

BAB 5

KESIMPULAN

5.1. Kesimpulan

- Metode KLT-Densitometri dapat digunakan untuk identifikasi dan menetapkan kadar sibutramin HCl dalam kapsul herbal pelangsing.
- Dari sembilan macam kapsul herbal pelangsing yang beredar dipasaran, merek A, B, dan C mengandung sibutramin HCl.

5.2. Saran

Berdasarkan hasil penelitian ini, disarankan untuk mengaplikasikan metode kromatografi lapis tipis-densitometri untuk identifikasi serta menetapkan kadar sibutramin HCl dalam berbagai sediaan kapsul herbal pelangsing yang beredar dipasaran.

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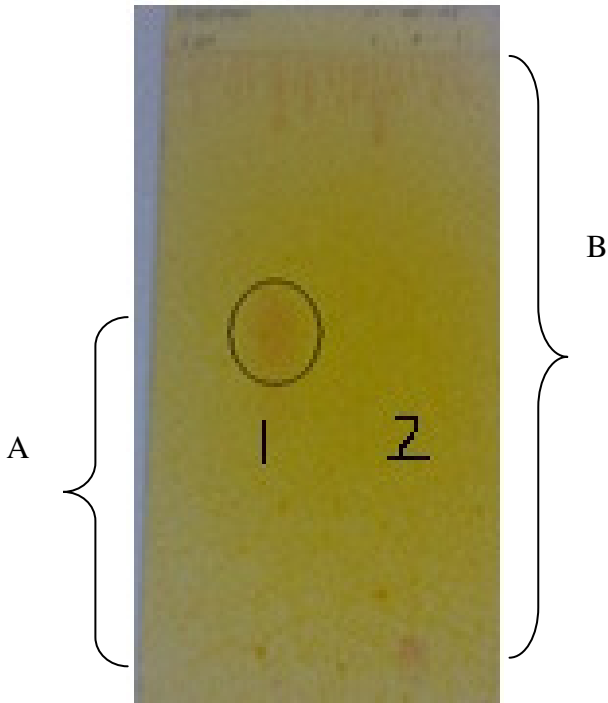
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Contoh perhitungan faktor retardasi (Rf)



$$R_f = \frac{A}{B} = \frac{5}{8} = 0,63$$

dimana :

Rf = faktor retardasi

A = jarak dari totolan sampai noda

B = jarak dari totolan sampai batas eluasi

Contoh Perhitungan Resolusi Analit

Diketahui :

- Jarak yang ditempuh matriks (dr A)
- Jarak yang ditempuh sibutramin HCl (dr B)
- Lebar puncak matriks (W_A)
- Lebar puncak sibutramin HCl (W_B)

$$R_{s AB} = \frac{2 \Delta Z}{W_A + W_B} = \frac{2 (dr A - dr B)}{W_A + W_B}$$

Perhitungan R_s :

$$1. \quad R_s \text{ fase gerak 1} = \frac{2(dr A - dr B)}{W_A + W_B} = \frac{2(6,4 - 2,9)}{0,3 + 0,9} = 5,8$$

$$2. \quad R_s \text{ fase gerak 2} = \frac{2(dr A - dr B)}{W_A + W_B} = \frac{2(5,8 - 4,5)}{0,5 + 0,8} = 2$$

Keterangan :

Fase gerak 1 = Toluena : Etil Asetat : Asam Formiat (1 : 8 : 1 v/v/v)

Fase gerak 2 = Metanol : Etil Asetat : Asam Formiat (1 : 8 : 1 v/v/v)

**Perhitungan Harga F yang Dihasilkan pada Uji Linearitas Sibutramin
HCl Menggunakan Tiga Kali Replikasi**

Hari	Konsentrasi (ppm) (x)	Luas area (y)	x^2	y^2	Xy
1	300	2191,5	90000	4802672,25	657450
	400	3854,8	160000	14859483,04	1541920
	500	4881,9	250000	23832947,61	2440950
	600	5330,8	360000	28417428,64	3198480
	700	5521,1	490000	30482545,21	3864770
			$\Sigma = 1350000$	$\Sigma = 102395076,8$	$\Sigma = 11703570$
2	300	1961,8	90000	3848659,24	588540
	400	3423,7	160000	11721721,69	1369480
	500	4707,8	250000	22163380,84	2353900
	600	5055,6	360000	25559091,36	3033360
	700	5573	490000	31058329	3901100
			$\Sigma = 1350000$	$\Sigma = 94351182,13$	$\Sigma = 11246380$
3	300,9	2474,9	90540,81	6125130,01	744697,41
	401,2	3057,4	160961,44	9347694,76	1226628,88
	501,5	4662,9	251502,25	21742636,41	2338444,35
	598,5	5355,7	358202,25	28683522,49	3205386,45
	698,5	5667,5	487902,25	32120556,25	3958748,75
			$\Sigma = 1349109$	$\Sigma = 98019539,92$	$\Sigma = 11473905,84$

	Σx^2	Σxy	Σy^2	Residual SS	n	Residual DF (n-2)
Regresi1	1350000	11703570	102395076,8	933187,3593	5	3
Regresi2	1350000	11246380	94351182,13	661505,7564	5	3
Regresi3	1349109	11473905,84	98019539,92	436234,7718	5	3
	$\Sigma(\Sigma x^2) =$ 4049109	$\Sigma(\Sigma xy) =$ 34423855,84	$\Sigma(\Sigma y^2) =$ 294765798,9	SSt = 2030927,888		DFt = 9

$$\begin{aligned}
SS1 &= \Sigma y^2 1 - \frac{\Sigma xy^2}{\Sigma x^2} = 102395076,8 - \frac{136973550700000}{1350000} = 933187,3593 \\
SS2 &= \Sigma y^2 2 - \frac{\Sigma xy^2}{\Sigma x^2} = 94351182,13 - \frac{126481063100000}{1350000} = 661505,7564 \\
SS3 &= \Sigma y^2 3 - \frac{\Sigma xy^2}{\Sigma x^2} = 98019539,92 - \frac{131650515200000}{1349109} = 436234,7718 \\
SSt &= SS1 + SS2 + SS3 = 933187,3593 + 661505,7564 + 436234,7718 \\
&= 2030927,888 \\
SSc &= \Sigma (\Sigma y^2) - \frac{\Sigma (\Sigma xy)^2}{\Sigma (\Sigma x^2)} = 294765798,9 - \frac{1,185 \times 10^{15}}{4049109} = 2108364,661 \\
F &= \frac{\frac{SSc - SSt}{DF-1}}{\frac{SSt}{DFt}} = \frac{\frac{2108364,661 - 2030927,888}{3-1}}{\frac{2030927,888}{9}} = \frac{38718,3865}{225658,6542} \\
&= 0,1716 \\
F \text{ hitung} &= 0,1716 \\
F \text{ tabel}_{0,05 (2;9)} &= 4,26 \\
F \text{ hitung} < F \text{ tabel} &= 0,1716 < 4,26 = \text{tidak berbeda bermakna}
\end{aligned}$$

Tabel F

Titik Persentase Distribusi F untuk Probabilita = 0,05															
df untuk penyebut (N2)	df untuk pembilang (N1)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	161	198	216	225	230	234	237	239	241	242	243	244	245	245	246
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.40	19.41	19.42	19.42	19.43
3	10.13	9.56	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.76	8.74	8.73	8.71	8.70
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.98	5.94	5.91	5.89	5.87	5.86
5	6.81	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.70	4.68	4.68	4.64	4.62
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.03	4.00	3.98	3.96	3.94
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.60	3.57	3.55	3.53	3.51
8	5.32	4.46	4.07	3.84	3.68	3.58	3.50	3.44	3.39	3.35	3.31	3.28	3.26	3.24	3.22
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.10	3.07	3.05	3.03	3.01
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.94	2.91	2.89	2.86	2.85
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.82	2.79	2.76	2.74	2.72
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.72	2.69	2.66	2.64	2.62
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.63	2.60	2.58	2.55	2.53
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.57	2.53	2.51	2.48	2.46
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.51	2.48	2.45	2.42	2.40
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.46	2.42	2.40	2.37	2.35
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.41	2.38	2.35	2.33	2.31
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.37	2.34	2.31	2.29	2.27
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.34	2.31	2.28	2.26	2.23
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.31	2.28	2.25	2.22	2.20
21	4.32	3.47	3.07	2.84	2.68	2.57	2.48	2.42	2.37	2.32	2.28	2.25	2.22	2.20	2.18
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.26	2.23	2.20	2.17	2.15
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.24	2.20	2.18	2.15	2.13
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.22	2.18	2.15	2.13	2.11
25	4.24	3.38	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.20	2.16	2.14	2.11	2.09
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.18	2.15	2.12	2.09	2.07
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.17	2.13	2.10	2.08	2.06
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.15	2.12	2.09	2.06	2.04
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.14	2.10	2.08	2.05	2.03
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.13	2.09	2.06	2.04	2.01
31	4.16	3.30	2.91	2.68	2.52	2.41	2.32	2.25	2.20	2.15	2.11	2.08	2.05	2.03	2.00
32	4.15	3.29	2.90	2.67	2.51	2.40	2.31	2.24	2.19	2.14	2.10	2.07	2.04	2.01	1.99
33	4.14	3.28	2.89	2.66	2.50	2.39	2.30	2.23	2.18	2.13	2.09	2.06	2.03	2.00	1.98
34	4.13	3.28	2.88	2.65	2.49	2.38	2.29	2.23	2.17	2.12	2.08	2.05	2.02	1.99	1.97
35	4.12	3.27	2.87	2.64	2.48	2.37	2.28	2.22	2.16	2.11	2.07	2.04	2.01	1.99	1.96
36	4.11	3.26	2.87	2.63	2.48	2.36	2.28	2.21	2.15	2.11	2.07	2.03	2.00	1.98	1.95
37	4.11	3.25	2.86	2.63	2.47	2.36	2.27	2.20	2.14	2.10	2.06	2.02	2.00	1.97	1.95
38	4.10	3.24	2.85	2.62	2.46	2.35	2.26	2.19	2.14	2.09	2.05	2.02	1.99	1.96	1.94
39	4.09	3.24	2.85	2.61	2.46	2.34	2.26	2.19	2.13	2.08	2.04	2.01	1.98	1.95	1.93
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.04	2.00	1.97	1.95	1.92
41	4.08	3.23	2.83	2.60	2.44	2.33	2.24	2.17	2.12	2.07	2.03	2.00	1.97	1.94	1.92
42	4.07	3.22	2.83	2.59	2.44	2.32	2.24	2.17	2.11	2.06	2.03	1.99	1.96	1.94	1.91
43	4.07	3.21	2.82	2.58	2.43	2.32	2.23	2.16	2.11	2.06	2.02	1.98	1.96	1.93	1.91
44	4.06	3.21	2.82	2.58	2.43	2.31	2.23	2.16	2.10	2.05	2.01	1.98	1.95	1.92	1.90
45	4.06	3.20	2.81	2.58	2.42	2.31	2.22	2.15	2.10	2.05	2.01	1.97	1.94	1.92	1.89

Tabel R

DEGREES OF FREEDOM (DF)	5 PERCENT	1 PERCENT	DEGREES OF FREEDOM (DF)	5 PERCENT	1 PERCENT
1	.997	1.000	24	.388	.496
2	.950	.990	25	.381	.487
3	.878	.959	26	.374	.478
4	.811	.917	27	.367	.470
5	.754	.874	28	.361	.463
6	.707	.834	29	.355	.456
7	.666	.798	30	.349	.449
8	.632	.765	35	.325	.418
9	.602	.735	40	.304	.393
10	.576	.708	48	.288	.372
11	.553	.684	50	.273	.354
12	.532	.661	60	.250	.325
13	.514	.641	70	.232	.302
14	.497	.623	80	.217	.283
15	.482	.606	90	.205	.267
16	.468	.590	100	.195	.254
17	.456	.575	125	.174	.228
18	.444	.561	150	.159	.208
19	.433	.549	200	.138	.181
20	.423	.537	300	.113	.148
21	.413	.526	400	.098	.128
22	.404	.515	500	.088	.115
23	.396	.505	1000	.062	.081

Sumber: Soedigdo & Soedigdo (1977).

**Cara Perhitungan Akurasi dan Presisi Metode Penetapan Kadar
Sibutramin HCl
pada Konsentrasi 80, 100 dan 120% dalam Matriks Kapsul Herbal
Pelangsing**

Matriks kapsul herbal pelangsing ditimbang sebanyak 112,5 mg diekstraksi dengan MeOH sebanyak 5,0 ml, sibutramin HCl ditimbang sebanyak tiga kali 26,8 mg untuk konsentrasi 80%, tiga kali 33,5 mg untuk konsentrasi 100%, dan tiga kali 40,2 mg untuk konsentrasi 120 %, masing-masing diekstraksi dengan 5,0 ml MeOH



Saring kemudian ditotolkan masing-masing sebanyak 5 µl sibutramin HCl dan 5 µl matriks, eluasi dengan fase gerak Metanol : Etil Asetat : Asam Formiat (1 : 8 : 1

v/v/v)



% perolehan kembali

Akurasi dan Presisi dari Sibutramin HCl

Konsentrasi 80%

Replika si	Penimba ngan (mg)	Kesetaraan/berat tablet (mg)	Konsentra si analit (ppm) (Xi)	Area noda (Yi)	Konsentrasi analit sebenarnya (ppm) (Xi ¹)	% recovery (%)
1	26,9/5 ml	2,01 mg/134 mg	401,2	3363,7	399,6	99,6
2	27,0/5 ml	2,01 mg/134 mg	402,6	3563,7	422,4	104,9
3	27,4/5 ml	2,05 mg/134 mg	409,0	3607,5	416,7	101,9
$\% recovery_{rata-rata} = 102,1\%$ $SD = 2,658$ $KV = 2,6$ $T \text{ hitung} = 1,39$						

Konsentrasi 100%

Replikasi	Penimba ngan (mg)	Kesetaraan/berat tablet (mg)	Konsentra si analit (ppm) (Xi)	Area noda (Yi)	Konsentrasi analit sebenarnya (ppm) (Xi ¹)	% recovery
1	33,6/5 ml	2,51 mg/134 mg	501,5	4225,0	498,0	99,3
2	33,8/5 ml	2,52 mg/134 mg	504,5	4396,0	517,0	102,5
3	32,7/5 ml	2,45 mg/134 mg	487,0	3959,9	467,7	96,0
$\% recovery_{rata-rata} = 99,3\%$ $SD = 3,250$ $KV = 3,3$ $T \text{ hitung} = 0,391$						

Konsentrasi 120%

Replikasi	Penimbangan (mg)	Kesetaraan/berat tablet (mg)	Konsentrasi analit (ppm) (Xi)	Area noda (Yi)	Konsentrasi analit sebenarnya (ppm) (Xi ¹)	% recovery
1	40,1/5 ml	2,99 mg/134 mg	598,5	5104,0	598,4	100,0
2	40,1/5 ml	2,99 mg/134 mg	598,5	4963,8	582,4	97,3
3	40,8/5 ml	3,04 mg/134 mg	608,9	5235,6	613,5	100,8

$$\%recovery_{rata-rata} = 99,4 \%$$

$$SD = 1,834$$

$$KV = 1,8$$

$$T \text{ hitung} = 0,598$$

Cara perhitungan

1. Replikasi 1 (120%) = 40,1 mg

(tiap tablet setara dengan 10 mg sibutramin HCl = 134 mg tablet setara dengan 10 mg sibutramin HCl)

- Jumlah sibutramin HCl yang terdapat dalam 40,1 mg tablet =

$$\frac{40,1}{134} \times 10 \text{ mg} = 2,9925 \text{ mg}$$

- 2,9925 mg ad 5,0 ml methanol → 598,5 ppm

2. % perolehan kembali = $\frac{\text{jumlah zat yang diperoleh}}{\text{jumlah zat yang sebenarnya}} \times 100\%$

$$\text{Contoh untuk replikasi 1 (120\%)} = \frac{598,4}{598,5} \times 100\% = 100\%$$

$$3. \quad SD = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}} = SD \ 120\% = \sqrt{\frac{6,73}{3-1}} = 1,834$$

Keterangan :

$$\bar{x} = \frac{100,0+97,3+100,8}{3} = 99,4 \%$$

n = jumlah data

$$\begin{aligned} \sum (x - \bar{x})^2 &= (100,0-99,4)^2 + (97,3-99,4)^2 + (100,8-99,4)^2 \\ &= 6,73 \end{aligned}$$

$$4. \quad KV = \frac{SD}{\bar{x}} \times 100\%$$

$$KV \ 120 \ % = \frac{1,834}{99,4} \times 100\% = 1,8 \%$$

$$5. \quad T \text{ hitung : } t = \frac{[\sum \bar{x} - \mu]}{\frac{SD}{\sqrt{n}}}$$

$$t \ 120 \ % = \frac{[99,4-100]}{\frac{1,834}{\sqrt{3}}} = 0,598$$

Hasil Perhitungan Harga Thitung dalam Uji Akurasi Menggunakan SPSS

T-TEST

/TESTVAL=100

/MISSING=ANALYSIS

/VARIABLES=konsentrasi80 konsentrasi100 konsentrasi120

/CRITERIA=CI(.95).

T-Test

[DataSet0]

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
konsentrasi80	3	102.1333	2.65769	1.53442
konsentrasi100	3	99.2667	3.25013	1.87646
konsentrasi120	3	99.3667	1.83394	1.05883

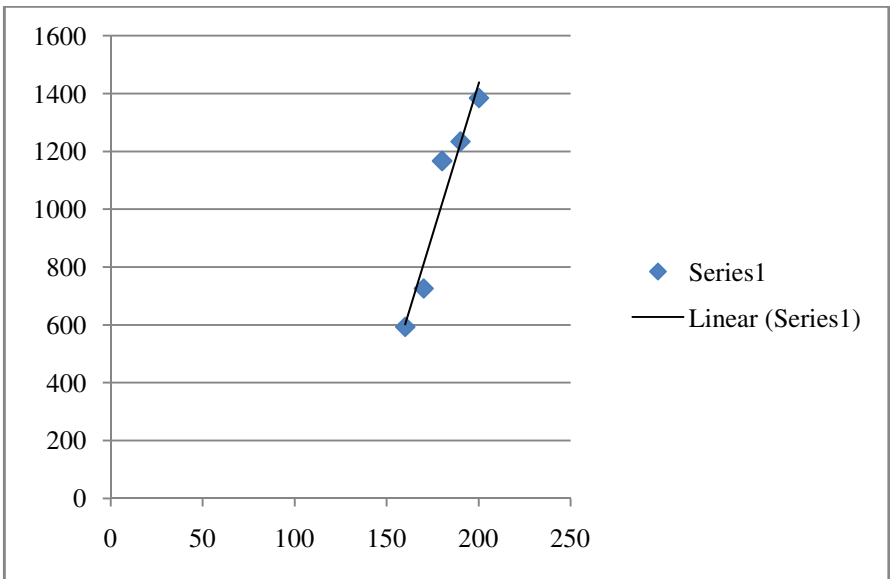
One-Sample Test

	Test Value = 100					
					95% Confidence Interval of the Difference	
	T	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
konsentrasi80	1.390	2	.299	2.13333	-4.4687	8.7354
konsentrasi100	-.391	2	.734	-.73333	-8.8071	7.3404
konsentrasi120	-.598	2	.610	-.63333	-5.1891	3.9224

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
Z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										

Hasil Ekstrapolasi Grafik Hubungan antara Jumlah Sibutramin HCl (X) Vs Luas Area pada Uji LOD/LOD



Perhitungan LOD/LOQ

Konsentrasi (ppm) (Xi)	Area (Yi)	Area sebenarnya (\bar{Y}_i)	$(Y_i - \bar{Y}_i)^2$
160,12	592,5	601,95	89,3025
170,13	724,9	810,99	7411,4881
180,14	1165,9	1020,00	21286,8100
190,14	1233,2	1228,85	18,9225
200,15	1383,2	1437,89	2990,9961
			$\Sigma = 31797,5192$

Persamaan kurva LOD/LOQ : $y = 20,8829x - 2741,82$

$$S_{\frac{y}{x}} = \sqrt{\frac{\Sigma(Y_i - \bar{Y}_i)^2}{N-2}} = S_{\frac{y}{x}} = \sqrt{\frac{31797,5192}{3}} = 102,95$$

$$LOD = \frac{3 \times S_{y/x}}{\text{slope}} = \frac{3 \times 102,95}{20,8829} = 14,79 \text{ ppm (14,79 } \mu\text{g/ml)}$$

$$LOQ = \frac{10 \times S_{y/x}}{\text{slope}} = \frac{10 \times 102,95}{20,8829} = 49,30 \text{ ppm (49,30 } \mu\text{g/ml)}$$

Penetapan LOD/LOQ Untuk Satu Buah Kapsul Herbal Pelangsing (450 mg) :

$$LOD = 5 \text{ ml} / 1 \text{ ml} \times 14,79 \mu\text{g} = 73,95 \mu\text{g dalam 5 ml}$$

$$= 73,95 \mu\text{g dalam 150 mg kapsul herbal pelangsing}$$

$$= 221,85 \mu\text{g dalam satu buah kapsul herbal pelangsing}$$

$$LOQ = 5 \text{ ml} / 1 \text{ ml} \times 49,30 \mu\text{g} = 246,5 \mu\text{g dalam 5 ml}$$

$$\begin{aligned} &= 246,5 \mu\text{g dalam } 150 \text{ mg kapsul herbal pelangsing} \\ &= 739,5 \mu\text{g dalam satu buah kapsul herbal pelangsing} \end{aligned}$$

Persen kadar yang masih dapat terdeteksi dan terkuantifikasi dalam satu kapsul herbal pelangsing :

$$\text{LOD} = 221,85 \mu\text{g} / 450000 \mu\text{g} \times 100 \% = 0,0493 \% \text{ b/b}$$

$$\text{LOQ} = 739,5 \mu\text{g} / 450000 \mu\text{g} \times 100 \% = 0,1643 \% \text{ b/b}$$

Contoh Perhitungan Kadar Sibutramin HCl dalam Sampel Kapsul Herbal Pelangsing

Tabel 4.12. Hasil Perhitungan Kadar Sibutramin HCl dalam Sampel A

Sampel	Penimbangan (mg)	Konsentrasi Teoritis (ppm)	Luas Area	Konsentrasi Pengamatan (ppm)	% Kadar
1	50,0	10000	3920,5	463,19	4,63
2	49,9	9980	3663,9	433,88	4,35
					4,49

Tabel 4.13. Hasil Perhitungan Kadar Sibutramin HCl dalam Sampel B

Sampel	Penimbangan (mg)	Konsentrasi Teoritis (ppm)	Luas Area	Konsentrasi Pengamatan (ppm)	% Kadar
1	30,1	6020	2661,4	319,33	5,30
2	30,2	6040	3966,2	468,42	7,76
					6,53

Tabel 4.14. Hasil Perhitungan Kadar Sibutramin HCl dalam Sampel C

Sampel	Penimbangan (mg)	Konsentrasi Teoritis (ppm)	Luas Area	Konsentrasi Pengamatan (ppm)	% Kadar
1	30,4	6080	3082,2	367,41	6,04
2	29,9	5980	2957,8	353,20	5,91
					5,98

Cara perhitungan

1. Konsentrasi teoritis = 30,4 mg dalam 5 ml

$$= 30400 \mu\text{g dalam } 5 \text{ ml}$$

$$= 6080 \mu\text{g/ml atau } 6080 \text{ ppm}$$

2. Konsentrasi pengamatan

Persamaan regresi linearitas :

$$Y = 8,7521X - 133,42$$

$$3082,2 = 8,7521X - 133,42$$

$$X = 367,41 \text{ ppm (} 367,41 \mu\text{g/ml)}$$

3. Kadar Sibutramin HCl dalam Satu Buah Kapsul Herbal

Pelangsing Sampel C (234,2 mg) :

$$- 234,2 \text{ mg dalam } 5,0 \text{ ml metanol} = 46840 \text{ ppm}$$

Contoh untuk sampel C :

$$- 5 \text{ ml} / 1 \text{ ml} \times 367,41 \mu\text{g} = 1837,05 \mu\text{g dalam } 5 \text{ ml}$$

$$= 1837,05 \mu\text{g dalam } 30,4 \text{ mg sampel C}$$

$$= 14152,5 \mu\text{g dalam satu kapsul herbal pelangsing sampel C}$$

Jadi, persen kadar sibutramin HCl dalam sampel C :

$$- 14152,5 \mu\text{g} / 234200 \mu\text{g} \times 100 \% = 6,04 \% \text{ b/b}$$

atau dengan rumus :

$$\% \text{ kadar} = \frac{\text{konsentrasi pengamatan}}{\text{konsentrasi sebenarnya}} \times 100\%$$

$$\frac{367,41}{6080} \times 100\% = 6,04\%$$