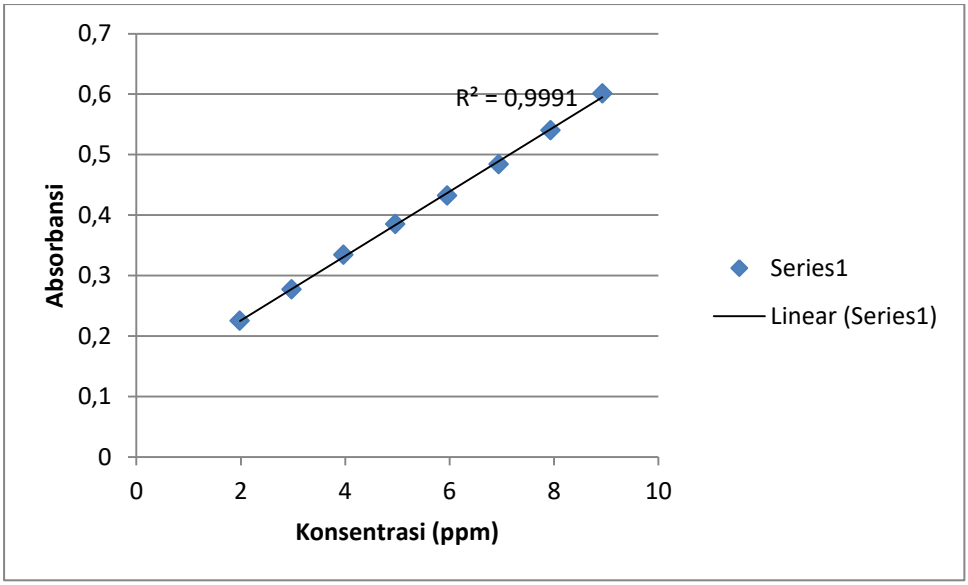
r = 0,999

Persamaan regresi linear antara konsentrasi (ppm) dan absorbansi adalah

y = 0,1183 + 0,0534x

dengan y adalah absorbansi dan x adalah konsentrasi dalam ppm.

Berikut adalah grafik dari data kurva baku di atas :



Perhitungan pengenceran seri kurva baku :

- 1 ml

  $V_1C_1 = V_2C_2$

  $1{,}5 \text{ ml} \cdot 19{,}84 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 1{,}984 \text{ ppm}$

- 1,5 ml

  $V_1C_1 = V_2C_2$

  $1{,}5 \text{ ml} \cdot 19{,}84 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 2{,}976 \text{ ppm}$

- 2 ml

  $V_1C_1 = V_2C_2$

  $2 \text{ ml} \cdot 19{,}84 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 3{,}968 \text{ ppm}$

- 2,5 ml

  $V_1C_1 = V_2C_2$

  $2{,}5 \text{ ml} \cdot 19{,}84 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 4{,}96 \text{ ppm}$

- 3 ml

  $V_1C_1 = V_2C_2$

  $3 \text{ ml} \cdot 19{,}84 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 5{,}952 \text{ ppm}$

- 3,5 ml

  $V_1C_1 = V_2C_2$

  $3{,}5 \text{ ml} \cdot 19{,}84 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 6{,}944 \text{ ppm}$

- 4 ml

  $V_1C_1 = V_2C_2$

  $4 \text{ ml} \cdot 36{,}64 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 7{,}936 \text{ ppm}$

- 4,5 ml

$V_1C_1 = V_2C_2$

$4{,}5\ ml \cdot 19{,}84\ ppm = 10\ ml \cdot C_2$

$C_2 = 8{,}928\ ppm$

e. Verifikasi metode

- Akurasi

No.	Konsentrasi (PPM)		Absorbansi	x	Konsentrasi	Rata-rata	rata rata keseluruhan
1		4,7616	0,373	4,76691	100%		
2	80%	4,7616	0,372	4,74816	100%	100%	
3		4,7616	0,37	4,71066	99%		
4		5,952	0,432	5,8732	99%		
5	100%	5,952	0,437	5,96696	100%	100%	100%
6		5,952	0,439	6,00446	101%		
7		7,1424	0,501	7,167	100%		
8	120%	7,1424	0,499	7,1295	100%	100%	
9		7,1424	0,5	7,14825	100%		

Akurasi dari metode yang digunakan sebesar 100%.

- Presisi

No.	Konsentrasi (PPM)	Absorbansi	x	x rata-rata	SD	CV
1	5,952	0,429	5,81695			
2	5,952	0,43	5,835701			
3	5,952	0,428	5,7982	5,823201	0,022708	0,4%
4	5,952	0,431	5,854452			
5	5,952	0,43	5,835701			
6	5,952	0,428	5,7982			

$$CV = \frac{SD}{X\ rata{-}rata} = \frac{0{,}022708}{5{,}823201} x100\% = 0{,}4\%$$

- LOD & LOQ

No.	Konsentrasi (ppm)	Absorbansi	Y'	Y-Y’	$(Y\text{-}Y')^2$	x rata rata
1	1,984	0,225	0,22429	0,000714	5,102E-07	
2	2,976	0,277	0,27725	-0,00025	6,25E-08	
3	3,968	0,334	0,33021	0,003786	1,433E-05	
4	4,96	0,385	0,38319	0,001821	3,318E-06	5,456
5	5,952	0,432	0,43614	-0,004143	1,716E-05	
6	6,944	0,484	0,48911	-0,005107	2,608E-05	
7	7,936	0,54	0,54207	-0,002071	4,291E-06	

8	8,928	0,601	0,59504	0,005964	3,557E-05
				$\sum(Y-Y')^2$	0,0001013
				Sy/x	0,0045018
				LOD	0,2529515
				LOQ	0,8431718

LOD $= 3{,}3x\frac{\frac{Sy}{X}}{b} = 3{,}3x\frac{0{,}0045018}{0{,}0534} = 0{,}2529515\ ppm$

Absobansi = 0,1183 + 0,0534x

= 0,1183 + 0,0534 · 0,253

= 0,1318

LOQ $= 10x\frac{\frac{Sy}{X}}{b} = 10x\frac{0{,}0045018}{0{,}0534} = 0{,}8431718\ ppm$

Absobansi = 0,1183 + 0,0534x

= 0,1183 + 0,0534 · 0,843

= 0,5685

Lampiran 3. Kurva kalibrasi dan verifikasi metode analisis dengan pelarut HCl 0,1 N

a. Pembuatan larutan induk

Furosemid+KS = 0,3077 gram
KS+sisa = 0,2575 gram -
Berat Furosemid = 0,0502 gram
Volume HCl 0,1 N = 100 ml
Larutan induk = 0,0502 gram / 100 ml
= 50,2 mg / 100 ml
= 502 ppm

Larutan induk furosemid 916 ppm dipipet 1 ml ke 10 ml labu takar, maka diperoleh kadar furosemid :

$V_1C_1 = V_2C_2$
1 ml · 502 ppm $= 10 \text{ ml} \cdot C_2$
$C_2 = 50{,}2$ ppm

b. Penetapan panjang gelombang maksimum

No.	P/V	Wavelength	Abs.	Description
1		343.00	0.1719	
2		274.00	0.6444	
3		234.00	1.3583	
4		302.00	0.0674	
5		250.00	0.2310	
6		205.00	0.5963	

Panjang gelombang maksimum larutan furosemid dengan pelarut HCl 0,1 N adalah 274 nm dengan serapan sebesar 0,6444.

c. Penentuan *operating time*

Time (Minute)	RawData ...
1.000	1.891
2.000	1.898
3.000	1.893
4.000	1.899
5.000	1.894
6.000	1.895
7.000	1.896
8.000	1.890
9.000	1.888
10.000	1.889
11.000	1.889
12.000	1.889
13.000	1.887
14.000	1.894
15.000	1.893
16.000	1.895
17.000	1.892
18.000	1.893
19.000	1.887
20.000	1.886
21.000	1.886
22.000	1.886
23.000	1.887
24.000	1.888
25.000	1.889
26.000	1.885
27.000	1.885
28.000	1.890
29.000	1.885
30.000	1.880
31.000	1.884
32.000	1.884
33.000	1.885
34.000	1.889
35.000	1.881
36.000	1.884
37.000	1.884
38.000	1.884
39.000	1.884
40.000	1.884
41.000	1.884
42.000	1.884
43.000	1.884
44.000	1.883
45.000	1.887

Scanning operating time menunjukkan bahwa larutan furosemid stabil pada menit ke-36 hinga menit ke-43.

d. Penentuan kurva baku

Konsentrasi (ppm)	Absorbansi
7,53	0,225
10,04	0,294
12,55	0,38
15,06	0,462
17,57	0,528
20,08	0,591
22,59	0,672

a = 0,00393

b = 0,02964

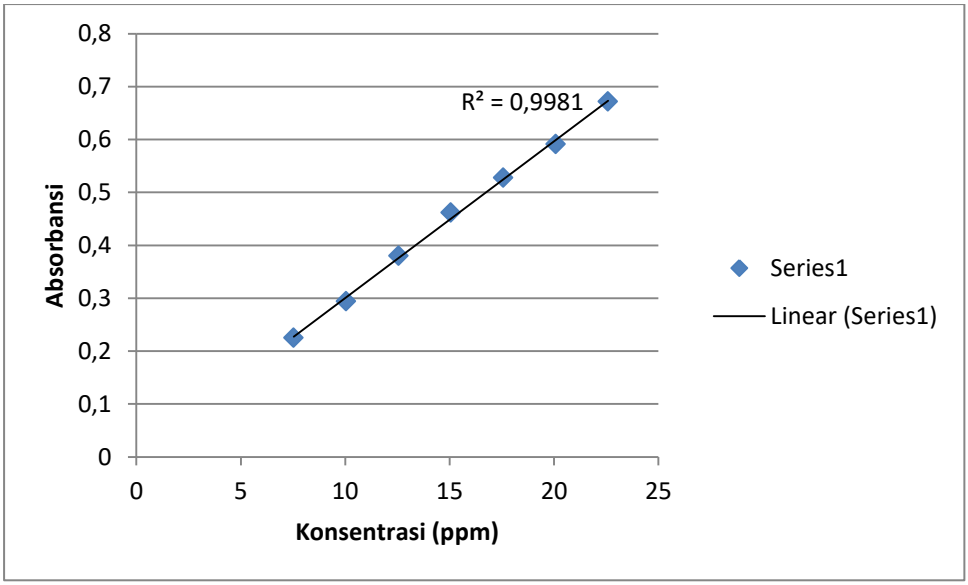
r = 0,999

Persamaan regresi linear antara konsentrasi (ppm) dan absorbansi adalah

y = 0,00393 + 0,02964x

dengan y adalah absorbansi dan x adalah konsentrasi dalam ppm.

Berikut adalah grafik dari data kurva baku :



Perhitungan pengenceran seri kurva baku :

- 1,5 ml

  $V_1C_1 = V_2C_2$

  $1{,}5 \text{ ml} \cdot 50{,}2 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 7{,}53 \text{ ppm}$

- 2 ml

  $V_1C_1 = V_2C_2$

  $2 \text{ ml} \cdot 50{,}2 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 10{,}04 \text{ ppm}$

- 2,5 ml

  $V_1C_1 = V_2C_2$

  $2{,}5 \text{ ml} \cdot 50{,}2 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 12{,}55 \text{ ppm}$

- 3 ml

  $V_1C_1 = V_2C_2$

  $3 \text{ ml} \cdot 50{,}2 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 15{,}06 \text{ ppm}$

- 3,5 ml

  $V_1C_1 = V_2C_2$

  $3{,}5 \text{ ml} \cdot 50{,}2 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 17{,}57 \text{ ppm}$

- 4 ml

  $V_1C_1 = V_2C_2$

  $4 \text{ ml} \cdot 50{,}2 \text{ ppm} = 10 \text{ ml} \cdot C_2$

  $C_2 = 20{,}08 \text{ ppm}$

- 4,5 ml

  $V_1C_1 = V_2C_2$

  $4{,}5 \text{ ml} \cdot 50{,}2 \text{ ppm} = 10 \text{ ml} \cdot C_2$

C_2 = 22,59 ppm

e. Verifikasi metode

- Akurasi

No.	Konsentrasi (ppm)		Absorbansi	x	konsentrasi	Rata-rata	Rata-rata keseluruhan
1		11,81	0,37	12,351	105%		
2	80%	11,81	0,359	11,980	101%	103%	
3		11,81	0,36	12,014	102%		
4		14,76	0,439	14,679	99%		
5	100%	14,76	0,459	15,354	104%	100%	101%
6		14,76	0,43	14,376	97%		
7		17,71	0,531	17,783	100%		
8	120%	17,71	0,525	17,581	99%	99%	
9		17,71	0,515	17,243	97%		

Akurasi dari metode yang digunakan sebesar 101%.

- Presisi

Konsentrasi (PPM)	Absorbansi	x	x rata-rata	SD	CV
14,76 ppm	0,432	14,443	14,589	0,179	1,2%
14,76 ppm	0,433	14,477			
14,76 ppm	0,443	14,814			
14,76 ppm	0,44	14,713			
14,76 ppm	0,44	14,713			
14,76 ppm	0,43	14,376			

$$CV = \frac{SD}{X\ rata-rata} = \frac{0,179}{14,589} x100\% = 1,2\%$$

- LOD & LOQ

no.	konsentrasi (ppm)	absorbansi	Y	Y-Y’	$(Y-Y')^2$	x rata-rata
1	7,53	0,225	0,227	-0,0021	4,445E-06	
2	10,04	0,294	0,302	-0,0075	5,625E-05	
3	12,55	0,38	0,376	0,0041	1,687E-05	
4	15,06	0,462	0,450	0,0117	0,0001372	15,06
5	17,57	0,528	0,525	0,0033	1,103E-05	
6	20,08	0,591	0,599	-0,0081	6,515E-05	
7	22,59	0,672	0,673	-0,0015	2,144E-06	
				$\sum(Y-Y')^2$	0,00029	
				Sy/X	0,0077	

LOD	0,8525
LOQ	2,5833
Vx0	1,7%

LOD $= 3{,}3x\frac{\frac{Sy}{X}}{b} = 3{,}3x\frac{0{,}00765}{0{,}02964} = 0{,}8525\ ppm$

Absorbansi = 0,00393 + 0,02964x

= 0,00393 + 0,02964 · 0,8525 ppm

= 0,0292

LOQ $= 10x\frac{\frac{Sy}{X}}{b} = 10x\frac{0{,}00765}{0{,}02964} = 2{,}5833\ ppm$

Absorbansi = 0,00393 + 0,02964x

= 0,00393 + 0,02964 · 2,5833 ppm

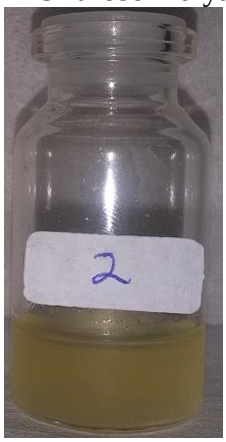
= 0,0805

Lampiran 4. Pembuatan formula SNEDDS furosemid

Select	Run	Component 1 A:minyak jarak	Component 2 B:tween 80	Component 3 C:peg 400	Response 1 persen trans...	Response 2 waktu emulsi...	Response 3 drug loading
	1	26,6667	63,3333	10	92,2	150,667	50490,4
	2	20	70	10	99	142,667	23849,1
	3	22,5	67,5	10	96,5	109,333	35397,5
	4	30	60	10	80,8	244,667	38733,7
	5	*25*	*65*	*10*	*86,2667*	*129,333*	*50491,8*
	6	27,5	62,5	10	72,6667	120,333	52540,4
	7	23,3333	66,6667	10	92,9	72	38177,4

Visualisasi Formula SNEDDS furosemid yang dibuat (belum disentrifugasi)

(26,67:63,33:10)



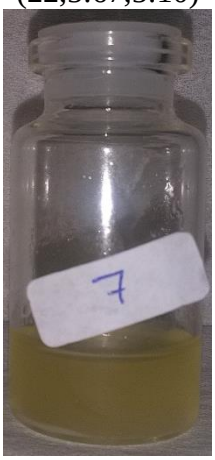
(20:70:10)

(22,5:67,5:10)

(30:60:10)

(25:65:10)

(27,5:62,5:10)



(23,33:66,67:10)

Lampiran 5. Evaluasi sediaan SNEDDS furosemid

a. Waktu emulsifikasi

Bening

Bening

Bening

Bening

Bening

Keruh

Bening

b. *Drug loding*

No	Absorbansi	FP	Kadar	Rata-rata kadar	SD
1	0,749	4000	47268,67	50490,36	8310,742
	0,758	5000	59929,61		
	0,591	5000	44272,8		
2	0,568	2000	16846,59	23849,07	6068,857
	0,413	5000	27584,7		
	0,408	5000	27115,93		
3	0,613	5000	46335,37	35397,48	11263,42
	0,373	5000	23834,56		
	0,503	5000	36022,5		
4	0,655	4000	40218,41	38733,69	10392,72
	0,634	5000	48304,19		
	0,414	5000	27678,45		
5	0,709	5000	55335,7	50491,77	4195,223
	0,631	5000	48022,93		
	0,632	5000	48116,69		
6	0,716	4000	44793,58	52540,43	6827,317
	0,707	5000	55148,19		
	0,734	5000	57679,53		
7	0,714	4000	44643,57	38177,42	5643,828
	0,499	5000	35647,49		

	0,484	5000	34241,19

Nilai kadar furosemid didapat dari rumus y = 0,1183 + 0,0534x, dengan nilai y adalah absorbansi dan x adalah kadar (ppm).

- Formula 1
  - y = 0,1183 + 0,0534x
    0,749 = 0,1183 + 0,0534x
    x = 11,81717· FP
    = 11,81717· 4000
    = 47268,67 ppm
  - y = 0,1183 + 0,0534x
    0,758 = 0,1183 + 0,0534x
    x = 11,98592 · FP
    = 11,98592 · 5000
    = 59929,61 ppm
  - y = 0,1183 + 0,0534x
    0,591 = 0,1183 + 0,0534x
    x = 8,85456 · FP
    = 8,85456 · 5000
    = 44272,8 ppm
- Formula 2
  - y = 0,1183 + 0,0534x
    0,568 = 0,1183 + 0,0534x
    x = 8,423294· FP
    = 8,423294· 2000
    = 16846,59 ppm
  - y = 0,1183 + 0,0534x
    0,413 = 0,1183 + 0,0534x
    x = 5,51694 · FP
    = 5,51694 · 5000
    = 27584,7 ppm
  - y = 0,1183 + 0,0534x
    0,408 = 0,1183 + 0,0534x
    x = 5,42319 · FP
    = 5,42319 · 5000
    = 27115,93 ppm
- Formula 3
  - y = 0,1183 + 0,0534x
    0,613 = 0,1183 + 0,0534x
    x = 9,267075 · FP
    = 9,267075 · 5000
    = 46335,37 ppm
  - y = 0,1183 + 0,0534x

0,373 = 0,1183 + 0,0534x
x = 4,766913 · FP
= 4,766913 · 5000
= 23834,56 ppm

- y = 0,1183 + 0,0534x
  0,503 = 0,1183 + 0,0534x
  x = 7,2045 · FP
  = 7,2045 · 5000
  = 36022,5 ppm

- Formula 4
  - y = 0,1183 + 0,0534x
    0,655 = 0,1183 + 0,0534x
    x = 10,0546 · FP
    = 10,0546 · 4000
    = 40218,41 ppm
  - y = 0,1183 + 0,0534x
    0,634 = 0,1183 + 0,0534x
    x = 9,660839 · FP
    = 9,660839 · 5000
    = 48304,19 ppm
  - y = 0,1183 + 0,0534x
    0,414 = 0,1183 + 0,0534x
    x = 5,53569 · FP
    = 5,53569 · 5000
    = 27678,45 ppm
- Formula 5
  - y = 0,1183 + 0,0534x
    0,709 = 0,1183 + 0,0534x
    x = 11,06714 · FP
    = 11,06714 · 5000
    = 55335,7 ppm
  - y = 0,1183 + 0,0534x
    0,631 = 0,1183 + 0,0534x
    x = 9,604587 · FP
    = 9,604587 · 5000
    = 48022,93 ppm
  - y = 0,1183 + 0,0534x
    0,632 = 0,1183 + 0,0534x
    x = 9,623338 · FP
    = 9,623338 · 5000
    = 48116,69 ppm
- Formula 6
  - y = 0,1183 + 0,0534x
    0,716 = 0,1183 + 0,0534x

x = 11,19839 · FP
= 11,19839 · 4000
= 44793,58 ppm

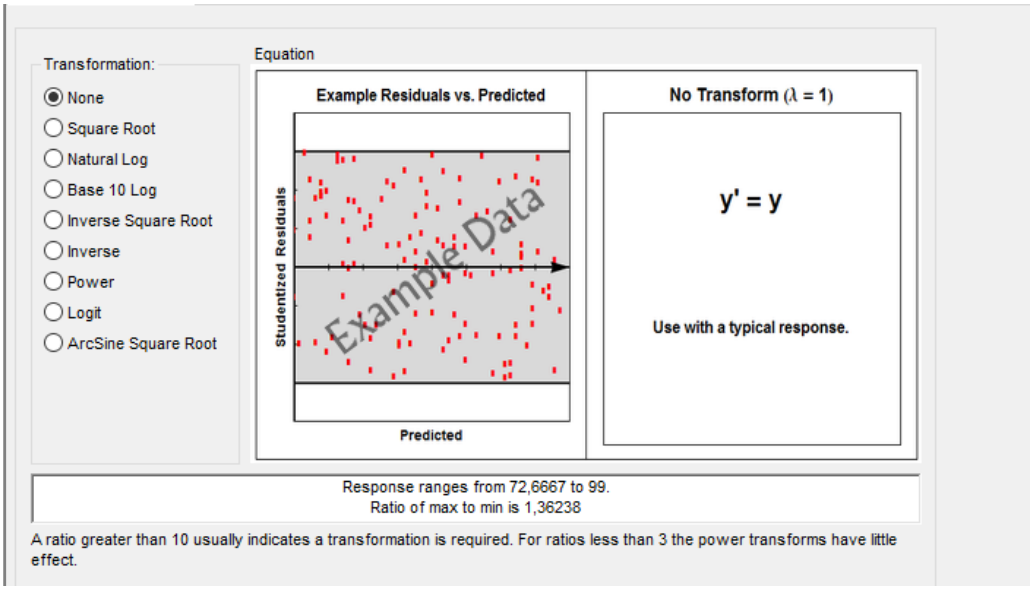
- y = 0,1183 + 0,0534x
  0,707 = 0,1183 + 0,0534x
  x = 11,02964 · FP
  = 11,02964 · 5000
  = 55148,19 ppm
- y = 0,1183 + 0,0534x
  0,734 = 0,1183 + 0,0534x
  x = 11,53591 · FP
  = 11,53591 · 5000
  = 57679,53 ppm

- Formula 7
  - y = 0,1183 + 0,0534x
    0,714 = 0,1183 + 0,0534x
    x = 11,16089 · FP
    = 11,16089 · 4000
    = 44643,57 ppm
  - y = 0,1183 + 0,0534x
    0,499 = 0,1183 + 0,0534x
    x = 7,129498 · FP
    = 7,129498 · 5000
    = 35647,49 ppm
  - y = 0,1183 + 0,0534x
    0,484 = 0,1183 + 0,0534x
    x = 6,848238 · FP
    = 6,848238 · 5000
    = 34241,19 ppm

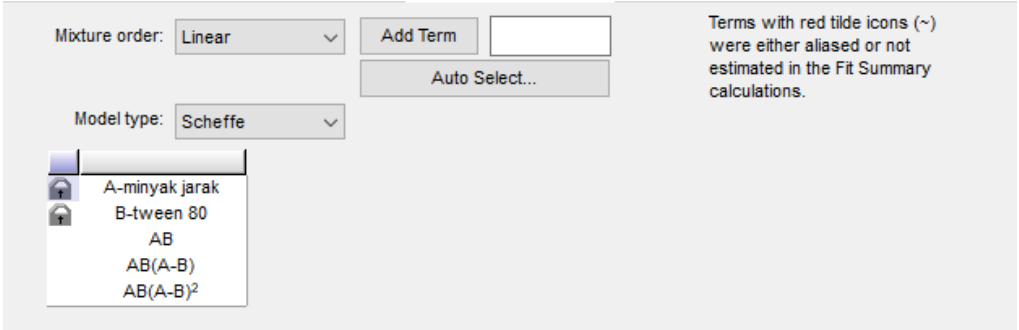
Lampiran 6. *Simplex Lattice Design*

a. Persen transmitan

Transformasi persen transmitan



Penentuan model persen transmitan



ANOVA

Response 1 persen transmitan

ANOVA for Linear Mixture model

***** Mixture Component Coding is L_Pseudo. *****

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

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	338,37	1	338,37	9,20	0,0290	significant
1 Linear Mixtu	*338,37*	*1*	*338,37*	*9,20*	*0,0290*	
Residual	183,80	5	36,76			
Cor Total	522,17	6				

1 Inference for linear mixtures uses Type I sums of squares.

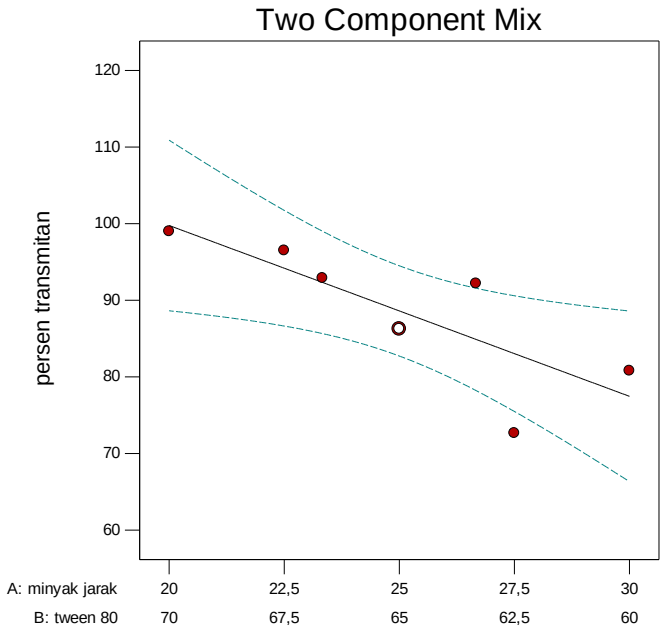
Std. Dev.	6,06	R-Squared	0,6480
Mean	88,62	Adj R-Squared	0,5776
C.V. %	6,84	Pred R-Square	0,3689
PRESS	329,57	Adeq Precisior	6,880
-2 Log Likeliho	42,74	BIC	44,69
		AICc	45,54

Component	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
A-minyak jarak	77,47	1	4,33	66,34	88,60	1,24
B-tween 80	99,77	1	4,33	88,64	110,90	1,24

Final Equation in Terms of L_Pseudo Components:

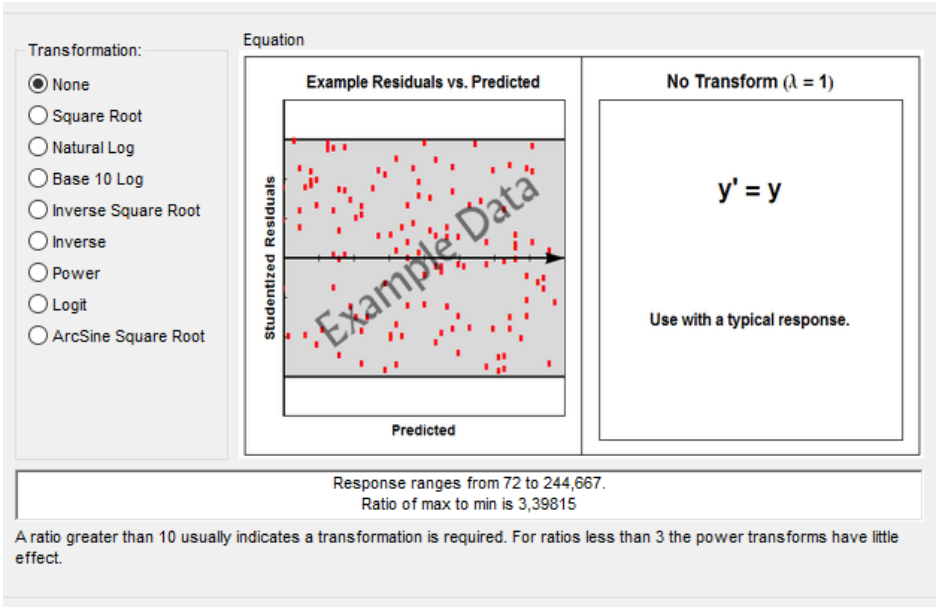
persen transmitan =
+77,47 * A
+99,77 * B

Normal plot

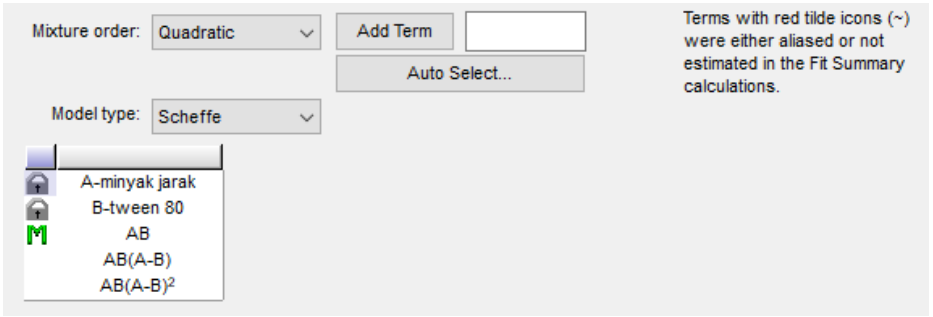


b. Waktu emulsifikasi

Transformasi waktu emulsifikasi



Penentuan model waktu emulsifikasi



ANOVA

Response 2 waktu emulsifikasi

ANOVA for Quadratic Mixture model

***** Mixture Component Coding is L_Pseudo. *****

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

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	14437,80	2	7218,90	10,75	0,0246	significant
1 Linear Mixtu	*6568,77*	*1*	*6568,77*	*9,78*	*0,0353*	
AB	*7869,02*	*1*	*7869,02*	*11,72*	*0,0267*	
Residual	2686,03	4	671,51			
Cor Total	17123,83	6				

1 Inference for linear mixtures uses Type I sums of squares.

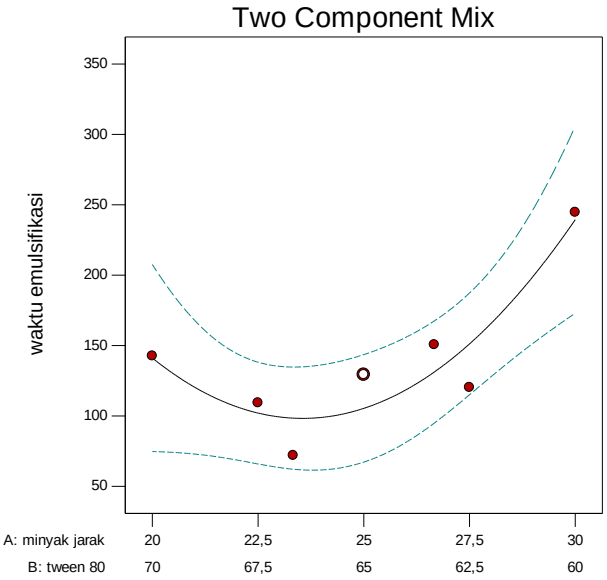
Std. Dev.	25,91	R-Squared	0,8431
Mean	138,43	Adj R-Squared	0,7647
C.V. %	18,72	Pred R-Square	0,6381
PRESS	6197,33	Adeq Precisior	8,311
-2 Log Likeliho	61,51	BIC	65,41
		AICc	68,51

Component	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
A-minyak jarak	239,45	1	23,93	173,02	305,88	2,07
B-tween 80	141,21	1	23,93	74,78	207,63	2,07
AB	-339,70	1	99,23	-615,22	-64,18	3,40

Final Equation in Terms of L_Pseudo Components:

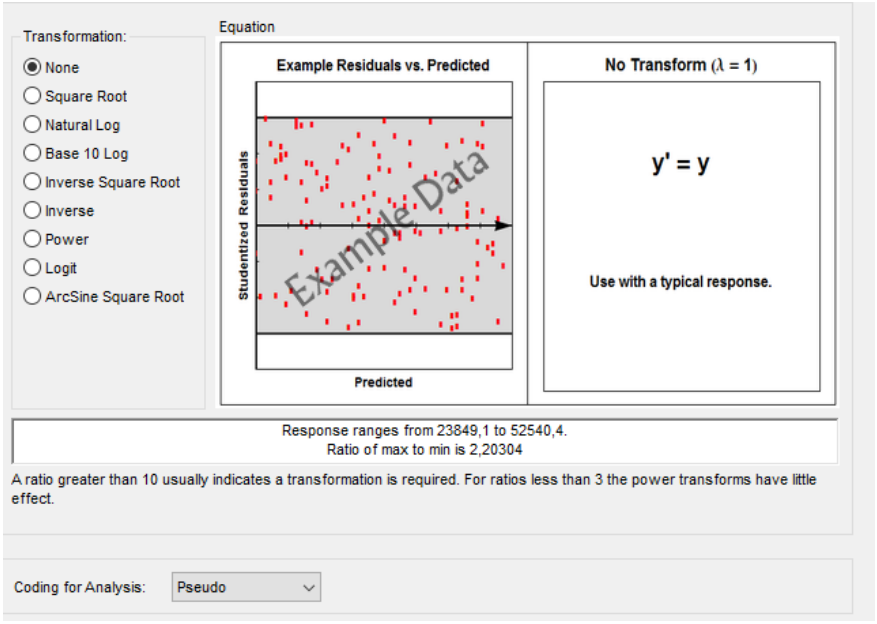
waktu emulsifikasi =
+239,45 * A
+141,21 * B
-339,70 * AB

Normal plot

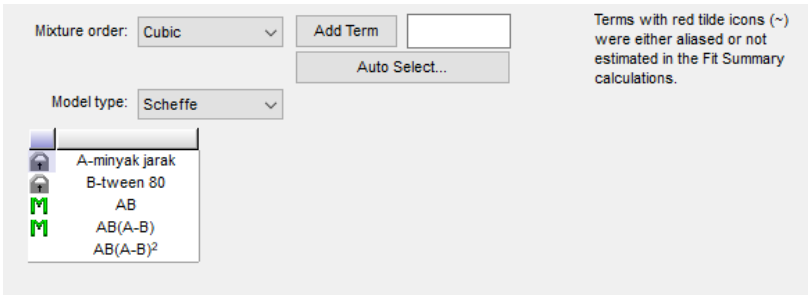


c. *Drug loading*

Transformasi *drug loading*



Penentuan model *drug loading*



ANOVA

Response 3 drug loading

ANOVA for Cubic Mixture model

***** Mixture Component Coding is L_Pseudo. *****

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

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	6,382E+008	3	2,127E+008	50,13	0,0046	significant
[1] Linear Mixtu	*2,790E+008*	*1*	*2,790E+008*	*65,75*	*0,0039*	
AB	*3,047E+008*	*1*	*3,047E+008*	*71,81*	*0,0035*	
Residual	1,273E+007	3	4,244E+006			
Cor Total	6,510E+008	6				

[1] Inference for linear mixtures uses Type I sums of squares.

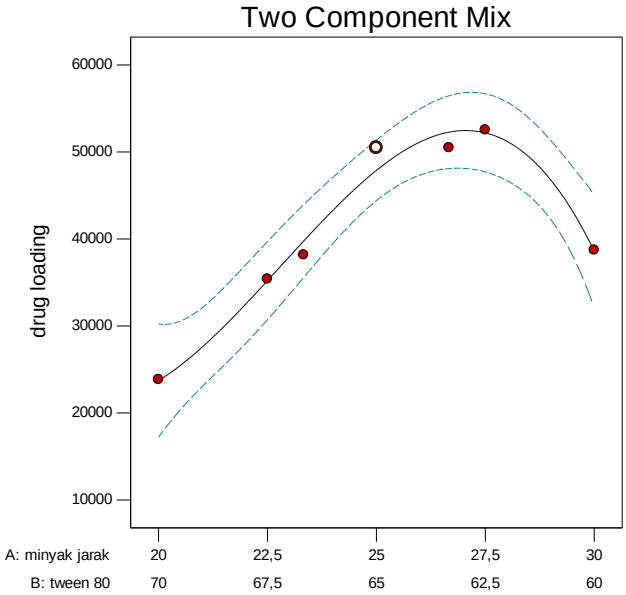
Std. Dev.	2060,05	R-Squared	0,9804
Mean	41382,89	Adj R-Squared	0,9609
C.V. %	4,98	Pred R-Square	0,7762
PRESS	1,457E+008	Adeq Precisior	18,338
-2 Log Likeliho	120,76	BIC	126,60
		AICc	134,76

Component	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
A-minyak jarak	38617,92	1	2043,48	32114,65	45121,18	2,39
B-tween 80	23721,42	1	2043,48	17218,16	30224,69	2,39
AB	66850,16	1	7888,88	41744,23	91956,10	3,40

Final Equation in Terms of L_Pseudo Components:

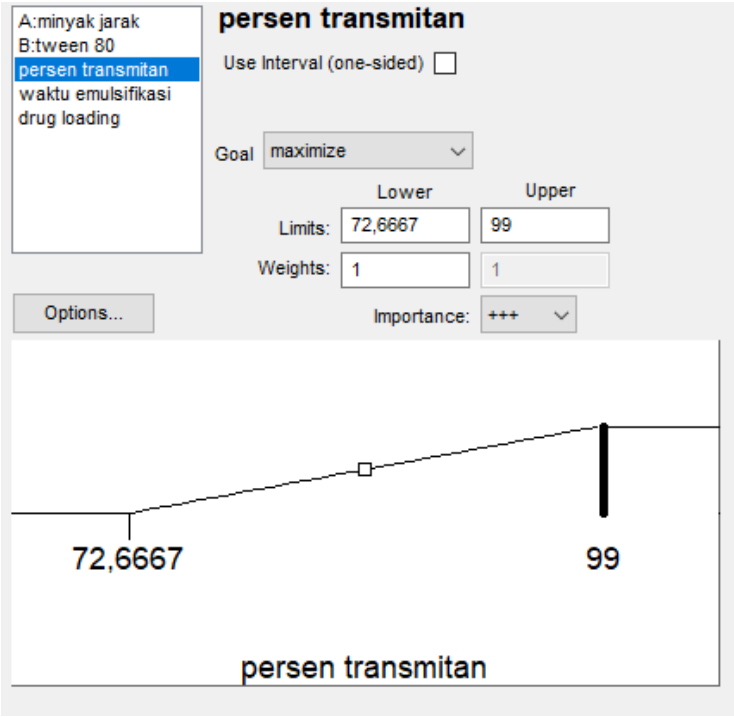
drug loading =
+38617,92 * A
+23721,42 * B
+66850,16 * AB

Normal plot

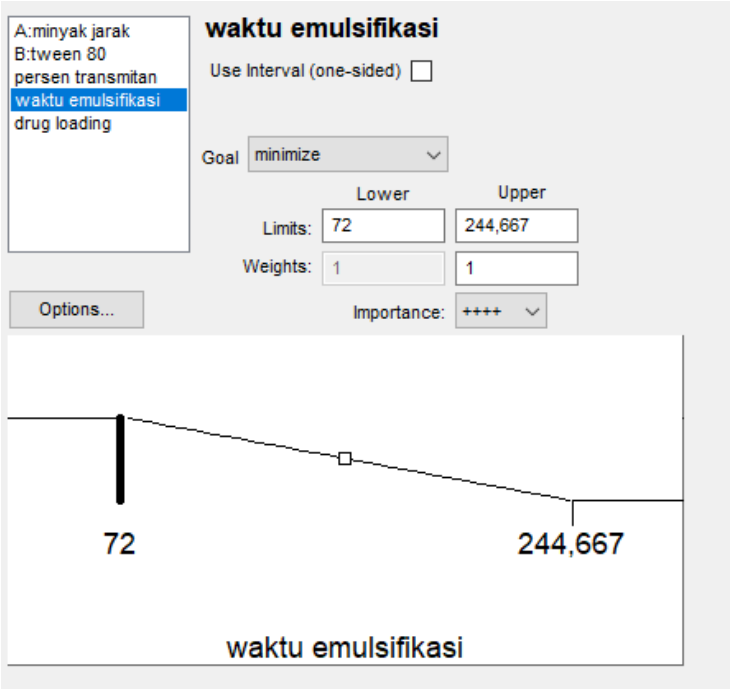


d. Optimasi formula

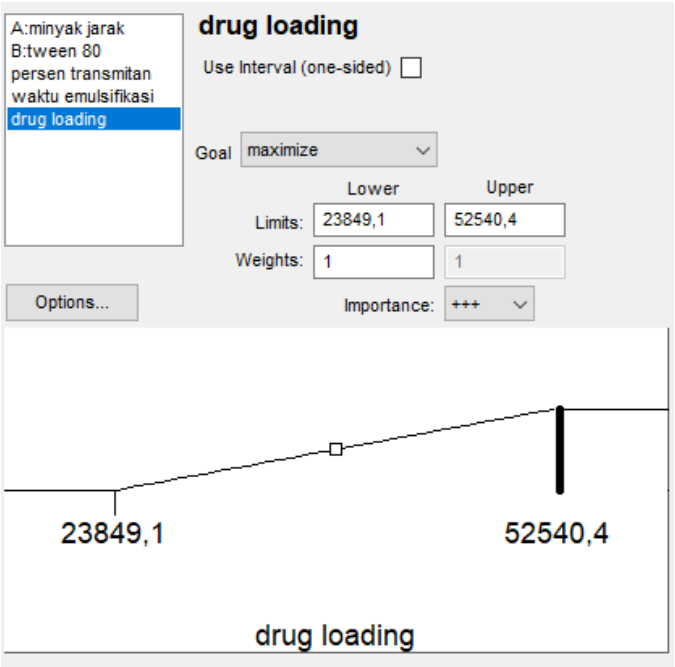
Parameter persen transmitan



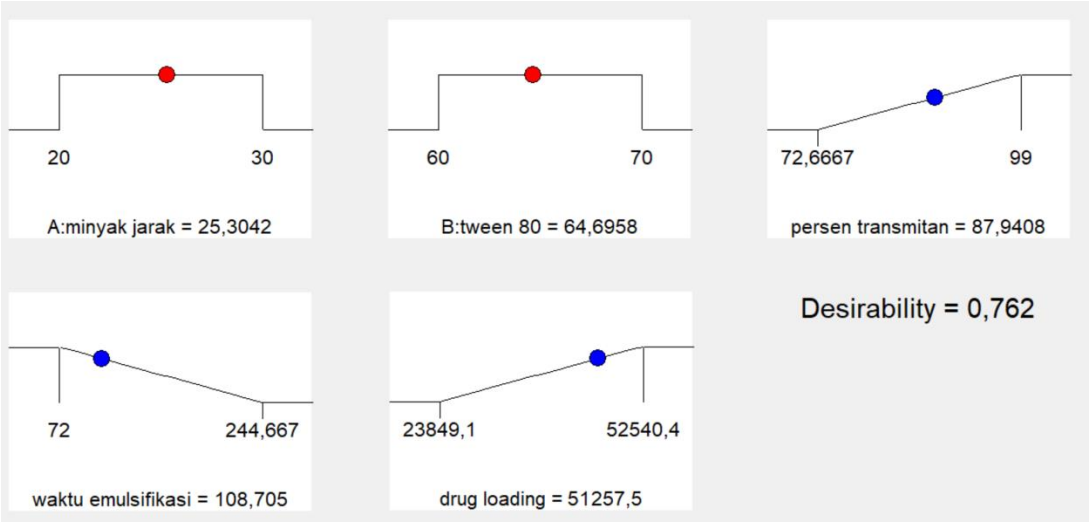
Parameter waktu emulsifikasi



Parameter *drug loading*



Hasil optimasi



Lampiran 7. Karakterisasi formula optimum SNEDDS furosemid

a. Persen transmitan

Replikasi	Persen transmitan (%)	Rata-rata (%)	SD
I	90,1		
II	83,6	87,9	3,72
III	90		

b. Waktu emulsifikasi

Replikasi	Waktu emulsifikasi (detik)	Rata-rata (detik)	SD
I	111		
II	102	102,6667	8,02
III	95		

c. *Drug loading*

Replikasi	Absorbansi	FP	Kadar (ppm)	Rata-rata kadar (ppm)	SD
I	0,572	2500	42491,49		
II	0,715	2500	55898,22	51335,55	7660,479
III	0,712	2500	55616,96		

- y = 0,1183 + 0,0534x
  0,572 = 0,1183 + 0,0534x
  x = 16,79498 · FP
  = 16,79498 · 2500
  = 41987,459 ppm
- y = 0,1183 + 0,0534x
  0,715 = 0,1183 + 0,0534x
  x = 21,37003 · FP
  = 21,37003 · 2500
  = 53425,081 ppm
- y = 0,1183 + 0,0534x
  0,712 = 0,1183 + 0,0534x
  x = 21,27405 · FP
  = 21,27405 · 2500
  = 53185,13 ppm

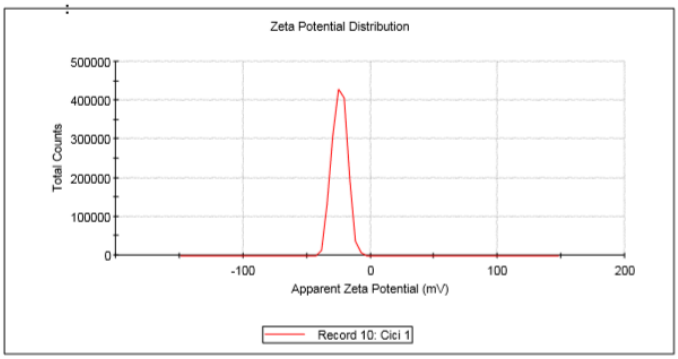
d. Zeta potensial

Replikasi	Zeta potensial (mV)	Rata-rata	SD
I	-24,1		
II	-23,2	-23,9	0,62
III	-24,4		

Replikasi I

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -24,1	Peak 1:	-24,1	100,0	5,75
Zeta Deviation (mV): 5,75	Peak 2:	0,00	0,0	0,00
Conductivity (mS/cm): 0,0503	Peak 3:	0,00	0,0	0,00

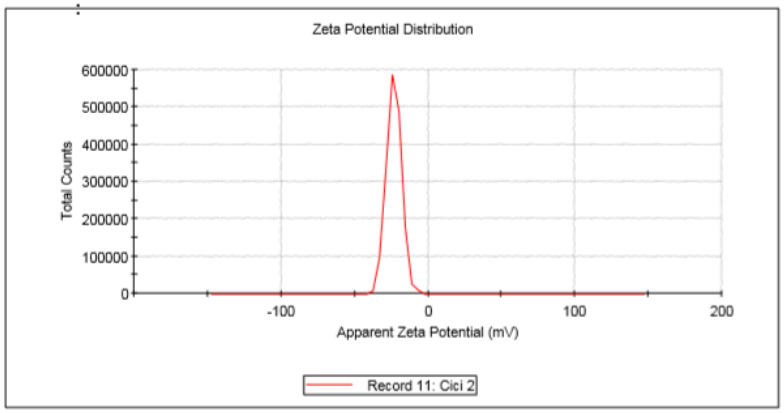
Result quality Good



Replikasi II

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -23,2	Peak 1:	-23,2	100,0	5,09
Zeta Deviation (mV): 5,09	Peak 2:	0,00	0,0	0,00
Conductivity (mS/cm): 0,0518	Peak 3:	0,00	0,0	0,00

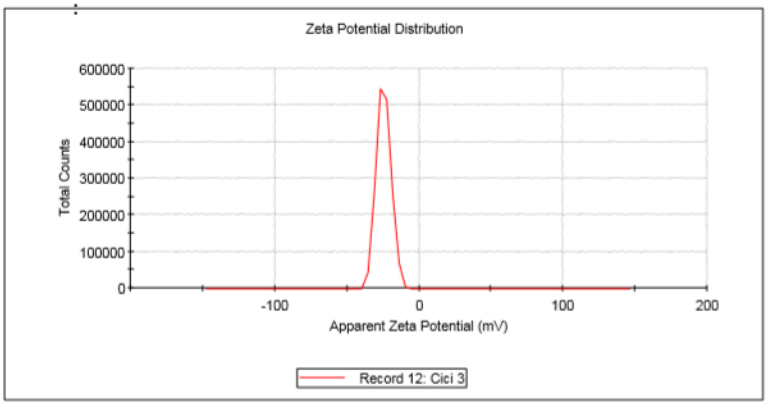
Result quality Good



Replikasi III

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -24,4	Peak 1:	-24,4	100,0	4,91
Zeta Deviation (mV): 4,91	Peak 2:	0,00	0,0	0,00
Conductivity (mS/cm): 0,0523	Peak 3:	0,00	0,0	0,00

Result quality Good



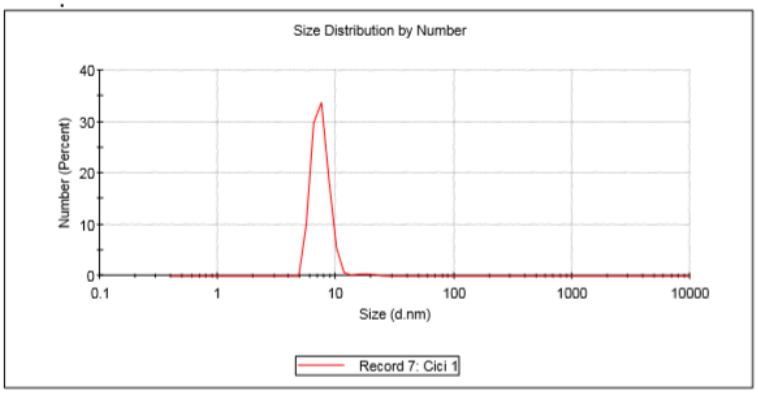
e. Ukuran droplet

Replikasi	Ukuran droplet (nm)	Rata-rata (nm)	SD
I	11,37		
II	11,37	11,35	0,03
III	11,32		

Replikasi I

			Size (d.n...	% Number:	St Dev (d.n...
Z-Average (d.nm):	653,2	Peak 1:	18,00	1,4	3,085
PdI:	0,609	Peak 2:	7,444	98,6	1,233
Intercept:	1,04	Peak 3:	0,000	0,0	0,000

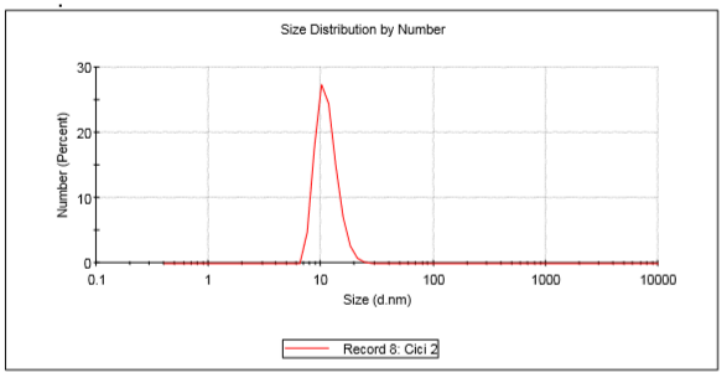
Result quality : Refer to quality report



Replikasi II

			Size (d.n...	% Number:	St Dev (d.n...
Z-Average (d.nm):	61,66	Peak 1:	11,37	100,0	2,624
PdI:	0,250	Peak 2:	0,000	0,0	0,000
Intercept:	0,956	Peak 3:	0,000	0,0	0,000

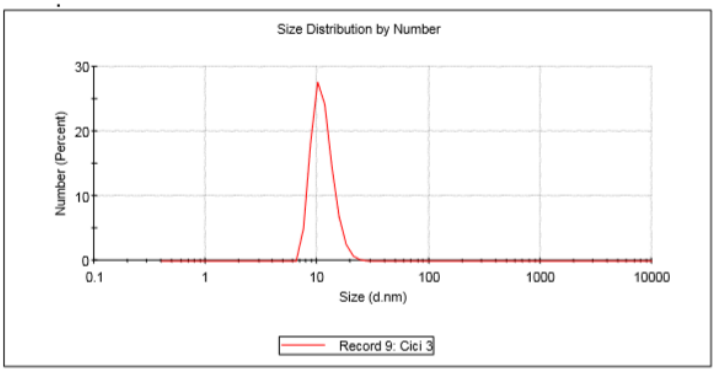
Result quality : Refer to quality report



Replikasi III

			Size (d.n...	% Number:	St Dev (d.n...
Z-Average (d.nm):	55,88	Peak 1:	11,32	100,0	2,605
PdI:	0,336	Peak 2:	0,000	0,0	0,000
Intercept:	0,947	Peak 3:	0,000	0,0	0,000

Result quality : Refer to quality report



f. Disolusi *in vitro*

Kadar Furosemid = 51335,55 ppm = 51,33 mg/ml

Jumlah SNEDDS furosemid yang dimasukkan ke dalam kapsul :

Volume = $\frac{dosis\ lazim\ furosemid}{kadar\ furosemid} = \frac{40\ mg}{51{,}33\ mg/ml} = 0{,}779\ ml$

Waktu	Serapan			Rata-rata	FP	X (ppm)	F koreksi	Kadar koreksi (ppm)	Kadar terkoreksi (mg)	Kadar terkoreksi (%)
	I	II	III							
5	0,321	0,32	0,321	0,321	4	42,747	0	42,747	38,472	96,18
10	0,322	0,325	0,325	0,324	4	43,197	0,237	43,434	39,091	97,73
15	0,441	0,439	0,437	0,439	4	58,717	0,239	58,957	53,061	132,65
20	0,456	0,45	0,454	0,453	4	60,651	0,326	60,978	54,879	137,19
25	0,344	0,347	0,344	0,345	4	46,031	0,337	46,368	41,731	104,33
30	0,329	0,33	0,333	0,331	4	44,096	0,256	44,352	39,917	99,79
35	0,305	0,31	0,307	0,307	4	40,947	0,245	41,192	37,073	92,68
60	0,34	0,343	0,339	0,341	4	45,446	0,227	45,673	41,106	102,77

- 5 menit

  y = 0,00393 + 0,02964x

  0,321 = 0,00393 + 0,02964x

  x = 10,68668 · FP

  = 10,68668 · 4

  = 42,747 ppm

  Faktor koreksi = 0

  Kadar terkoreksi (ppm) = 42,747 ppm + 0

  = 42,747 ppm

  Kadar terkoreksi (mg) = $\frac{42{,}747\ mg}{1000\ ml} x\ 900\ ml$

  = 38,472 mg

  Kadar terkoreksi (%) = $\frac{38{,}472\ mg}{40\ mg} x\ 100\%$

  = 96,18%

- 10 menit

  y = 0,00393 + 0,02964x

  0,324 = 0,00393 + 0,02964x

  x = 10,79915 · FP

  = 10,79915 · 4

  = 43,197 ppm

  Faktor koreksi $= \frac{5}{900} x\ 42{,}747\ ppm$

  = 0,237 ppm

  Kadar terkoreksi (ppm) = 43,197 ppm + 0,237 ppm

  = 43,434

  Kadar terkoreksi (mg) $= \frac{43{,}434\ \text{mg}}{1000\ ml} x\ 900\ ml$

  = 39,091 mg

  Kadar terkoreksi (%) $= \frac{39{,}091\ \text{mg}}{40\ mg} x\ 100\%$

  = 97,73%

- 15 menit

  y = 0,00393 + 0,02964x

  0,439 = 0,00393 + 0,02964x

  x = 14,67922 · FP

  = 14,67922 · 4

  = 58,717 ppm

  Faktor koreksi $= \frac{5}{900} x\ 43{,}197\ ppm$

  = 0,239 ppm

  Kadar terkoreksi (ppm) = 58,717 ppm + 0,239 ppm

  = 58,957 ppm

  Kadar terkoreksi (mg) $= \frac{58{,}957\text{mg}}{1000\ ml} x\ 900\ ml$

  = 53,061 mg

  Kadar terkoreksi (%) $= \frac{53{,}061\ \text{mg}}{40\ mg} x\ 100\%$

  = 132,65%

- 20 menit

  y = 0,00393 + 0,02964x

  0,453 = 0,00393 + 0,02964x

  x = 11,50768 · FP

  = 11,50768 · 4

  = 46,031 ppm

  Faktor koreksi $= \frac{5}{900} x\ 58{,}957\ ppm$

  = 0,337 ppm

  Kadar terkoreksi (ppm) = 46,031 ppm + 0,337 ppm

  = 46,368 ppm

  Kadar terkoreksi (mg) $= \frac{46{,}368\ \text{mg}}{1000\ ml} x\ 900\ ml$

  = 41,731 mg

Kadar terkoreksi (%) $= \frac{41{,}731 \text{ mg}}{40\ mg} x\ 100\%$
= 104,33%

- 25 menit

y = 0,00393 + 0,02964x
0,345 = 0,00393 + 0,02964x
x = 15,16283 · FP
= 15,16283 · 4
= 60,651 ppm

Faktor koreksi $= \frac{5}{900} x\ 58{,}717\ ppm$
= 0,326 ppm
Kadar terkoreksi (ppm) = 60,651 ppm + 0,326 ppm
= 60,978 ppm
Kadar terkoreksi (mg) $= \frac{60{,}978 \text{ mg}}{1000\ ml} x\ 900\ ml$
= 54,879 mg
Kadar terkoreksi (%) $= \frac{54{,}879 \text{ mg}}{40\ mg} x\ 100\%$
= 137,19%

- 30 menit

y = 0,00393 + 0,02964x
0,331 = 0,00393 + 0,02964x
x = 11,02408 · FP
= 11,02408 · 4
= 44,096 ppm

Faktor koreksi $= \frac{5}{900} x\ 60{,}978\ ppm$
= 0,256 ppm
Kadar terkoreksi (ppm) = 44,096 ppm + 0,256 ppm
= 44,352 ppm
Kadar terkoreksi (mg) $= \frac{44{,}352 \text{ mg}}{1000\ ml} x\ 900\ ml$
= 39,917 mg
Kadar terkoreksi (%) $= \frac{39{,}917 \text{ mg}}{40\ mg} x\ 100\%$
= 99,79%

- 35 menit

y = 0,00393 + 0,02964x
0,307 = 0,00393 + 0,02964x
x = 10,23682 · FP
= 10,23682 · 4
= 40,947 ppm

Faktor koreksi $= \frac{5}{900} x\ 44{,}352\ ppm$
= 0,245 ppm
Kadar terkoreksi (ppm) = 40,947 ppm + 0,245 ppm
= 41,192 ppm

Kadar terkoreksi (mg) $= \frac{41{,}192\ \text{mg}}{1000\ ml} x\ 900\ ml$

$= 37{,}073$ mg

Kadar terkoreksi (%) $= \frac{37{,}073\ \text{mg}}{40\ mg} x\ 100\%$

$= 92{,}68\%$

- 60 menit

  y $= 0{,}00393 + 0{,}02964x$

  0,341 $= 0{,}00393 + 0{,}02964x$

  x $= 11{,}36148 \cdot FP$

  $= 11{,}36148 \cdot 4$

  $= 45{,}446$ ppm

  Faktor koreksi $= \frac{5}{900} x\ 41{,}192\ ppm$

  $= 0{,}227$ppm

  Kadar terkoreksi (ppm) $= 45{,}446$ ppm + 0,227 ppm

  $= 45{,}446$ ppm

  Kadar terkoreksi (mg) $= \frac{45{,}446\ \text{mg}}{1000\ ml} x\ 900\ ml$

  $= 41{,}106$ mg

  Kadar terkoreksi (%) $= \frac{41{,}106\ \text{mg}}{40\ mg} x\ 100\%$

  $= 102{,}77\%$

Lampiran 8. Verifikasi formula optimum SNEDDS furosemid

One-Sample Kolmogorov-Smirnov Test

		persen transmitan	waktu emulsifikasi	drug loading
N		3	3	3
Normal Parameters[a,b]	Mean	87,9000	102,6667	51335,5567
	Std. Deviation	3,72424	8,02081	7660,47735
Most Extreme Differences	Absolute	,380	,200	,379
	Positive	,277	,200	,276
	Negative	-,380	-,184	-,379
Kolmogorov-Smirnov Z		,659	,346	,656
Asymp. Sig. (2-tailed)		,779	1,000	,783

a. Test distribution is Normal.

b. Calculated from data.

Data uji *One-Sample Kolmogorov-Smirnov* menunjukkan nilai signifikansi $p > 0,05$ (H_0 diterima). Disimpulkan data tersebut terdistribusi normal.

a. Persen transmitan

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
persen transmitan	3	87,9000	3,72424	2,15019

One-Sample Test

	Test Value = 87.9374					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
persen transmitan	-,017	2	,988	-,03740	-9,2889	9,2141

b. Waktu emulsifikasi

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
waktu emulsifikasi	3	102,6667	8,02081	4,63081

One-Sample Test

	Test Value = 108.723					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
waktu emulsifikasi	-1,308	2	,321	-6,05633	-25,9811	13,8685

c. *Drug loading*

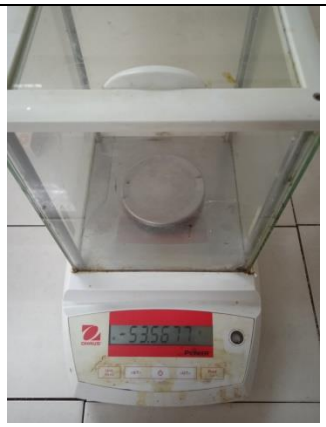
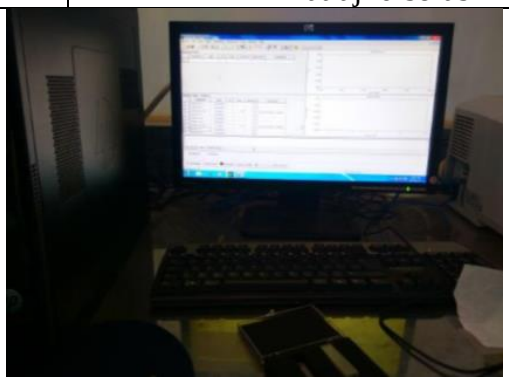
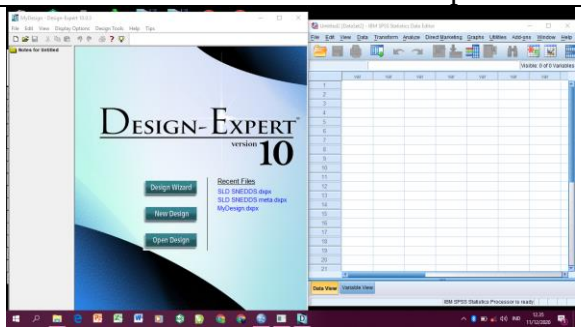
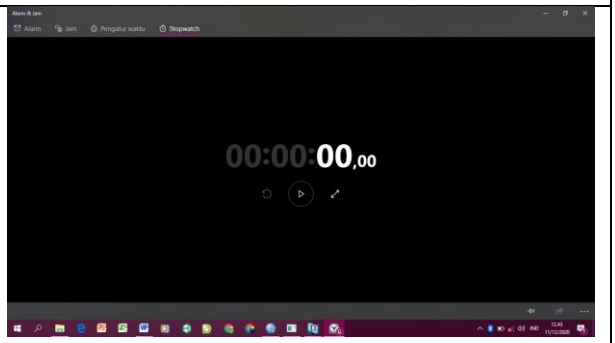
One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
drug loading	3	51335,5567	7660,47735	4422,77866

One-Sample Test

	Test Value = 51257.5					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
drug loading	,018	2	,988	78,05667	-18951,6240	19107,7373

Lampiran 19. Alat-alat yang digunakan dalam praktikum

<table>
<tr><td> 
Neraca analitik</td><td> 
Magnetic stirrer</td></tr>
<tr><td> 
Sentrifugator</td><td> 
Alat uji disolusi</td></tr>
<tr><td colspan="2">  
Spektrofotometer UV-Vis</td></tr>
<tr><td> 
Perangkat terinstal Design Expert dan SPSS</td><td> 
Stopwatch</td></tr>
</table>