

Lampiran 1. Pembuatan fase gerak

Fase gerak metanol : air-asam pospat 0,1% (36:67) sebanyak 300 ml

A. Membuat air-asam pospat 0,1 %

Diketahui konsentrasi asam pospat pekat 85 %

Untuk membuat air- asam pospat 0,1 % 200 ml di butuhkan asam pospat pekat 85 % sebanyak :

$$\begin{aligned} \text{ml} &= \frac{0,1}{85} \times 200 \\ &= 0,2\text{ml} \end{aligned}$$

Dipipet 0,2 ml asam pospat pekat 85 %

Kemudian masukkan labu takar

Adkan dengan aquabidestilata sampai tanda batas homogenkan.

B. Perhitungan fase gerak menurut perbandingan

$$\text{Metanol} = \frac{36}{103} \times 300 = 104,85 \text{ ml}$$

$$\text{Air -Asam pospat} = \frac{67}{103} \times 300 = 195,15 \text{ ml}$$

C. Pembuatan fase gerak

Diambil metanol 104,85 ml masukkan beaker glass

Diambil air-asam pospat 0,1 % 195,15 ml campurkan dengan metanol

Kemudian di homogenkan

Lampiran 2. Pembuatan larutan

A. Membuat larutan NaOH 0,1 N sebanyak 100 ml

$$\text{Perhitungan : } N = \frac{\text{gram} \times \text{valensi}}{\text{mr} \times \text{liter}}$$

$$0.1N = \frac{\text{gr} \times 1}{40 \times 01}$$

gram = 0.4 gram

ditimbang NaOH sebanyak 0.4 gram

masukkan labu takar 100 ml

dilartukan dengan aquabidestilata ad tanda batas homogenkan

B. Membuat larutan HCl 0,1 N sebanyak 10 ml

Diketahui konsentrasi HCl pekat 11.64 N

Perhitungan :

$$V_1 \times N_1 = V_2 \times N_2$$

$$V_1 \times 11,64 = 10 \times 0,1$$

$$V_1 = 0,86 \text{ ml}$$

Dipipet sebanyak 0,86 ml HCl dimasukkan dalam labu takar 10 ml

Dilartukan dengan aquabidestilata ad tanda batas homogenkan

C. Pembuatan H₂O₂ 3 % sebanyak 10 ml

Diketahui konsentrasi H₂O₂ pekat 30 %

$$\text{Perhitungan : } ml = \frac{3}{30} \times 10 = 1 \text{ ml}$$

Dipipet sebanyak 1 ml H₂O₂ dimasukkan labu takar

Dilartukan dengan aquabidestilata ad kan smpat tanda batas homogenkan

Lampiran 3. Pembuatan larutan baku induk

A. Membuat larutan tiamin HCl ± 200 ppm

- Ditimbang ± 10 mg asam askorbat dimasukkan labu takar 50 ml
- Kemudian dilarutkan dengan fase gerak adkan sampai tanda batas homogenkan.

- Penimbangan tiamin HCl

$$\text{Kertas + zat} = 0,1411 \text{ gram}$$

$$\text{Kertas + sisa} = 0,1516 \text{ gram -}$$

$$\text{Zat} = 0,0075 \text{ gram}$$

- Didapat konsentrasi 150 ppm larutan baku induk tiamin HCl

B. Membuat larutan asam askorbat ± 200 ppm

- Ditimbang ± 10 mg asam askorbat dimasukkan labu takar 50 ml
- Kemudian dilarutkan dengan fase gerak adkan sampai tanda batas homogenkan

- Penimbangan asam askorbat untuk baku induk

$$\text{Kertas + zat} = 0,1449 \text{ gram}$$

$$\text{Kertas + sisa} = 0,1358 \text{ gram -}$$

$$\text{Zat} = 0,0091 \text{ gram}$$

- Didapat konsentrasi 182 ppm larutan baku induk asam askorbat

Lampiran 4. Pembuatan larutan standart tiamin HCl

Larutan induk 150 ppm (lihat lampiran 3)

Pengenceran

1. Dipipet 1ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$1 \times 150 = 10 \times C_2$$

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

2. Dipipet 2ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$2 \times 150 = 10 \times C_2$$

$$C_2 = 30 \text{ ppm}$$

3. Dipipet 3ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$3 \times 150 = 10 \times C_2$$

$$C_2 = 45 \text{ ppm}$$

4. Dipipet 4ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$4 \times 150 = 10 \times C_2$$

$$C_2 = 60 \text{ ppm}$$

5. Dipipet 5ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$5 \times 150 = 10 \times C_2$$

$$C_2 = 75 \text{ ppm}$$



Lampiran 5. Pembuatan larutan standart asam askorbat

Larutan induk 182 ppm (lihat lampiran 3)

Pengenceran

1. Dipipet 1ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$1 \times 182 = 10 \times C_2$$

$$C_2 = 18,2 \text{ ppm}$$

2. Dipipet 2ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$2 \times 182 = 10 \times C_2$$

$$C_2 = 36,4 \text{ ppm}$$

3. Dipipet 3ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$3 \times 182 = 10 \times C_2$$

$$C_2 = 54,6 \text{ ppm}$$

4. Dipipet 4ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$4 \times 182 = 10 \times C_2$$

$$C_2 = 72,8 \text{ ppm}$$

5. Dipipet 5ml dari larutan induk

$$V_1 \times C_1 = V_2 \times C_2$$

$$5 \times 182 = 10 \times C_2$$

$$C_2 = 91 \text{ ppm}$$



Lampiran 6. Data kurva baku campuran dan pembuktian linieritas

Tiamin HCl

Asam askorbat

ppm	Luas area
15	419805
30	1023229
45	1700301
60	2506030
75	3315549

Ppm	luas area
18,2	891577
36,4	1608879
54,6	2361243
72,8	3420533
91	4165427

Keterangan

Diperoleh persamaan garis regresi untuk tiamin HCl $Y = - 389304 + 48495,26$ dan nilai $R=0,9979$ sedangkan asam sakorbat persamaan garis regresinya $Y = - 18274,4 + 45930,52$ serta nilai $R = 0,9979$.

a. **Pembuktian nilai koefisien relatif asam askorbat bahwa kesalahan tidak lebih 2 %:**

$$S_y = \sqrt{\frac{\sum(Y_i - \bar{Y})^2}{n-2}}$$

$$S_{x_0} = \frac{S_y}{B}$$

$$V_{x_0} = \frac{S_{x_0}}{\bar{x}} \times 100 \%$$

konsentrasi ppm (x)	luas area (y)	Yi	(y-yi)	(y-yi) ²
18,2	891577	817661	73916	546357506
36,4	1608879	1653596	-44717,4	1999645863
54,6	2361243	2489532	-128289	16458016205
72,8	3420533	3325467	95065,8	9037506330
91	4165427	4161403	4024,4	16195795,36
$\bar{X}=54,6$				$\sum 32974939249$

Created with

$$S_y = \sqrt{\frac{32974929440}{3}} = 104841,0531$$

$$S_{x_0} = \frac{104841,0531}{45930,52} = 2,2826$$

$$V_{x_0} = \frac{2,2826 \times 100\%}{54,6} = 0,04\%$$

b. Pembuktian nilai koefisien relatif tiamin HCl bahwa kesalahan tidak

lebih 2 %:

$$S_y = \sqrt{\frac{\sum (y - \bar{y})^2}{n-2}}$$

$$S_{x_0} = \frac{S_y}{B}$$

$$V_{x_0} = \frac{S_{x_0} \times 100\%}{\bar{x}}$$

konsentrasi ppm (x)	luas area (y)	Yi	(y-yi)	(y-yi) ²
15	419805	338125	81680	6671622400
30	1023229	1065554	-42324,9	1791397160
45	1700301	1792983	-92681,8	8589916051
60	2506030	2520412	-14381,7	206833294,9
75	3315549	3247841	67708,4	4584427431
$\bar{X}=45$				$\Sigma 21844196337$

$$S_y = \sqrt{\frac{21844196337}{3}} = 85331,1126$$

$$S_{x_0} = \frac{85331,1126}{48495,26} = 1,7596$$

$$V_{x_0} = \frac{1,7596 \times 100\%}{45} = 0,04\%$$

Lampiran 7. Perhitungan batas deteksi (LOD) dan batas kuantitasi (LOQ)

asam askorbat

Persamaan garis regresi $y = -18274,4 + 45930,52x$

konsentrasi ppm (x)	luas area (y)	Yi	(y-yi)	(y-yi) ²
18,2	891577	817661	73916	546357506
36,4	1608879	1653596	-44717,4	1999645863
54,6	2361243	2489532	-128289	16458016205
72,8	3420533	3325467	95065,8	9037506330
91	4165427	4161403	4024,4	16195795,36
JUMLAH				32974939249

$$SB = \sqrt{\frac{\sum (y-y_i)^2}{n-1}} = \sqrt{\frac{32974939249}{3}} = 104841,1$$

$$LOQ = \frac{10 \times SB}{\text{slope}} = \frac{10 \times 104841,1}{45930,52} = 22,82601$$

$$LOD = \frac{3 \times SB}{\text{slope}} = \frac{3 \times 104841,1}{45930,52} = 7,53284$$

Lampiran 8. Perhitungan batas deteksi (LOD) dan batas kuantitasi (LOQ)

tiamin HCl

Persamaan garis regresi $y = -389304 + 48495,26x$

konsentrasi ppm (x)	luas area (y)	Yi	(y-yi)	(y-yi) ²
15	419805	338125	81680	6671622400
30	1023229	1065554	-42324,9	1791397160
45	1700301	1792983	-92681,8	8589916051
60	2506030	2520412	-14381,7	206833294,9
75	3315549	3247841	67708,4	4584427431
JUMLAH				21844196337

$$SB = \sqrt{\frac{\sum (y-y_i)^2}{n-1}} = \sqrt{\frac{21844196337}{3}} = 85331,11$$

$$LOQ = \frac{10 \times SB}{\text{slope}} = \frac{10 \times 85331,11}{48495,26} = 17,59576$$

$$LOD = \frac{3 \times SB}{\text{slope}} = \frac{3 \times 85331,11}{48495,26} = 5,8066$$

Lampiran 9. Perhitungan kadar perlakuan tiamin HCl

Persamaan garis $Y = -389304 + 48495,26 X$

a. Netral

$$\diamond 393033 = -389304 + 48495,26X$$

$$782337 = 48495,26 X$$

$$X = 16,1322$$

$$\text{Kadar \%} = \frac{16,1322}{15} \times 100\% = 107,55 \%$$

$$\diamond 415508 = -389304 + 48495,26X$$

$$804812 = 48495,26 X$$

$$X = 16,5957$$

$$\text{Kadar \%} = \frac{16,5957}{15} \times 100\% = 110,64 \% \longrightarrow \text{data dicurigai}$$

$$\diamond 394238 = -389304 + 48495,26X$$

$$783542 = 48495,26 X$$

$$X = 16,1571$$

$$\text{Kadar \%} = \frac{16,1571}{15} \times 100\% = 107,71 \%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
107,55	107,63	0,08	$6,4 \times 10^{-3}$
107,71		0,08	$6,4 \times 10^{-3}$
Jumlah			$12,8 \times 10^{-3}$

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{0,0128}{2}} = 0,08$$

$$RSD = \frac{|x - \bar{x}|}{SD} < 2$$

$$= \frac{110,64 - 107,63}{0,08} = 37,625 > 2 \rightarrow \text{data ditolak}$$

Kadar 107,63 % \pm 0,08

b. Penambahan HCl 0,1N

$$\diamond 429902 = -389304 + 48495,26X$$

$$819206 = 48495,26 X$$

$$X = 16,8924$$

$$\text{Kadar \%} = \frac{16,8924}{15} \times 100 = 112,62 \%$$

$$\diamond 375690 = -389304 + 48495,26X$$

$$764994 = 48495,26 X$$

$$X = 15,7746$$

$$\text{Kadar \%} = \frac{15,7746}{15} \times 100\% = 105,16\% \rightarrow \text{data dicurigai}$$

$$\diamond 425372 = -389304 + 48495,26X$$

$$814676 = 48495,26 X$$

$$X = 16,7991$$

$$\text{Kadar \%} = \frac{16,7991}{15} \times 100\% = 111,99 \%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
112,62	112,305	0,311	0,0967
111,99		0,311	0,0968
JUMLAH			0,1935

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{0,1935}{2}} = 0,31$$

$$RSD = \frac{|X - \bar{X}|}{SD} < 2$$

$$= \frac{105,14 - 112,305}{0,3110} = 22,9611 > 2 \longrightarrow \text{data ditolak}$$

Kadar 112,31 % \pm 0,31

c. Penambahan NaOH 0,1N

$$\diamond 309632 = - 389304 + 48495,26X$$

$$698936 = 48495,26 X$$

$$X = 14,4125$$

$$\text{Kadar \%} = \frac{14,4125}{15} \times 100\% = 96,08 \% \longrightarrow \text{data dicurigai}$$

$$\diamond 514939 = - 389304 + 48495,26X$$

$$904243 = 48495,26 X$$

$$X = 18,6460$$

$$\text{Kadar \%} = \frac{18,6460}{15} \times 100\% = 124,31 \%$$

$$\diamond 58071 = - 389304 + 48495,26X$$

$$970061 = 48495,26 X$$

$$X = 20,0022$$

$$\text{Kadar \%} = \frac{20,0022}{15} \times 100\% = 133,35\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
124,31	128,81	4,51	20,34
133,32		4,51	20,34
JUMLAH			40,68

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{40,68}{2}} = 4,51$$

$$RSD = \frac{|X - \bar{X}|}{SD} < 2$$

$$= \frac{96,08 - 128,81}{4,51} = 7,26 > 2 \quad \longrightarrow \text{data ditolak}$$

Kadar 128,81 % \pm 4,51

d. Penambahan H₂O₂ 3%

$$\diamond 417931 = - 389304 + 48495,26X$$

$$807235 = 48495,26 X$$

$$X = 16,6456$$

$$\text{Kadar \%} = \frac{16,6456}{15} \times 100\% = 110,97\% \quad \longrightarrow \text{data dicurigai}$$

$$\diamond 264205 = - 389304 + 48495,26X$$

$$635509 = 48495,26 X$$

$$X = 13,1046$$

$$\text{Kadar \%} = \frac{13,1046}{15} \times 100\% = 87,36\%$$

$$\diamond 347858 = - 389304 + 48495,26X$$

$$737162 = 48495,26 X$$

$$X = 15,2007$$

$$\text{Kadar \%} = \frac{15,2007}{15} \times 100\% = 101,34\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
110,97	106,15	4,82	23,23
101,34		4,81	23,14
JUNLAH			46,36

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{46,36}{2}} = 4,81$$

$$RSD = \frac{|x - \bar{x}|}{SD} < 2$$

$$= \frac{87,36 - 106,15}{4,81} = 3,91 > 2 \longrightarrow \text{data ditolak}$$

Kadar 106,15 % \pm 4,81

e. Penambahan H₂O₂ 30%

$$\diamond 396821 = - 389304 + 48495,26X$$

$$786125 = 48495,26 X$$

$$X = 16,210$$

$$\text{Kadar \%} = \frac{16,210}{15} \times 100\% = 108,07 \%$$

$$\diamond 443296 = - 389304 + 48495,26X$$

$$832600 = 48495,26 X$$

$$X = 17,1699$$

$$\text{Kadar \%} = \frac{17,1699}{15} \times 100\% = 114,47 \longrightarrow \text{data dicurigai}$$

$$\diamond 446985 = - 389304 + 48495,26X$$

$$836289 = 48495,26 X$$

$$X = 17,2447$$

$$\text{Kadar \%} = \frac{17,2447}{15} \times 100\% = 114,97\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
108,07	111,52	3,45	11,90
114,97		3,45	11,90
JUMLAH			23,80

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{23,80}{2}} = 3,45$$

$$RSD = \frac{|x - \bar{x}|}{SD} < 2$$

$$= \frac{101,07 - 111,52}{3,45}$$

$$= 3,02 > 2 \longrightarrow \text{data ditolak}$$

Kadar 111,52 % \pm 3,45

Lampiran 10. Perhitungan kadar perlakuan asam askorbat

Persamaan regresi linear $Y = -18274,4 + 45930,52 X$

a. Netral

$$\diamond 775622 = -18274,4 + 45930,52 X$$

$$793896,4 = 45930,52 X$$

$$X = 17,2847$$

$$\text{Kadar \%} = \frac{17,2847}{182} \times 100\% = 94,97\%$$

$$\diamond 788518 = -18274,4 + 45930,52 X$$

$$806792,4 = 45930,52 X$$

$$X = 17,5655$$

$$\text{Kadar \%} = \frac{17,5655}{182} \times 100\% = 96,51\% \longrightarrow \text{data dicurigai}$$

$$\diamond 770793 = -18274,4 + 45930,52 X$$

$$789067,4 = 45930,52 X$$

$$X = 17,1790$$

$$\text{Kadar \%} = \frac{17,1790}{182} \times 100\% = 94,39\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
94,97	94,68	0,29	0,0841
94,39		0,29	0,0841
JUNLAH			0.1682

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{0,1682}{2}} = 0,29$$

$$RSD = \frac{|X - \bar{X}|}{SD} < 2$$

$$= \frac{96,51 - 94,68}{0,29} = 5,31 > 2 \quad \longrightarrow \quad \text{data ditolak}$$

Kadar 94,68 % \pm 0,29

b. Penambahan HCl 0,1N

$$\diamond \quad 615670 = - 18274,4 + 45930,52 X$$

$$633944,4 = 45930,52 X$$

$$X = 13,8022$$

$$\text{Kadar \%} = \frac{13,8022}{182} \times 100\% = 75,84 \%$$

$$\diamond \quad 602490 = - 18274,4 + 45930,52 X$$

$$620768,4 = 45930,52 X$$

$$X = 13,5154$$

$$\text{Kadar \%} = \frac{13,5154}{182} \times 100\% = 74,260\%$$

$$\diamond \quad 578844 = - 18274,4 + 45930,52 X$$

$$597118,4 = 45930,52 X$$

$$X = 13,0005$$

$$\text{Kadar \%} = \frac{13,0005}{182} \times 100\% = 71,43\% \quad \longrightarrow \quad \text{data dicurigai}$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
75,84	75,135	0,705	0,4970
74,43		0,705	0,4970
JUNLAH			1,9881

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{1,9881}{2}} = 0,71$$

$$RSD = \frac{|x - \bar{x}|}{SD} < 2$$

$$= \frac{71,43 - 75,135}{0,71} = 5,22 > 2 \quad \longrightarrow \text{data ditolak}$$

Kadar 75,14 % \pm 0,71

c. Penambahan NaOH 0,1N

$$\diamond 214965 = -18274,4 + 45930,52 X$$

$$233239,4 = 45930,52 X$$

$$X = 5,0781$$

$$\text{Kadar \%} = \frac{5,0781}{182} \times 100\% = 27,90\% \quad \longrightarrow \text{data dicurigai}$$

$$\diamond 11576 = -18274,4 + 45930,52 X$$

$$29850,4 = 45930,52 X$$

$$X = 0,6499$$

$$\text{Kadar \%} = \frac{0,6499}{182} \times 100\% = 3,57\%$$

$$\diamond 10802 = -18274,4 + 45930,52 X$$

$$29074,4 = 45930,52 X$$

$$X = 0,6331$$

$$\text{Kadar \%} = \frac{0,6331}{182} \times 100\% = 1,38\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
3,57	2,47	1,1	1,21
1,38		1,095	1,1990
JUNLAH			2,4090

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{2,4090}{2}} = 1,1$$

$$RSD = \frac{|X - \bar{X}|}{SD} < 2$$

$$= \frac{2790 - 2,47}{1,1} = 23,11 > 2 \longrightarrow \text{data ditolak}$$

Kadar 2,47 % \pm 1,1

d. Penambahan H₂O₂ 3%

$$\diamond 2024963 = - 18274,4 + 45930,52 X$$

$$2043237,4 = 45930,52 X$$

$$X = 44,4854$$

$$\text{Kadar \%} = \frac{44,4854}{182} \times 100\% = 244,43 \%$$

$$\diamond 1489719 = - 18274,4 + 45930,52 X$$

$$1507993,4 = 45930,52 X$$

$$X = 32,8321$$

$$\text{Kadar \%} = \frac{32,8321}{182} \times 100\% = 180,39 \% \longrightarrow \text{data dicurigai}$$

$$\diamond 23909871 = - 18274,4 + 45930,52 X$$

$$2409145,4 = 45930,52 X$$

$$X = 52,4520$$

$$\text{Kadar \%} = \frac{52,4520}{182} \times 100\% = 288,19\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
244,31	266,25	21,94	481,36
288,19		21,94	481,36
JUMLAH			962,72

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{962,72}{2}} = 21,94$$

$$RSD = \frac{|X - \bar{X}|}{SD} < 2$$

$$= \frac{18039 - 266,25}{21,94} = 3,91 > 2 \rightarrow \text{data ditolak}$$

Kadar 266,25 % \pm 21,94

e. Penambahan H₂O₂ 30%

$$\diamond 18392800 = - 18274,4 + 45930,52 X$$

$$18411074,4 = 45930,52 X$$

$$X = 400,8462$$

$$\text{Kadar \%} = \frac{400,8462}{182} \times 100\% = 2202,45\% \rightarrow \text{data dicurigai}$$

$$\diamond 20071602 = - 18274,4 + 45930,52 X$$

$$20089876,4 = 45930,52 X$$

$$X = 437,3971$$

$$\text{Kadar \%} = \frac{437,3971}{182} \times 100\% = 2403,28\%$$

$$\diamond 19982585 = - 18274,4 + 45930,52 X$$

$$20000859,4 = 45930,52 X$$

$$X = 435,4590$$

$$\text{Kadar \%} = \frac{435,4590}{182} \times 100\% = 2392,63\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
2403,28	2397,95	5,33	28,41
2392,63		5,32	28,30
JUMLAH			56,71

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{56,71}{2}} = 5,33$$

$$RSD = \frac{|X - \bar{X}|}{SD} < 2$$

$$= \frac{2202,45 - 2397,95}{5,33}$$

$$= 36,68 > 2 \quad \longrightarrow \text{data ditolak}$$

Kadar 2397,95% \pm 5,33

Lampiran 11. Penimbangan bahan untuk larutan untuk recovery

a. Penimbangan tiamin HCl untuk recovery

Kertas + zat = 0,1443 gram

Kertas + sisa = 0,1341 gram -

Zat = 0,0102 gram

Didapat konsentrasi larutan ±200 ppm

b. Penimbangan asam askorbat untuk recovery

Kertas + zat = 0,1603 gram

Kertas + sisa = 0.1525 gram -

Zat = 0.0078 gram

Didapat konsentrasi larutan ±150 ppm

Lampiran 12. Perhitungan recovery asam askorbat

$$Y = - 18274,4 + 45930,52 X$$

$$\diamond \quad 637037 = - 18274,4 + 45930,52 X$$

$$45930,52 X = 655311,4$$

$$X = 14,2674$$

$$\% \text{ recovery} = \frac{14,2674}{15} \times 100\% = 95,11\%$$

$$\diamond \quad 638820 = - 18274,4 + 45930,52 X$$

$$45930,52 X = 657094,4$$

$$X = 14,3062$$

$$\% \text{ recovery} = \frac{14,3062}{15} \times 100\% = 95,37\%$$

$$\diamond \quad 643930 = - 18274,4 + 45930,52 X$$

$$45930,52 X = 643930$$

$$X = 14,0594$$

$$\% \text{ recovery} = \frac{14,0594}{15} \times 100\% = 93,72\% \longrightarrow \text{data dicurigai}$$

X	\bar{X}	$ X - \bar{X} $	$ X - \bar{X} ^2$
95,116	95,2454	0,1294	0,0167
95,3747		0,1293	0,0167
JUMLAH			0,0334

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}}$$

$$= \sqrt{\frac{0,0334}{2}}$$

$$= 0,1292$$

$$RSD = \frac{|\bar{x} - x|}{SD} < 2$$

$$= \frac{93,7293 - 95,2454}{0,1292}$$

$$= 11,7345 > 2 \longrightarrow \text{data ditolak}$$

Kadar 95,24 % \pm 0,13

Lampiran 13. Perhitungan recovery tiamin HCl

$$Y = - 389304 + 48495,26 X$$

$$\diamond \quad 502075 = - 389304 + 48495,26 X$$

$$48495,26 X = 891379$$

$$X = 18,3807$$

$$\% \text{ recovery} = \frac{18,3807}{20} \times 100\% = 91,90\%$$

$$\diamond \quad 485743 = - 389304 + 48495,26 X$$

$$48495,26 X = 875047$$

$$X = 18,0439$$

$$\% \text{ recovery} = \frac{18,0439}{20} \times 100\% = 91,21\% \longrightarrow \text{data dicurigai}$$

$$\diamond \quad 494632 = - 389304 + 48495,26 X$$

$$48495,26 X = 888936$$

$$X = 18,2273$$

$$\% \text{ recovery} = \frac{18,2273}{20} \times 100\% = 91,13\%$$

X	\bar{X}	$ X - \bar{X} $	$ X - \bar{X} ^2$
91,9037	91,52	0,3837	0,1472
91,1363		0,3837	0,1472
JUNLAH			0,2944

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{0,2944}{2}} = 0,3837$$

$$RSD = \frac{|X - \bar{X}|}{SD} < 2$$

$$= \frac{90,2195 - 91,52}{0,3837}$$

$$= 3,3894 > 2 \longrightarrow \text{data ditolak}$$

Kadar 91,52 % \pm 0,38

Lampiran 14. Uji t

Variansi keseluruhan :

$$S_p^2 = \frac{Jk A + Jk B}{nA + nB - 2}$$

Standart deviasi dari perbedaan rata-rata

$$S_{\bar{x}_A - \bar{x}_B} = \sqrt{\frac{Sp^2}{nA} + \frac{Sp^2}{nB}}$$

t hitung

$$t_{hit} = \frac{(\bar{X}_A) - (\bar{X}_B)}{S_{\bar{x}_A - \bar{x}_B}}$$

Uji t untuk tiamin HCl

replikasi	Netral (%)	HCl (%)	NaOH(%)	H ₂ O ₂ 3 (%)	H ₂ O ₂ 30 (%)
1	107,54	112,61	96,08	110,97	108,06
2	110,63	105,16	124,30	87,36	101,14
3	107,71	111,99	133,34	101,33	114,96
rata-rata	108,63	109,92	117,91	99,89	108,06
SD	1,74	4,13	19,44	11,87	6,91
JK	1,01	5,70	125,94	46,97	15,92

❖ Netral dan HCl

$$S_p^2 = \frac{|1,01 + 5,70|}{3 + 3 - 2} = 1,68$$

$$S_{x_A - x_B} = \sqrt{\frac{1,68}{3} + \frac{1,68}{3}} = 1,06$$

$$t_{\text{hit}} = \frac{|108,63 - 109,92|}{1,06} = 1,21$$

$$t_{\text{table}} (k-1 ; 0,05) = 4; 0,05 = 2,78$$

Kesimpulan netral dan HCl tidak ada beda karena $t_{\text{hitung}} < t_{\text{tabel}}$

❖ Netral dan NaOH

$$S_p^2 = \frac{|1,1 + 125,94|}{3 + 3 - 2} = 31,76$$

$$S_{x_A - x_B} = \sqrt{\frac{31,76}{3} + \frac{31,76}{3}} = 4,60$$

$$t_{\text{hit}} = \frac{|108,63 - 117,91|}{4,60} = 2,017$$

$$t_{\text{table}} (k-1 ; 0,05) = 4; 0,05 = 2,78$$

Kesimpulan netral dan NaOH tidak ada beda karena $t_{\text{hitung}} < t_{\text{tabel}}$

❖ Netral dan H₂O₂ 3%

$$S_p^2 = \frac{|1,1 + 46,97|}{3 + 3 - 2} = 12,0175$$

$$S_{x_A - x_B} = \sqrt{\frac{12,0175}{3} + \frac{12,0175}{3}} = 2,83$$

$$t_{\text{hit}} = \frac{|108,63 - 99,89|}{2,83} = 3,088$$

$$t_{\text{table}} (k-1 ; 0,05) = 4; 0,05 = 2,78$$

kesimpulan netral dan H₂O₂ 3% ada perbedaan karena t hitung > t tabel

❖ Netral dan H₂O₂ 30%

$$S_p^2 = \frac{|1,1 + 15,92|}{3 + 3 - 2} = 4,255$$

$$S_{x_A - x_B} = \sqrt{\frac{4,255}{3} + \frac{4,255}{3}} = 1,68$$

$$t_{\text{hit}} = \frac{|108,63 - 108,06|}{1,68} = 0,33$$

$$t_{\text{table}} (k-1 ; 0,05) = 4; 0,05 = 2,78$$

kesimpulan netral dan H₂O₂ 30% tidak ada perbedaan karena t hitung < t tabel

uji t untuk asam askorbat

replikasi	Netral (%)	HCl (%)	NaOH(%)	H2O2 3 %	H2O2 30 %
1	94,97	75,84	27,90	244,43	2202,45
2	96,51	74,26	3,57	180,40	240328
3	94,39	743	1,38	288,20	239263
rata-rata	95,29	52,51	10,95	237,67	2332.79
SD	1,10	39,05	14,72	54,22	113,00
JK	0,40	508,21	72,24	979,79	425635

❖ Netral dan HCl

$$S_p^2 = \frac{0,40 + 508,21}{3 + 3 - 2} = 127,15$$

$$S_{x_A - x_B} = \sqrt{\frac{127,15}{3} + \frac{127,15}{3}} = 9,21$$

$$t_{\text{hit}} = \frac{|95,29 - 52,51|}{9,21} = 4,64$$

$$t_{\text{table}}(k-1; 0,05) = 4; 0,05 = 2,78$$

Kesimpulan netral dan HCl ada beda karena $t_{\text{hitung}} > t_{\text{tabel}}$

❖ Netral dan NaOH

$$S_p^2 = \frac{|0,40 + 72,24|}{3 + 3 - 2} = 18,16$$

$$S_{x_A - x_B} = \sqrt{\frac{18,16}{3} + \frac{18,16}{3}} = 3,48$$

$$t_{\text{hit}} = \frac{|95,29 - 10,95|}{3,48} = 24,24$$

$$t_{\text{table}} (k-1 ; 0,05) = 4; 0,05 = 2,78$$

Kesimpulan netral dan NaOH ada beda karena $t_{\text{hitung}} > t_{\text{tabel}}$

❖ Netral dan H₂O₂ 3%

$$S_p^2 = \frac{|0,40 + 979,79|}{3 + 3 - 2} = 245,05$$

$$S_{x_A - x_B} = \sqrt{\frac{245,05}{3} + \frac{245,05}{3}} = 12,78$$

$$t_{\text{hit}} = \frac{|95,29 - 979,79|}{12,78} = 69,21$$

$$t_{\text{table}} (k-1 ; 0,05) = 4; 0,05 = 2,78$$

kesimpulan netral dan H₂O₂ 3% ada perbedaan karena $t_{\text{hitung}} > t_{\text{tabel}}$

❖ Netral dan H₂O₂ 30%

$$S_p^2 = \frac{|0,40 + 2332,79|}{3 + 3 - 2} = 583,29$$

$$S_{x_A - x_B} = \sqrt{\frac{583,29}{3} + \frac{583,29}{3}} = 19,72$$

$$t_{\text{hit}} = \frac{|95,29 - 2332,79|}{19,72} = 113,46$$

$$t_{\text{table}} (k-1 ; 0,05) = 4; 0,05 = 2,78$$

kesimpulan netral dan H₂O₂ 30% perbedaan karena $t_{\text{hitung}} > t_{\text{tabel}}$

lampiran 15. Perhitungan kadar tunggal dan uji T nya

perhitungan kadar tunggal tiamin HCl

Persamaan garis $Y = -389304 + 48495,26 X$

$$\diamond \quad 242710 = -389304 + 48495,26X$$

$$632014 = 48495,26 X$$

$$X = 13,032$$

$$\text{Kadar \%} = \frac{13,032}{15} \times 100\% = 87,22\% \longrightarrow \text{data dicurigai}$$

$$\diamond \quad 284659 = -389304 + 48495,26X$$

$$673963 = 48495,26 X$$

$$X = 13,8975$$

$$\text{Kadar \%} = \frac{13,8975}{15} \times 100\% = 92,26\%$$

$$\diamond \quad 294654 = -389304 + 48495,26X$$

$$683958 = 48495,26 X$$

$$X = 14,1036$$

$$\text{Kadar \%} = \frac{14,1036}{15} \times 100 = 94,02\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
92,265	93,1435	1,1215	1,2577
94,024		0,0829	0,0068
Jumlah			1,2644

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{1,2644}{2}} = 0,7951$$

$$RSD = \frac{|x - \bar{x}|}{SD} < 2$$

$$= \frac{87,2213 - 93,1435}{0,7951} = 7,4283 > 2 \longrightarrow \text{data ditolak}$$

Kadar 93,14 % \pm 0,79

Perhitungan kadar tunggal asam askorbat

Persamaan garis $Y = -18274,4 + 45930,52 X$

$$\diamond 773983 = -18274,4 + 45930,52 X$$

$$792263,4 = 45930,52 X$$

$$X = 17,2492$$

$$\text{Kadar \%} = \frac{17,2492}{182} \times 100\% = 94,77\%$$

$$\diamond 762892 = -18274,4 + 45930,52 X$$

$$781166,4 = 45930,52 X$$

$$X = 17,0075$$

$$\text{Kadar \%} = \frac{17,0075}{182} \times 100\% = 93,44\% \longrightarrow \text{data dicurigai}$$

$$\diamond 775927 = -18274,4 + 45930,52 X$$

$$794201,4 = 45930,52 X$$

$$X = 17,2914$$

$$\text{Kadar \%} = \frac{17,2914}{182} \times 100\% = 95,00\%$$

X	\bar{X}	$ X - \bar{X} $	$ \bar{X} - X ^2$
94,77	94,88	0,11	0,0121
95		0,115	0,0132
Jumlah			0,0253

$$SD = \sqrt{\frac{\sum |X - \bar{X}|^2}{n-1}} = \sqrt{\frac{0,0253}{2}} = 0,11$$

$$\text{RSD} = \frac{|x - \bar{x}|}{\text{SD}} < 2$$

$$= \frac{93,44 - 94,88}{0,11} = 13,09 > 2 \longrightarrow \text{data ditolak}$$

Kadar 94,88% \pm 0,11

Uji t antara campuran tiamin HCl dan tunggal tiamin HCl

replikasi	campuran	tunggal
1	107,5482	87,2213
2	110,6379	92,265
3	107,7139	94
rata-rata	108,63	91,17
SD	1,74	3,53
JK	1,01	4,16

$$S_p^2 = \frac{|1,01 + 4,16|}{3 + 3 - 2} = 1,2925$$

$$S_{xA - xB} = \sqrt{\frac{1,2925}{3} + \frac{1,2925}{3}} = 0,9282$$

$$t_{\text{hit}} = \frac{|108,63 - 91,17|}{0,9282} = 18,81$$

$$t_{\text{table}} (k-1 ; 0,05) = 4 ; 0,05 = 2,78$$

kesimpulan campuran tiamin dan tunggal tiamin ada perbedaan karena $t_{\text{hitung}} > t_{\text{tabel}}$

Uji t antara campuran asam askorbat dan tunggal asam askorbat

replikasi	campuran	tunggal
1	94,97	94,78
2	96,51	93,45
3	94,39	95,01
rata-rata	95,9	94,41
SD	1,10	0,84
JK	0,40	0,24

$$S_p^2 = \frac{|0,40 + 0,24|}{3 + 3 - 2} = 0,16$$

$$S_{x_A - x_B} = \sqrt{\frac{0,16}{3} + \frac{0,16}{3}} = 0,3265$$

$$t_{\text{hit}} = \frac{|95,29 - 94,41|}{0,3265} = 2,6952$$

$$t_{\text{table}} (k-1 ; 0,05) = 4; 0,05 = 2,78$$

kesimpulan campuran asam askorbat dan tunggal asam askorbat tidak ada beda karena $t_{\text{hitung}} < t_{\text{tabel}}$

lampiran 16. perhitungan % degradasi

% degradasi = % kadar netral - % kadar perlakuan

1. tunggal dengan netral

nama	Netral %	Tunggal %	Degradasi %
Tiamin HCl	108,63	91,17	17,46
Asam askorbat	95,29	94,41	-

2. netral dengan asam

nama	Netral %	Asam %	Degradasi %
Tiamin HCl	108,63	109,92	-
Asam askorbat	95,29	52,51	42,78

3. netral dengan basa

nama	Netral %	Basa %	Degradasi %
Tiamin HCl	108,63	117,91	-
Asam askorbat	95,29	10,95	84,34

4. netral dengan H₂O₂ 3%

nama	Netral %	H ₂ O ₂ 3% %	Degradasi %
Tiamin HCl	108,63	99,89	8,74
Asam askorbat	95,29	237,67	142,38

5. netral dengan H₂O₂ 30%

nama	Netral %	H ₂ O ₂ 30% %	Degradasi %
Tiamin HCl	108,63	108,06	-
Asam askorbat	95,29	2332,79	2237,5

Lampiran 17. Data pemilihan kecepatan alir

Cara menghitung N dan HETP pada pemilihan kecepatan alir

1. Kecepatan alir 1,2 ml/menit

a. Thiamin HCl

Diketahui $t_R = 5,5 \text{ cm}$, $W = 0,6 \text{ cm}$, $L = 25 \text{ cm}$

$$N = 16 \left(\frac{t_R}{W} \right)^2 = 16 \left(\frac{5,5}{0,6} \right)^2 = 12444,44$$

$$HETP = \frac{L}{N} = \frac{25}{12444,44} = 0,00186$$

b. Asam askorbat

Diketahui $t_R = 2 \text{ cm}$, $W = 0,7 \text{ cm}$, $L = 25 \text{ cm}$

$$N = 16 \left(\frac{t_R}{W} \right)^2 = 16 \left(\frac{2}{0,7} \right)^2 = 130,6123$$

$$HETP = \frac{L}{N} = \frac{25}{130,6123} = 0,1921$$

2. Kecepatan alir 1,3 ml/menit

a. Thiamin HCl

Diketahui $t_R = 5,5 \text{ cm}$, $W = 0,7 \text{ cm}$, $L = 25 \text{ cm}$

$$N = 16 \left(\frac{t_R}{W} \right)^2 = 16 \left(\frac{5,5}{0,7} \right)^2 = 987,755$$

$$HETP = \frac{L}{N} = \frac{25}{987,755} = 0,02531$$

b. Asam askorbat

Diketahui $t_R = 5,5 \text{ cm}$, $W = 0,7 \text{ cm}$, $L = 25 \text{ cm}$

$$N = 16 \left(\frac{t_R}{W} \right)^2 = 16 \left(\frac{5,5}{0,7} \right)^2 = 987,7551$$

$$HETP = \frac{L}{N} = \frac{25}{987,7551} = 0,02531$$

3. Kecepatan alir 1,4 ml/menit

a. Thiamin HCl

Diketahui $t_R = 5 \text{ cm}$, $W = 0,9 \text{ cm}$, $L = 25 \text{ cm}$

$$N = 16 \left(\frac{t_R}{W} \right)^2 = 16 \left(\frac{5}{0,9} \right)^2 = 493,8271$$

$$HETP = \frac{L}{N} = \frac{25}{493,8271} = 0,0506$$

b. Asam askorbat

Diketahui $t_R = 5,5 \text{ cm}$, $W = 0,7 \text{ cm}$, $L = 25 \text{ cm}$

$$N = 16 \left(\frac{t_R}{W} \right)^2 = 16 \left(\frac{5,5}{0,7} \right)^2 = 987,7551$$

$$HETP = \frac{L}{N} = \frac{25}{987,7551} = 0,02531$$

4. Kecepatan alir 1,5 ml/menit

a. Thiamin HCl

Diketahui $t_R = 1,5 \text{ cm}$, $W = 0,7 \text{ cm}$, $L = 25 \text{ cm}$

$$N = 16 \left(\frac{t_R}{W} \right)^2 = 16 \left(\frac{1,5}{0,7} \right)^2 = 73,4694$$

$$HETP = \frac{L}{N} = \frac{25}{73,4694} = 0,340277$$

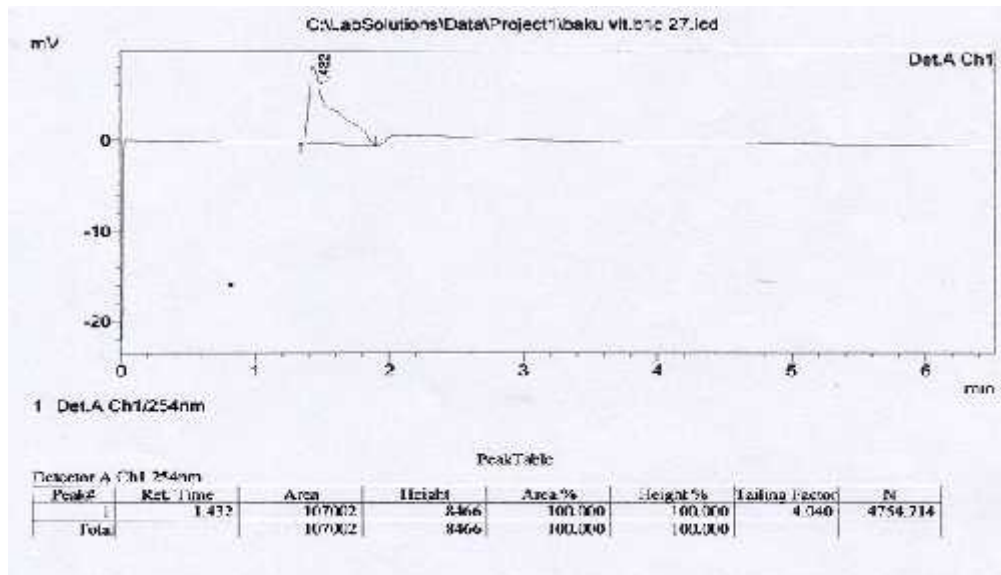
b. Asam askorbat

Diketahui $t_R = 5,5 \text{ cm}$, $W = 0,7 \text{ cm}$, $L = 25 \text{ cm}$

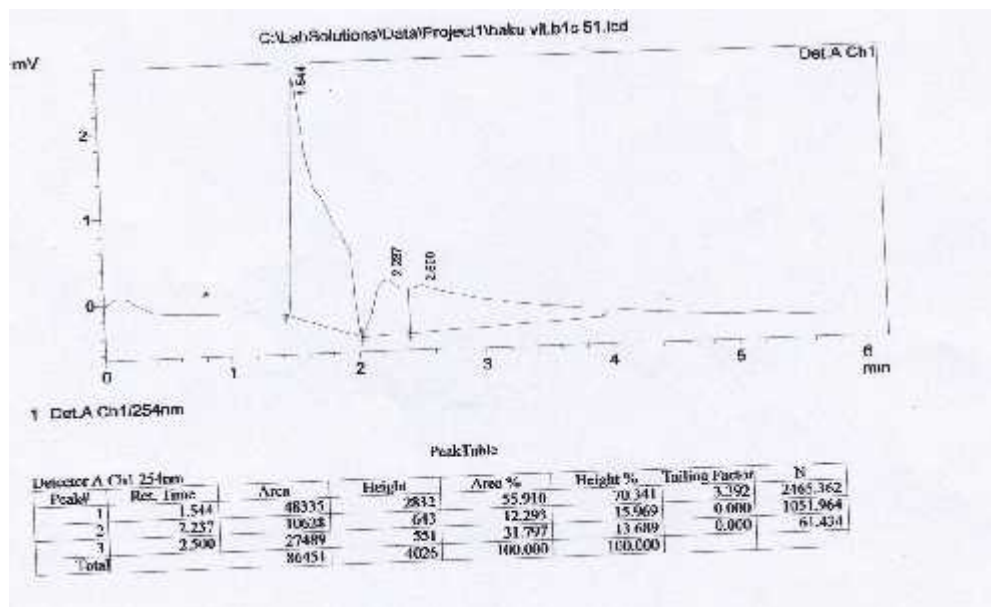
$$N = 16 \left(\frac{tR}{W} \right)^2 = 16 \left(\frac{5,5}{0,7} \right)^2 = 987,7551$$

$$HETP = \frac{L}{N} = \frac{25}{987,7551} = 0,02531$$

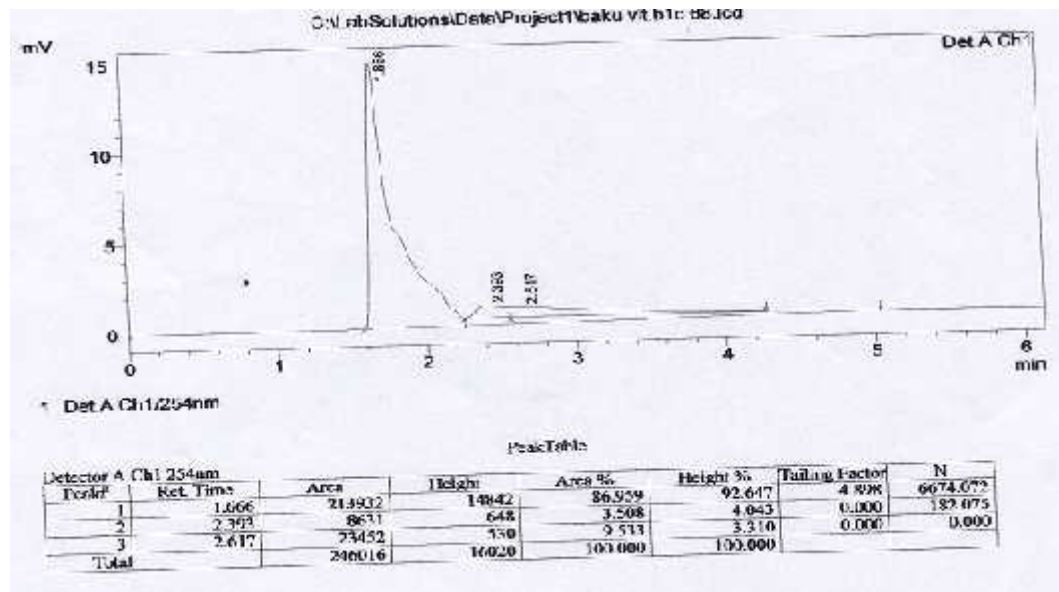
Lampiran 18. Gambar kromatogram kondisi alat



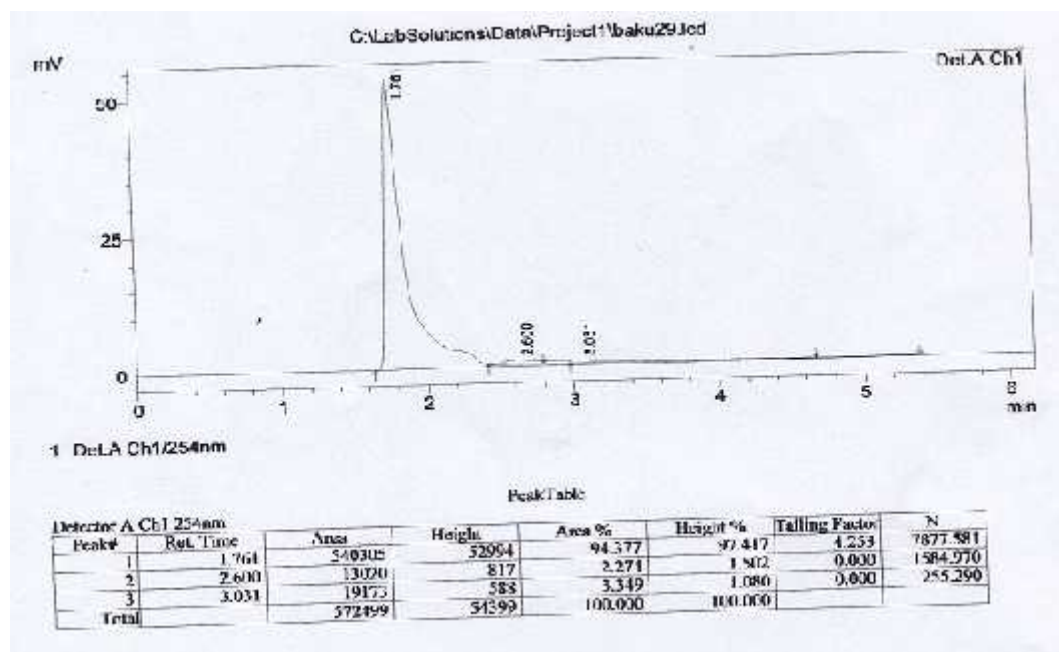
Gambar 10. kromatogram tiamin HCl kecepatan alir 1,5 ml/menit



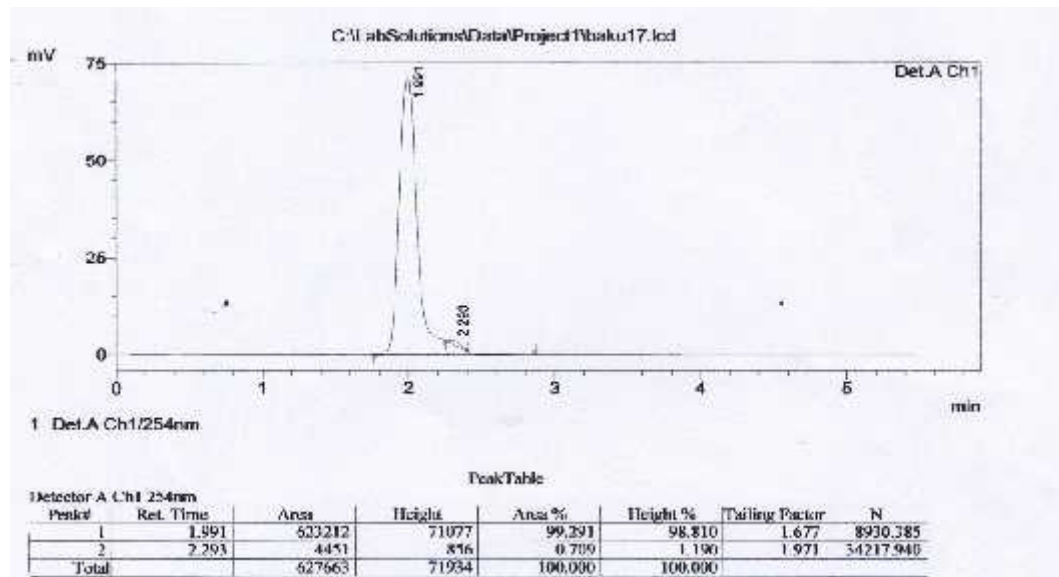
Gambar11. kromatogra tiamin HCl kecepatan alir 1.4 ml/menit



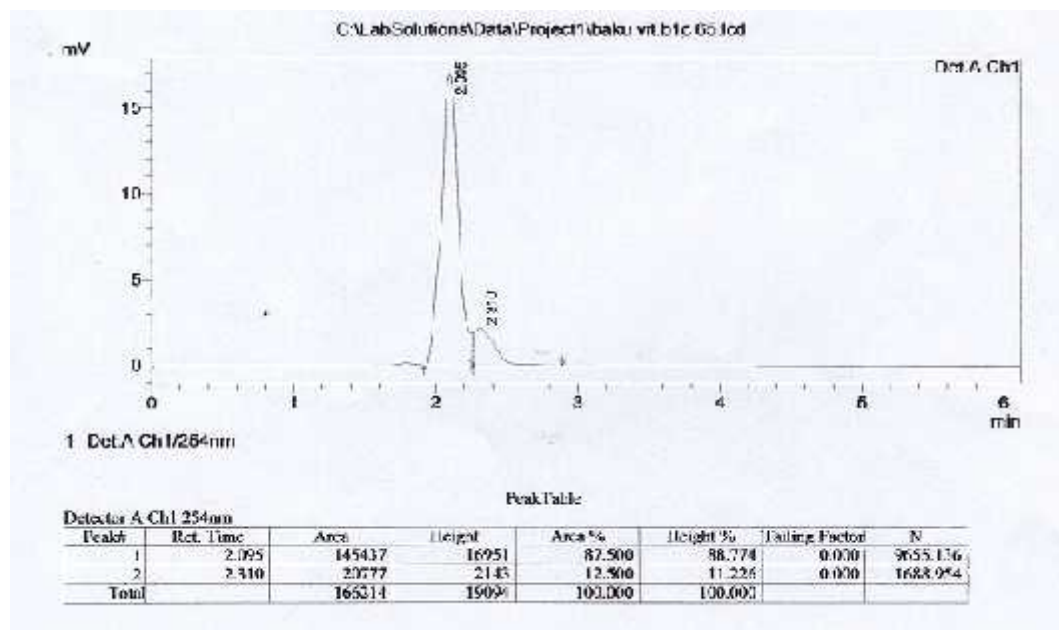
Gambar 12. kromatogram tiamin HCl kecepatan alir 1.3 ml/menit



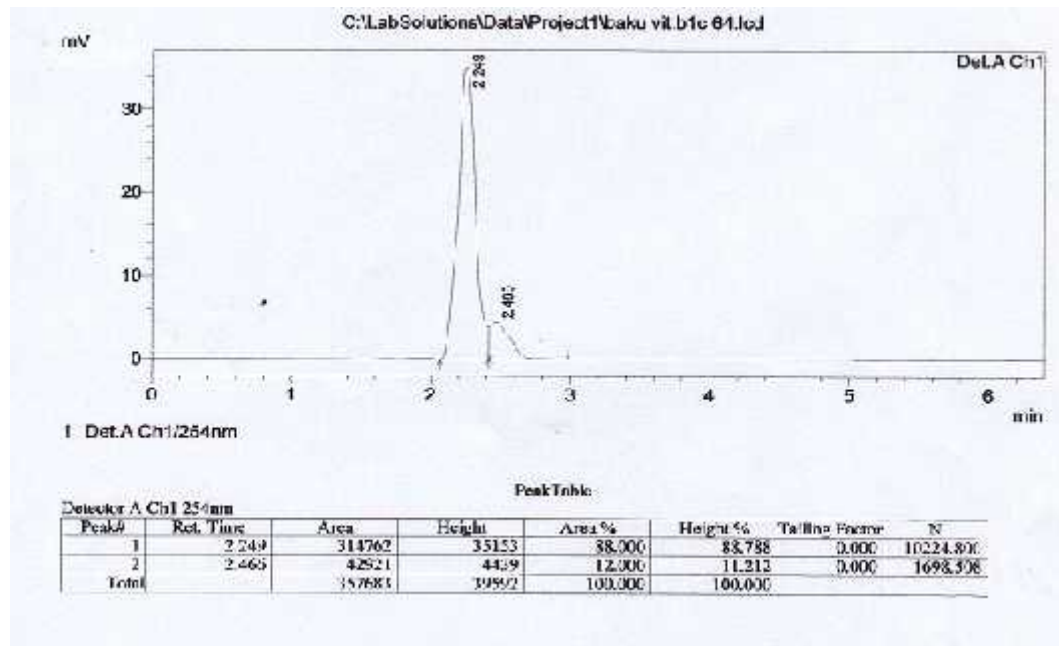
Gambar13. kromatogram tiamin HCl kecepatan alir 1.2 ml/menit



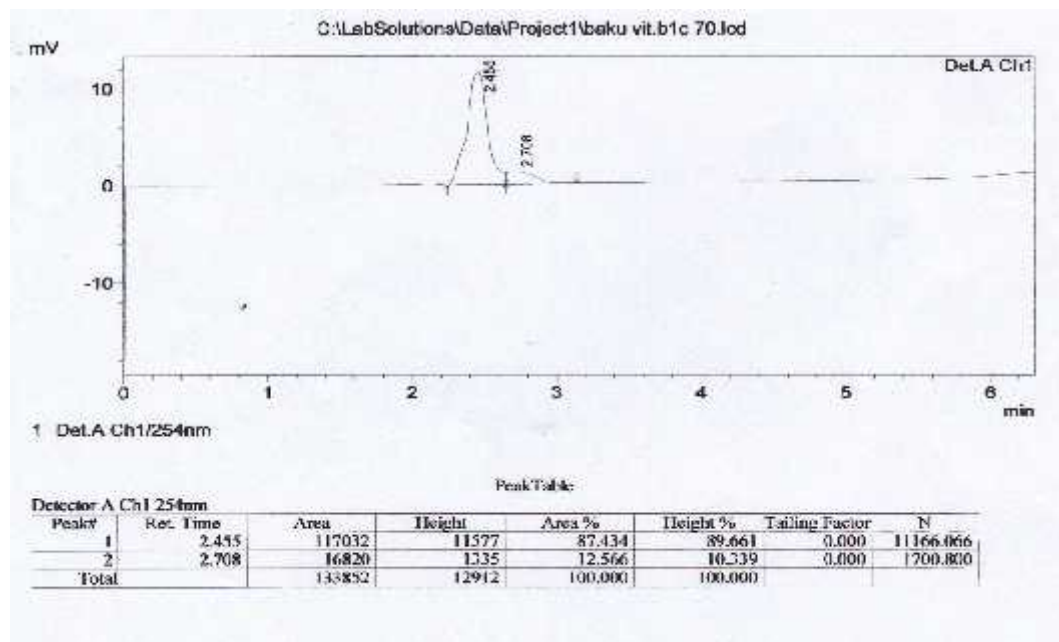
Gambar14. kromatogram asam askorbat kecepatan alir 1.5 ml/menit



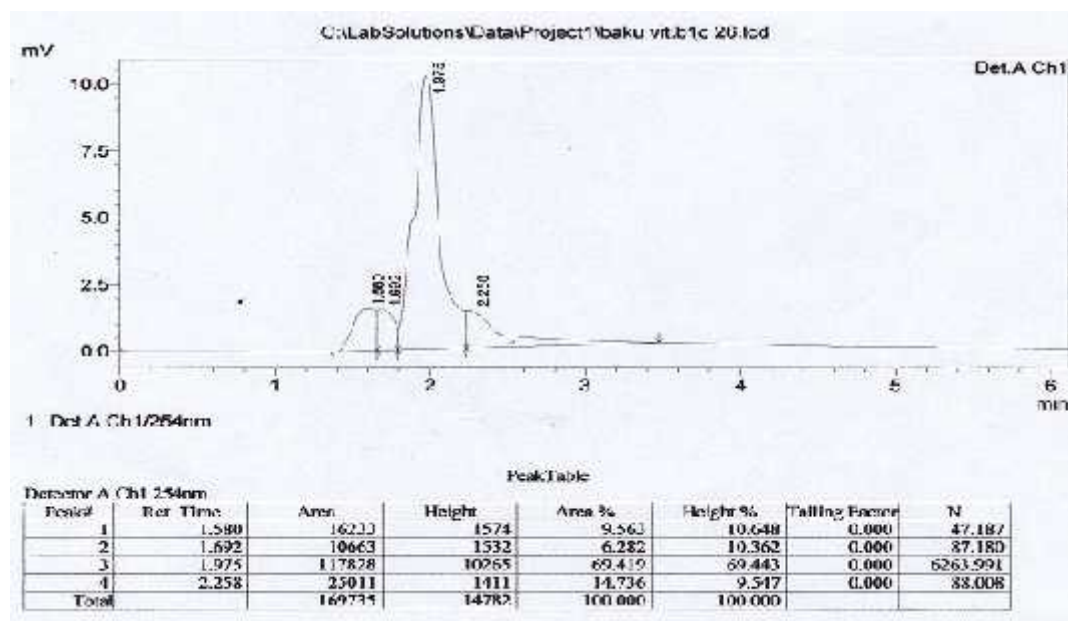
Gambar15. kromatogram asam askorbat kecepatan alir 1.4 ml/menit



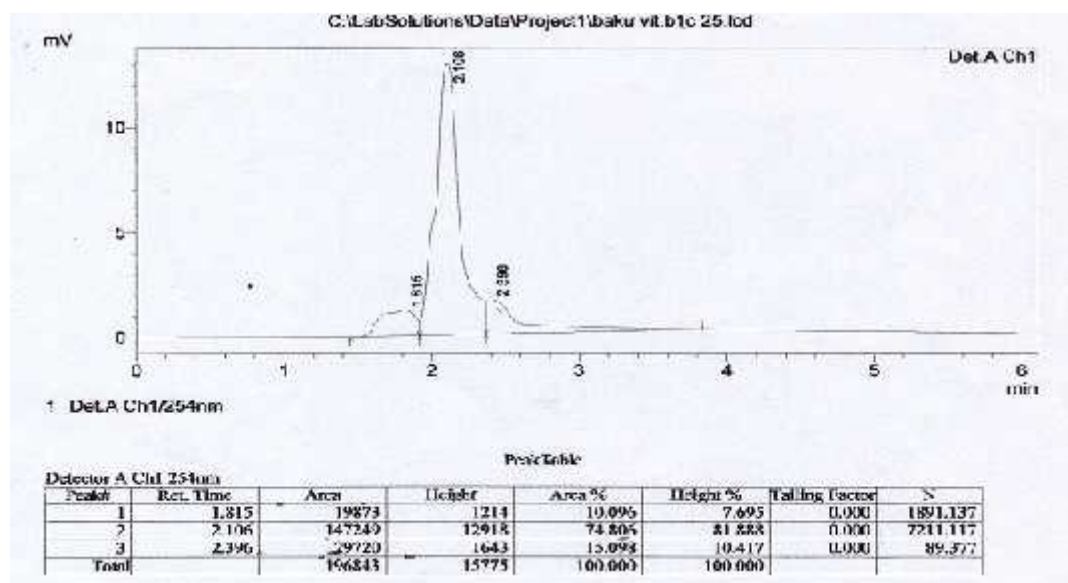
Gambar 16. kromatogram asam askorbat kecepatan alir 1.3 ml/menit



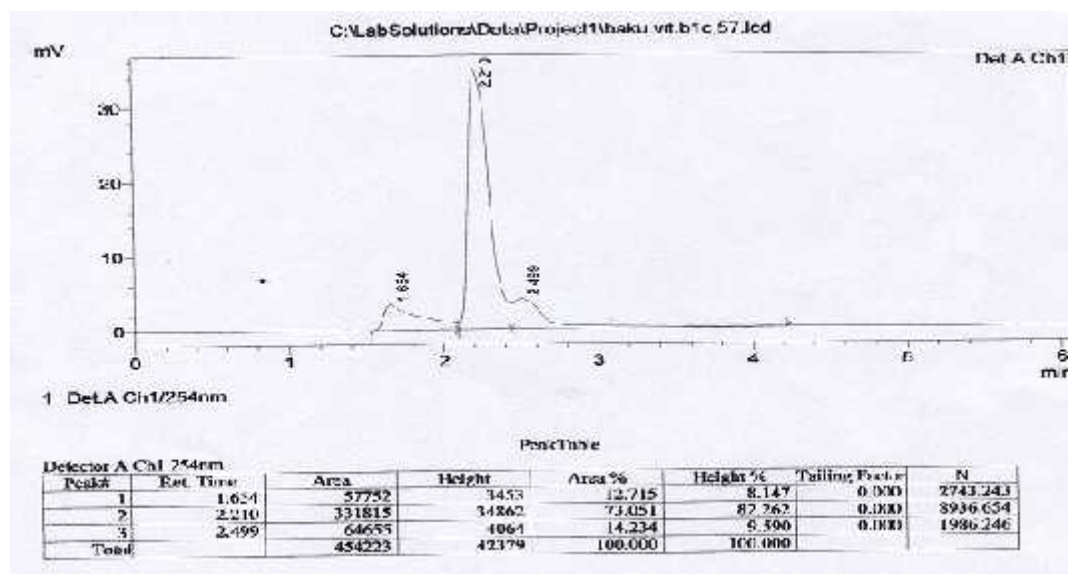
Gambar 17. kromatogram asam askorbat kecepatan alir 1.2 ml/menit



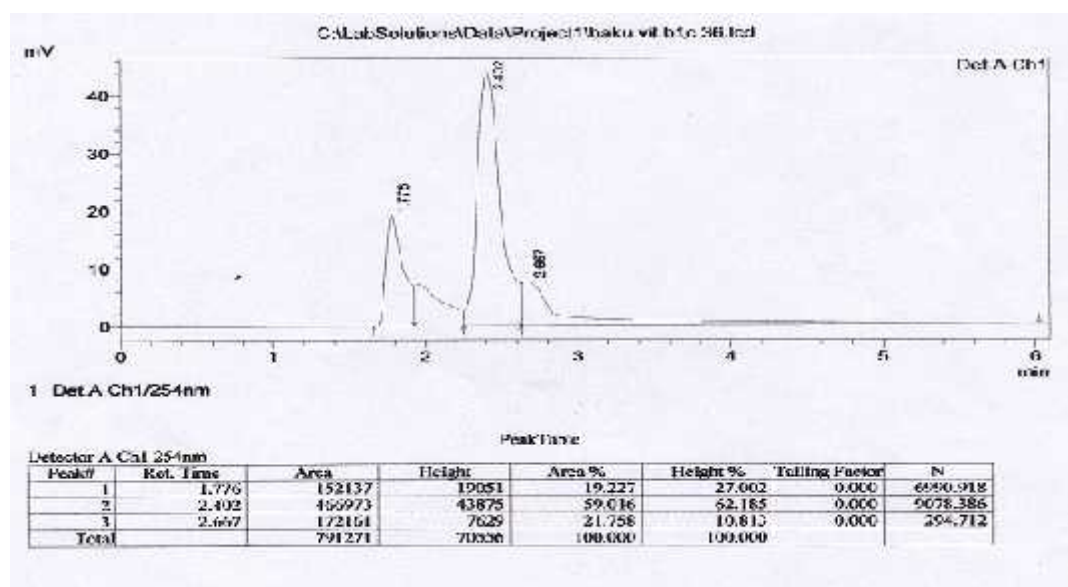
Gambar18. kromatogram campuran kecepatan alir 1,5 ml/menit



Gambar 19. kromatogram campuran kecepatan alir 1,4 ml/menit

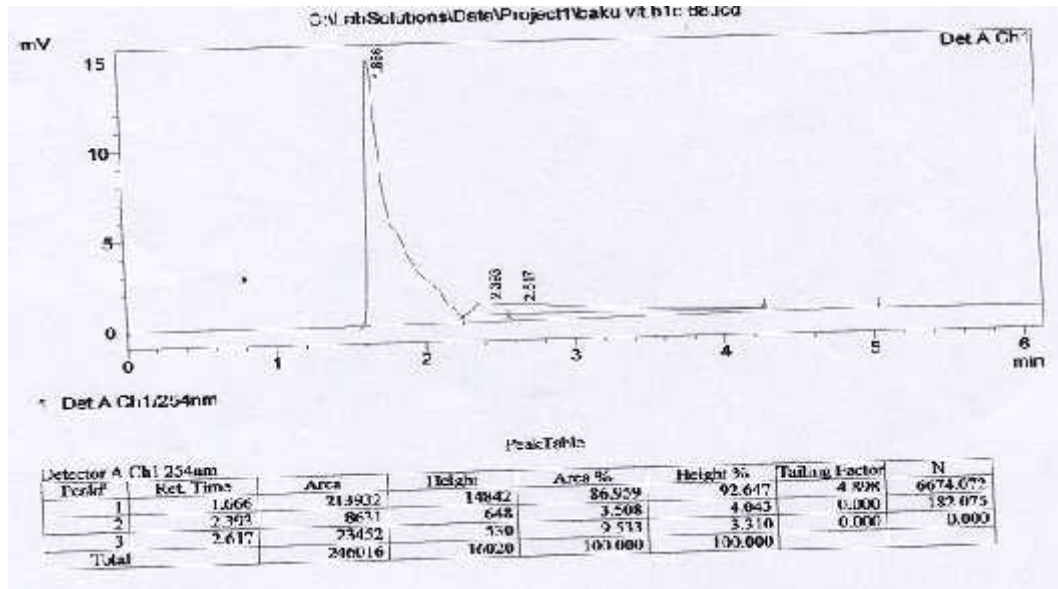


Gambar20. kromatogram campuran kecepatan alir 1,3 ml/menit.

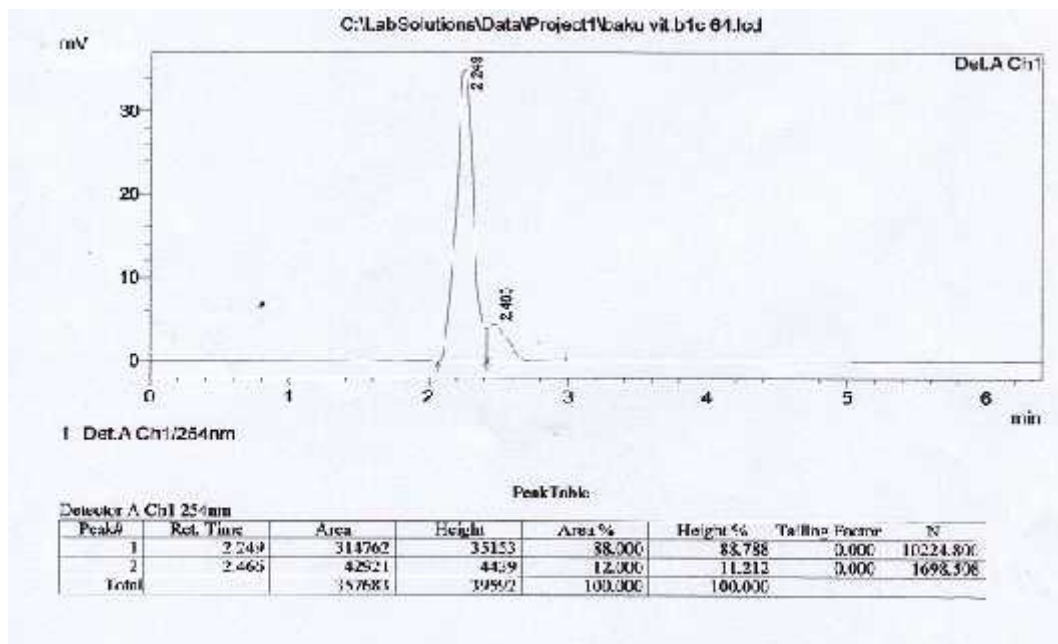


Gambar 21. kromatogram campuran kecepatan alir 1,2 ml/menit

Lampiran19. Kromatogram uji kualitatif

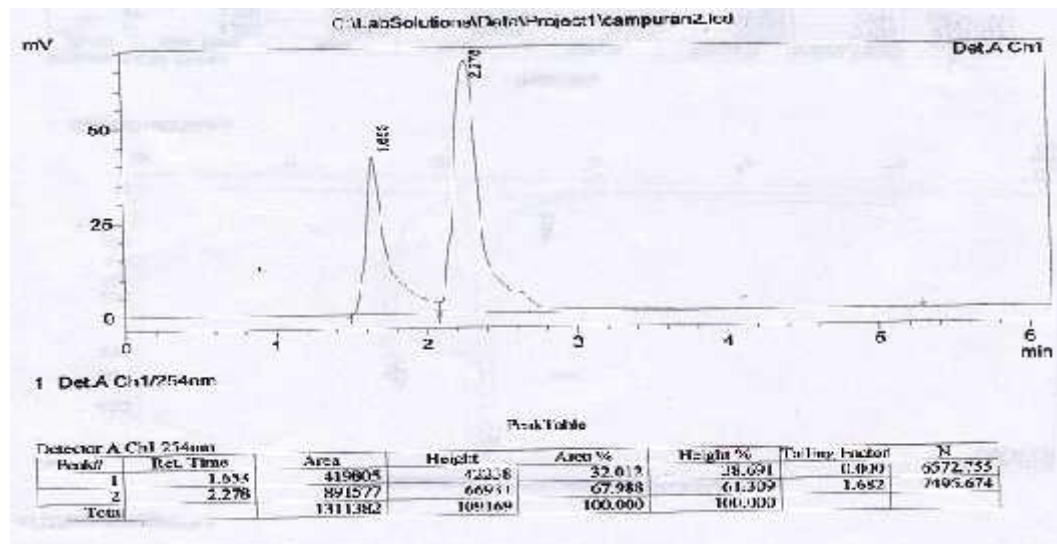


Gambar 22. kromatogram tiamin HCl

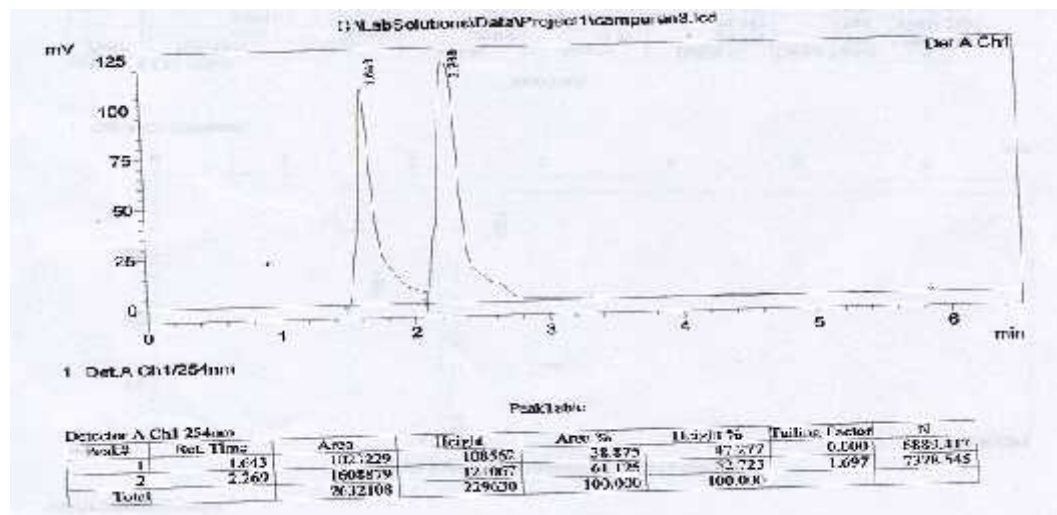


Gambar 23.kromatogram asam askorbat

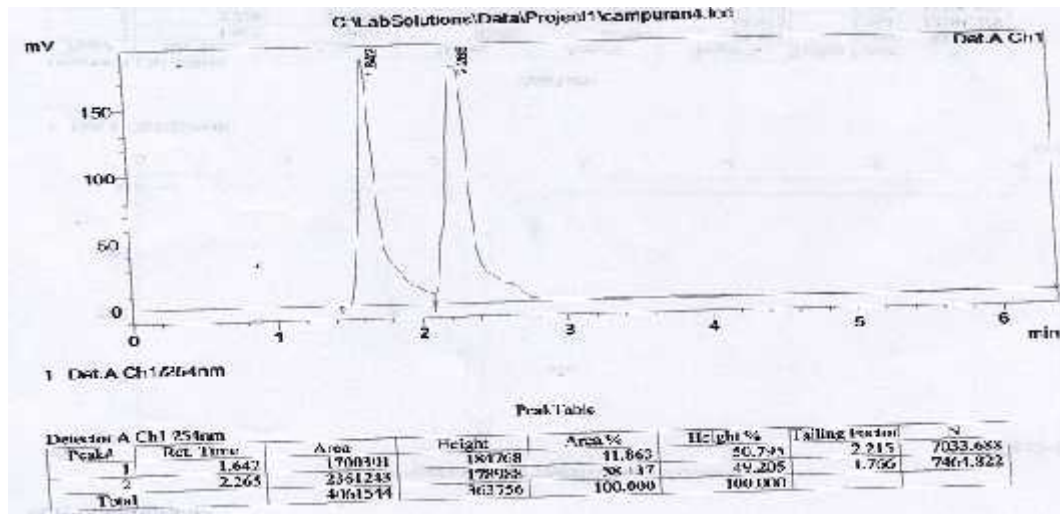
Lampiran 20. Gambar kromatogram kurva baku



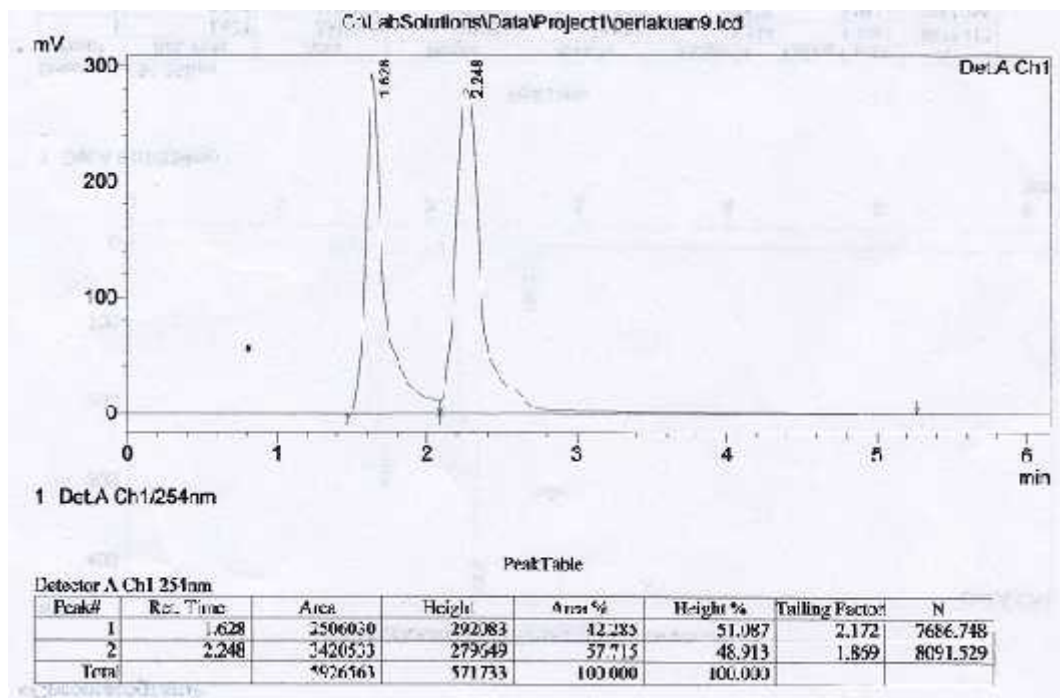
Gambar 24. kromatogram tiamin HCl 15 ppm dan asam askorbat 18,2 ppm



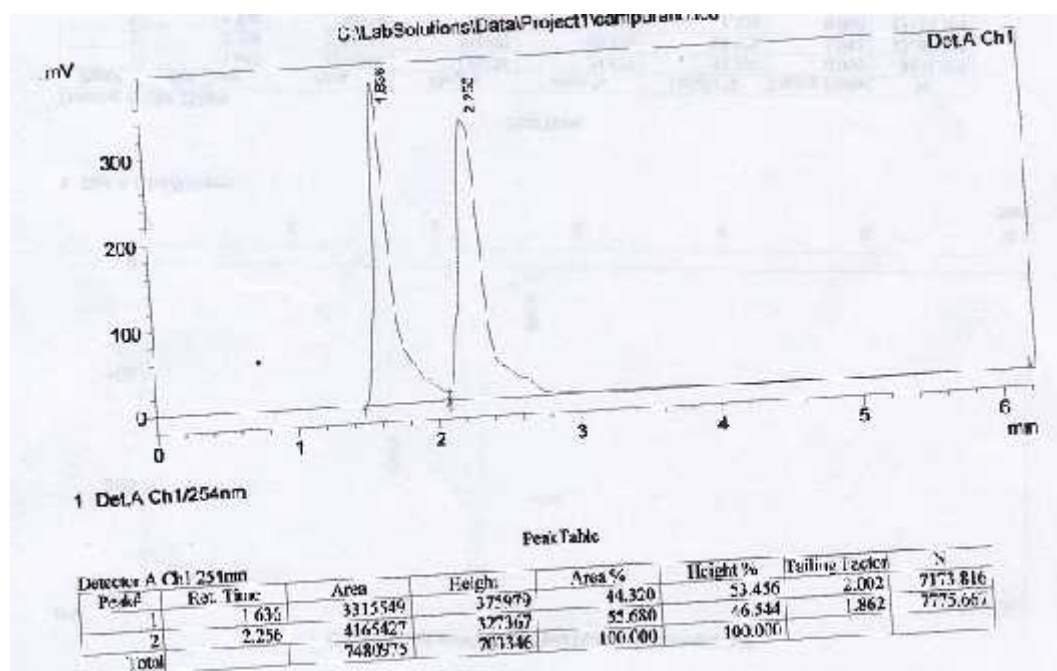
Gambar 25. kromatogram tiamin HCl 30 ppm & asam askorbat 36,4 ppm



Gambar 26. kromatogram tiamin HCl 45 ppm & asam askorbat 54,5 ppm

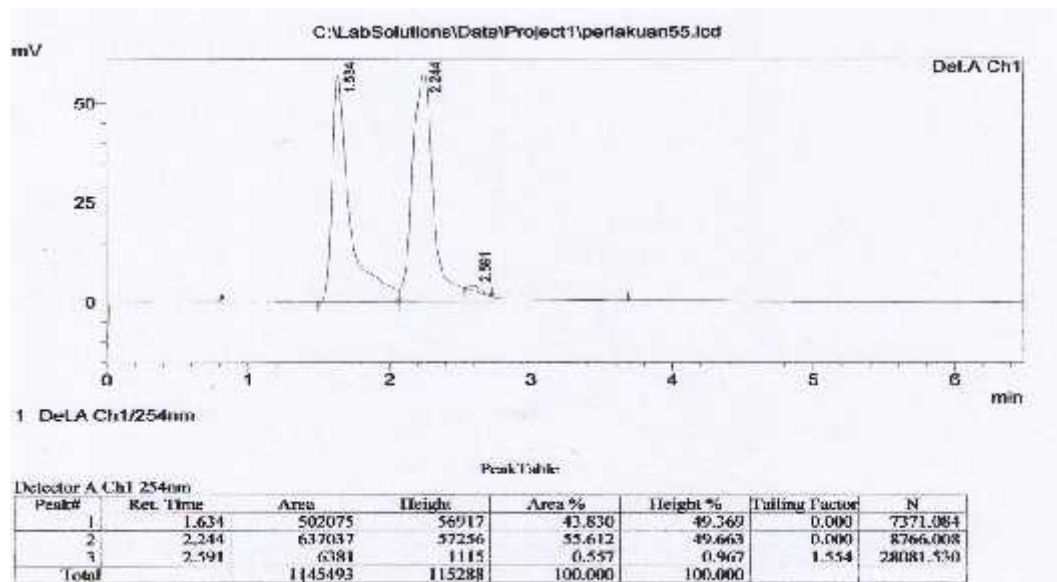


Gambar 27. kromatogram tiamin HC 160 ppm & asam askorbat 72,8ppm

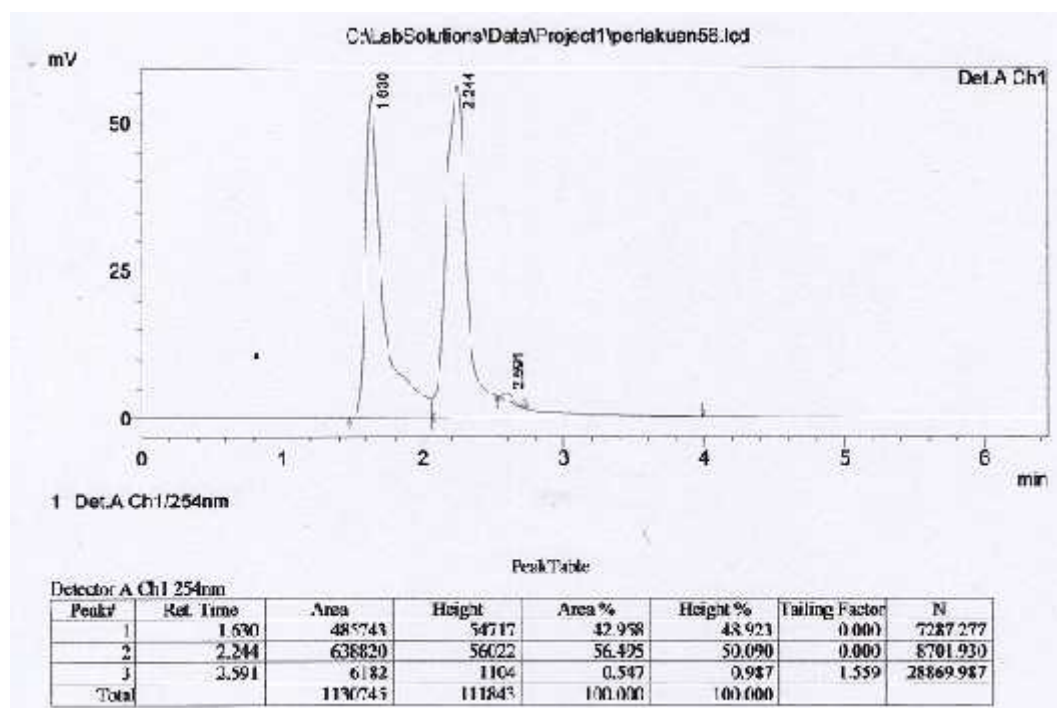


Gambar 28. kromatogram tiamin HC 175 ppm & asam askorbat 91 ppm

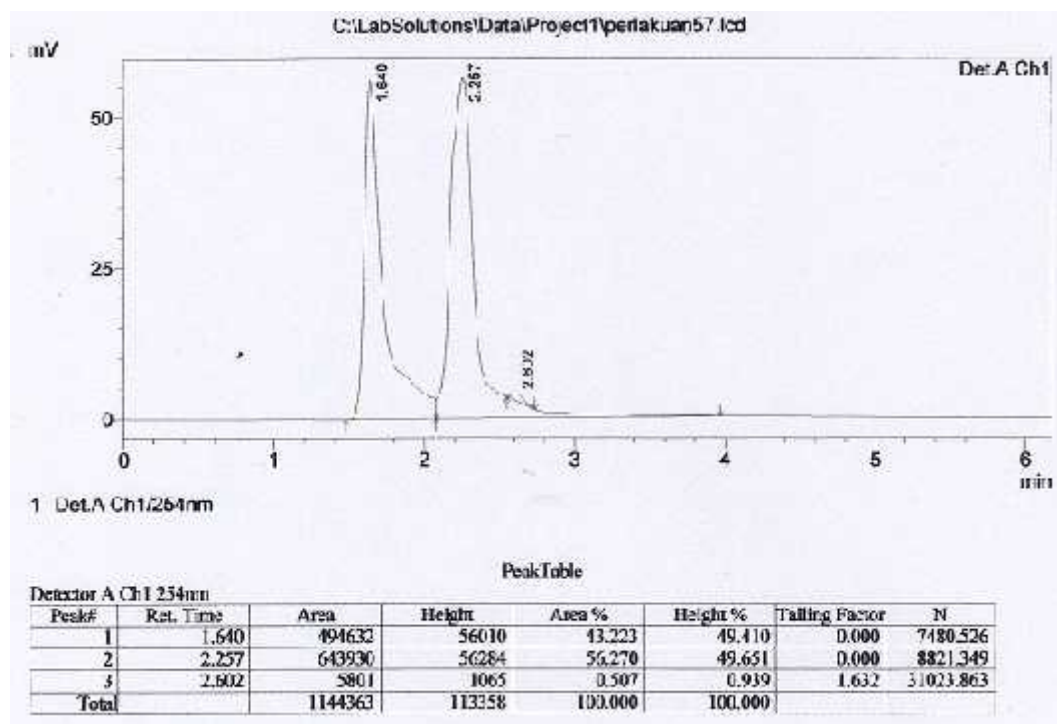
Lampiran 21. Gambar kromatogram recovery



Gambar 29. kromatogram recovery replikasi 1

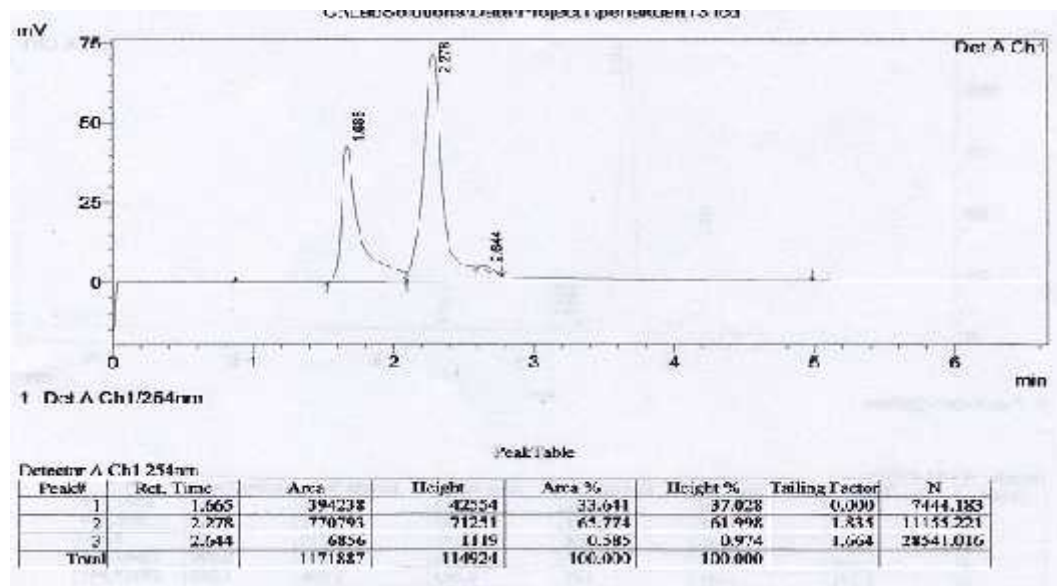


Gambar 30. kromatogram recovery replikasi 2

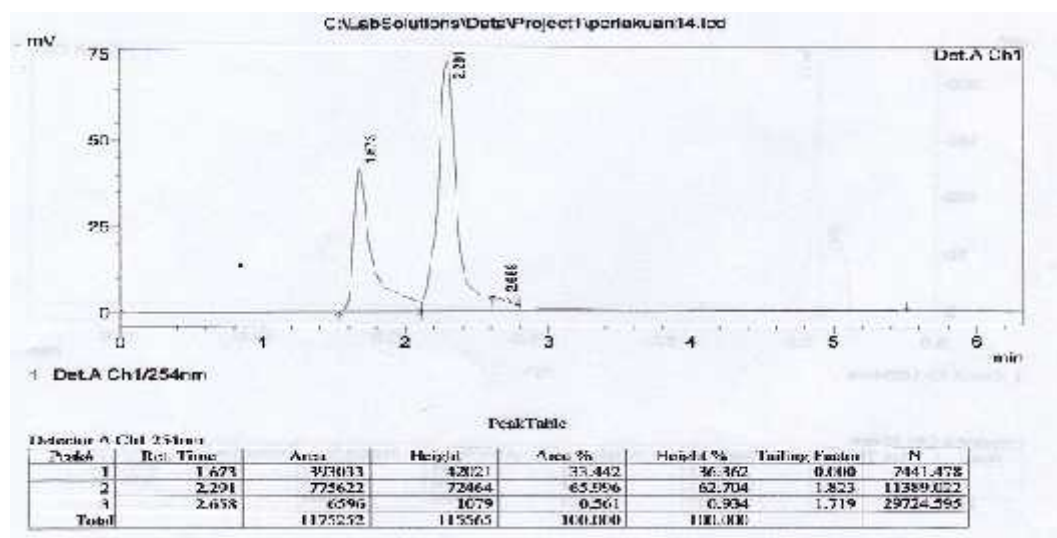


Gambar 31. kromatogram recovery replikasi 3

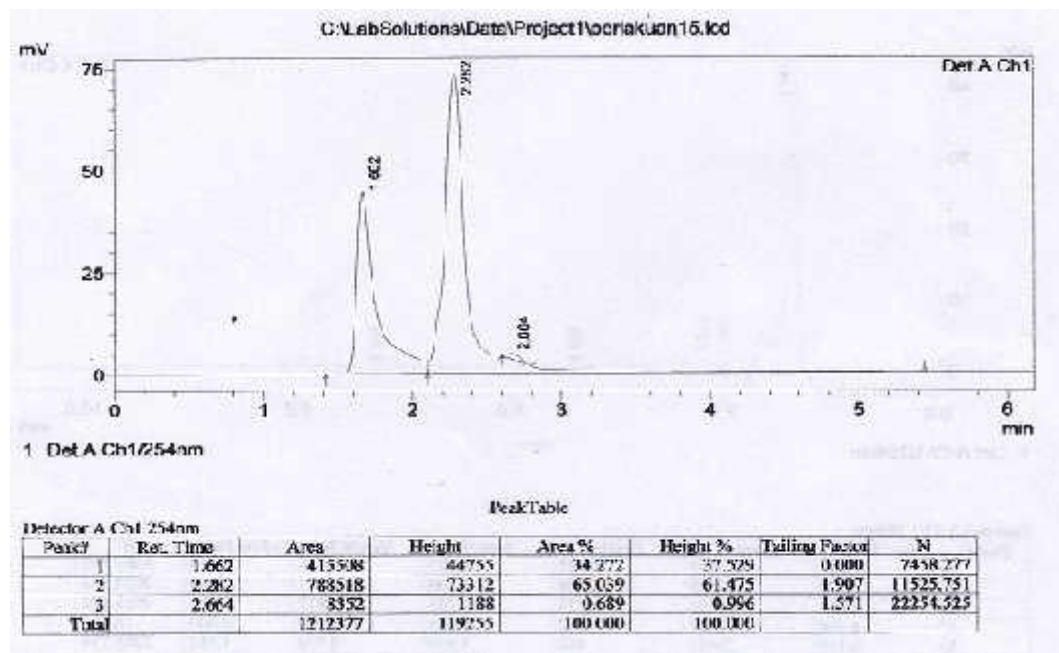
Lampiran 22. Gambar perlakuan campuran uji stabilitas



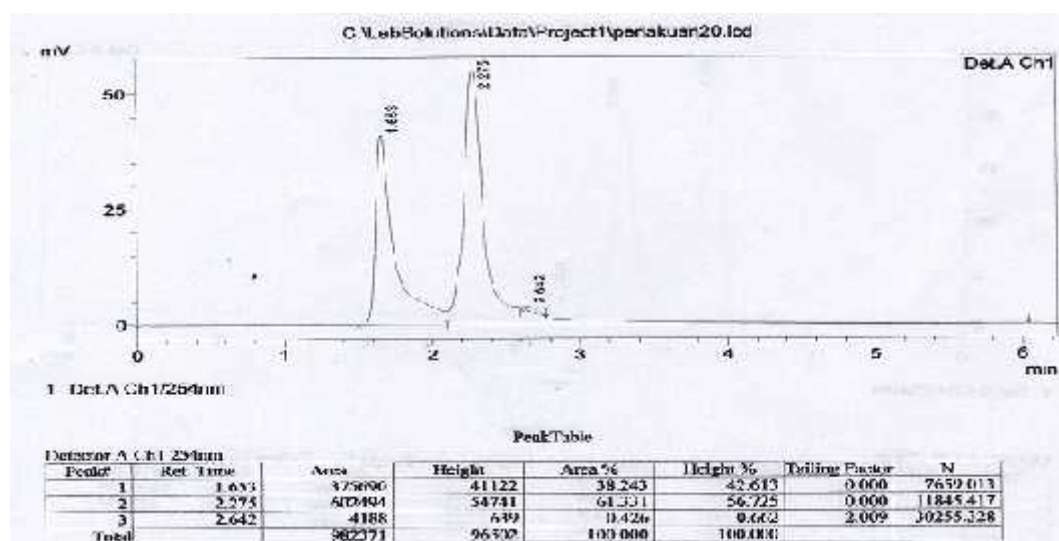
Gambar 32. kromatogram uji stabilitas kondisi netral replikasi 1



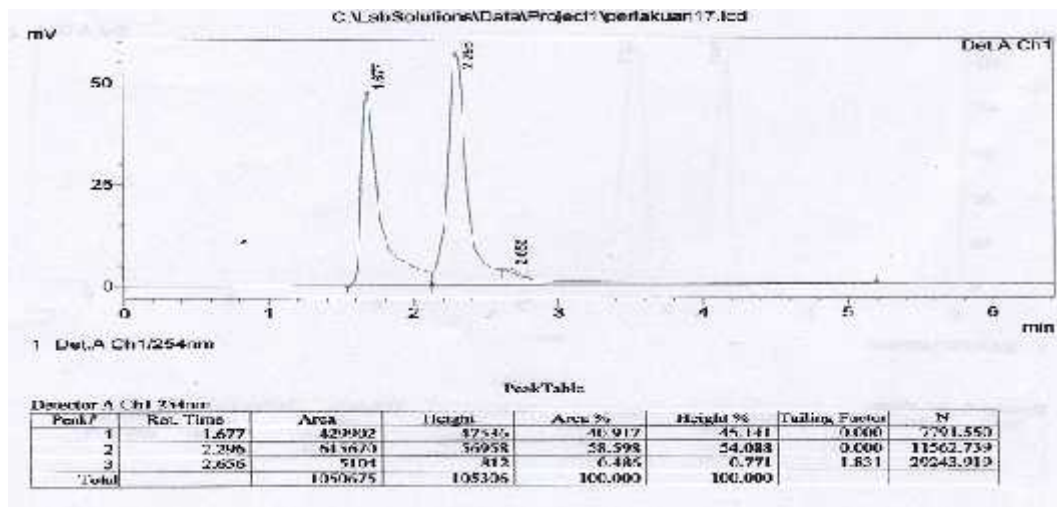
Gambar 33. kromatogram uji stabilitas kondisi netral replikasi 2



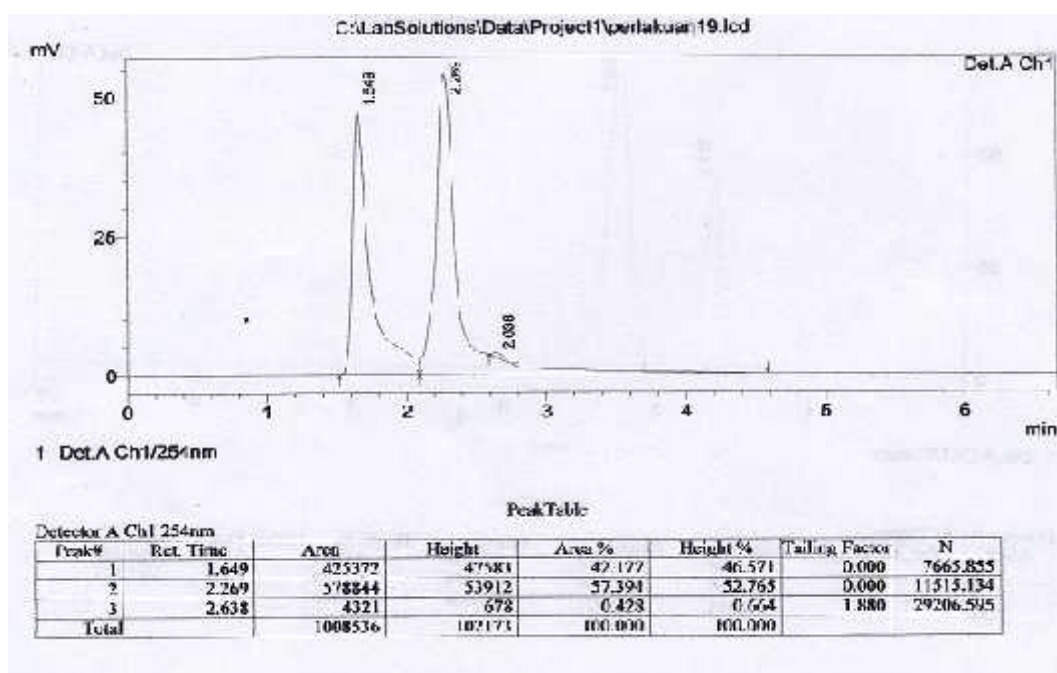
Gambar 34. kromatogram uji stabilitas kondisi netral replikasi 3



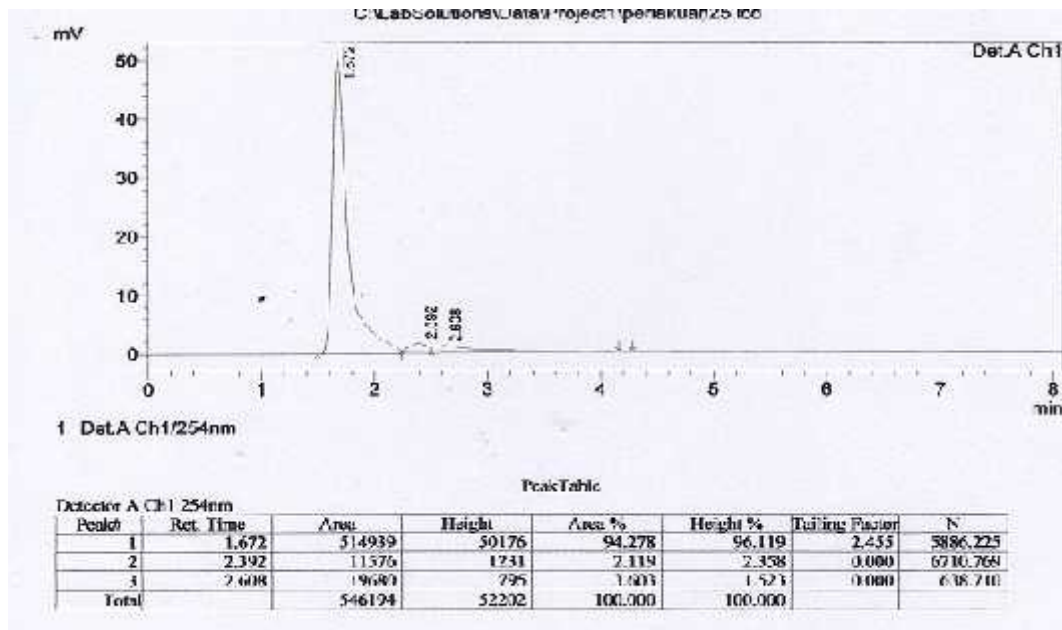
Gambar 35 .kromatpgram uji stabilitas kondisi asam replikasi 1



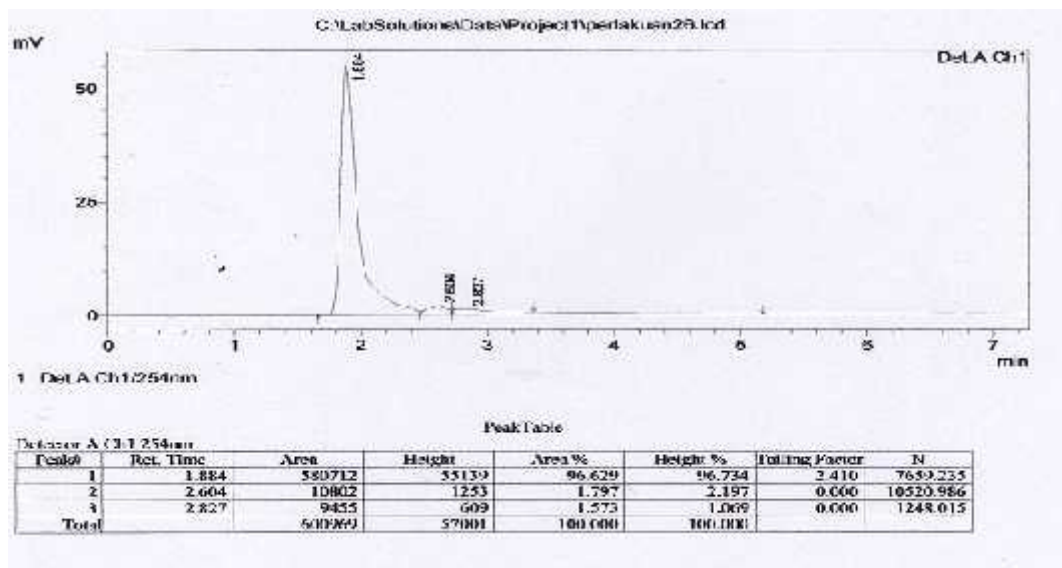
Gambar 36. kromatogram uji stabilitas kondisi asam replikasi 2



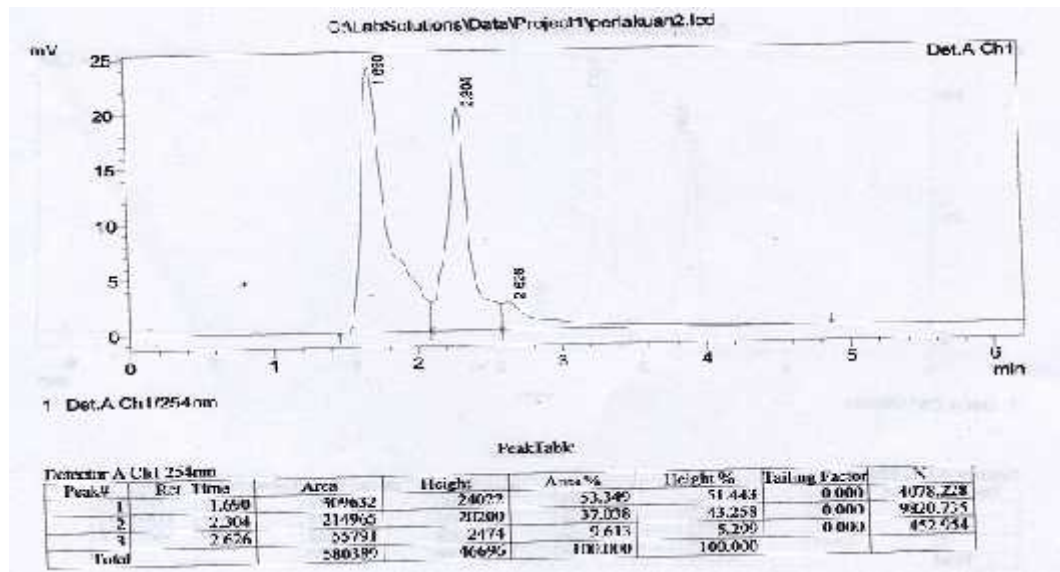
Gambar 37. kromatogram uji stabilitas kondisi asam replikasi 3



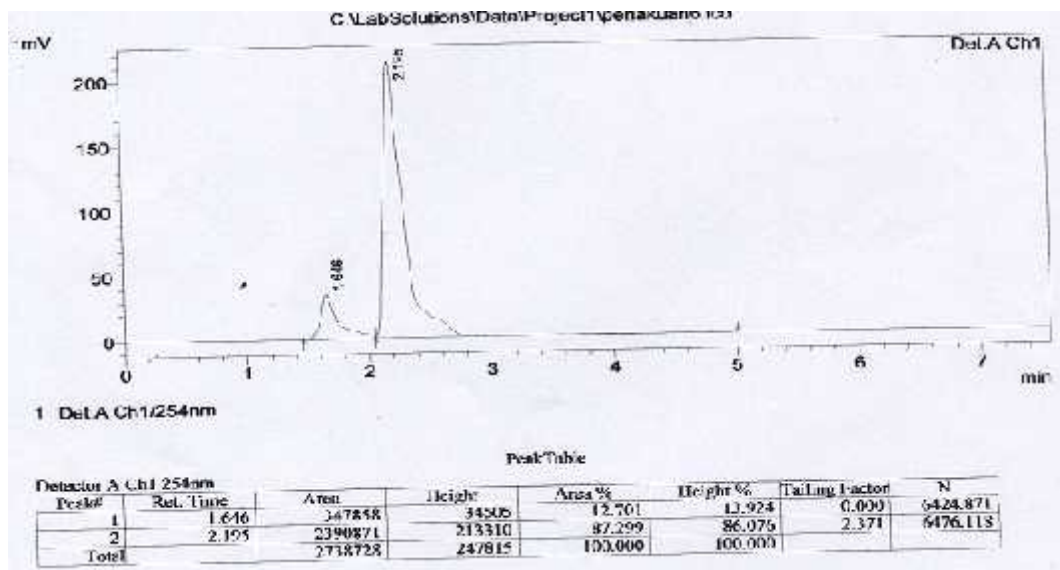
Gambar 38. kromatogram uji stabilitas kondisi basa replikasi 1



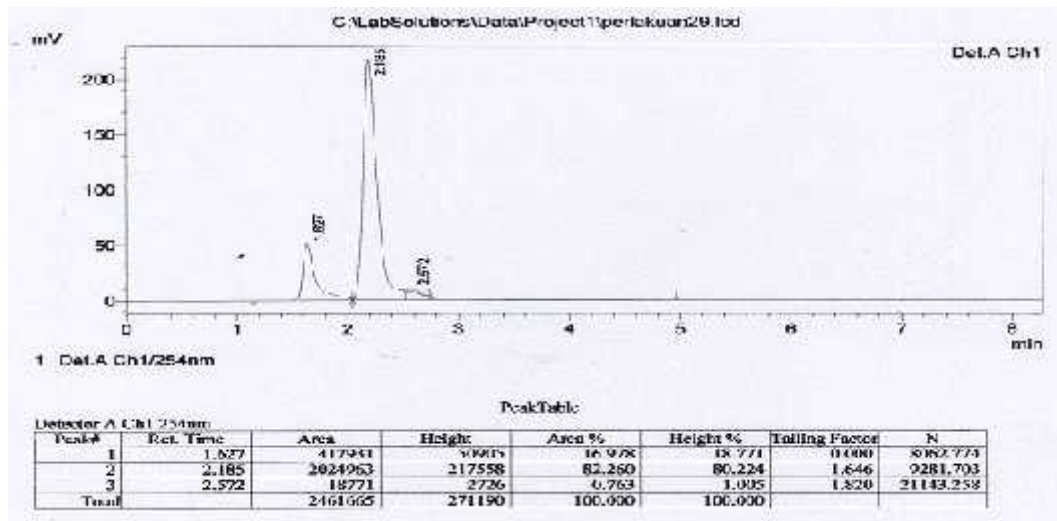
Gambar 39. kromatogram uji stabilitas kondisi basa replikasi 2



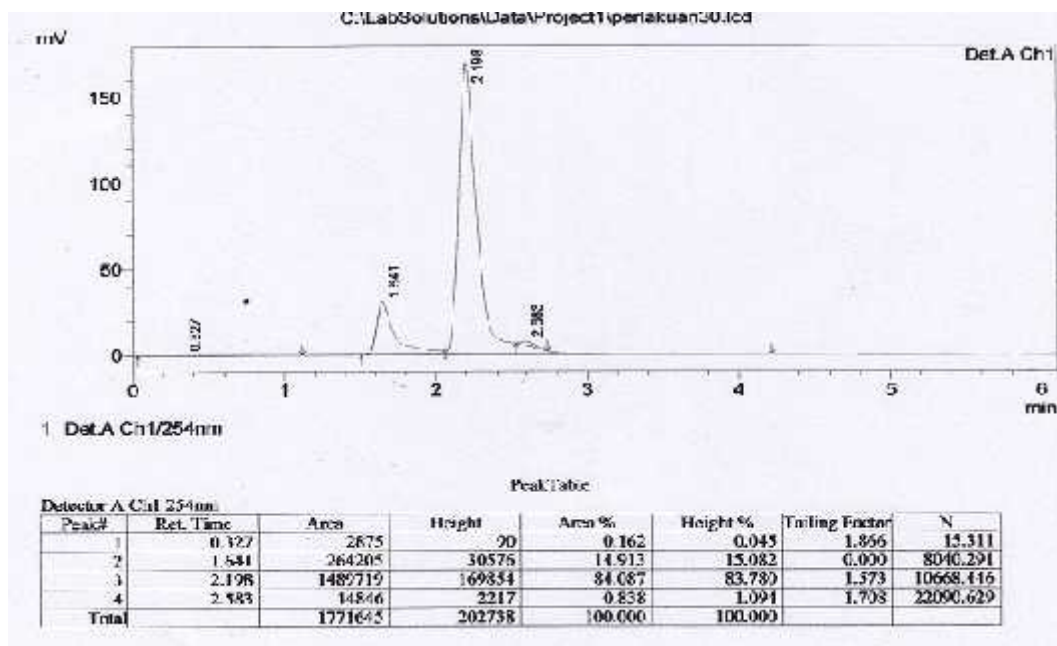
Gambar40. kromatogram uji stabilitas kondisi basa replikasi 3



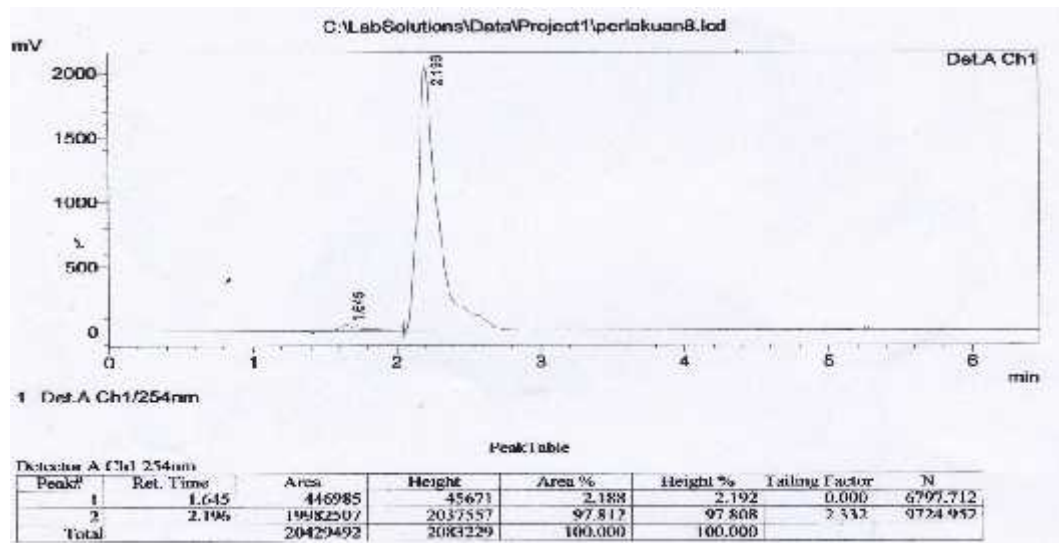
Gambar 41. kromatogram uji stabilitas H₂O₂ 3% replikasi 1



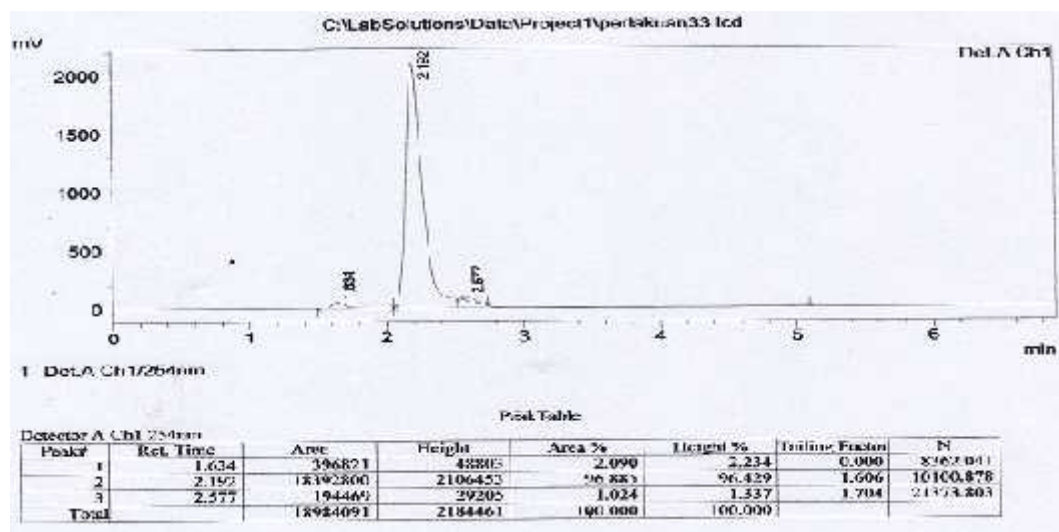
Gambar 42.kromatogram uji stabilitas H₂O₂ 3% replikasi 2



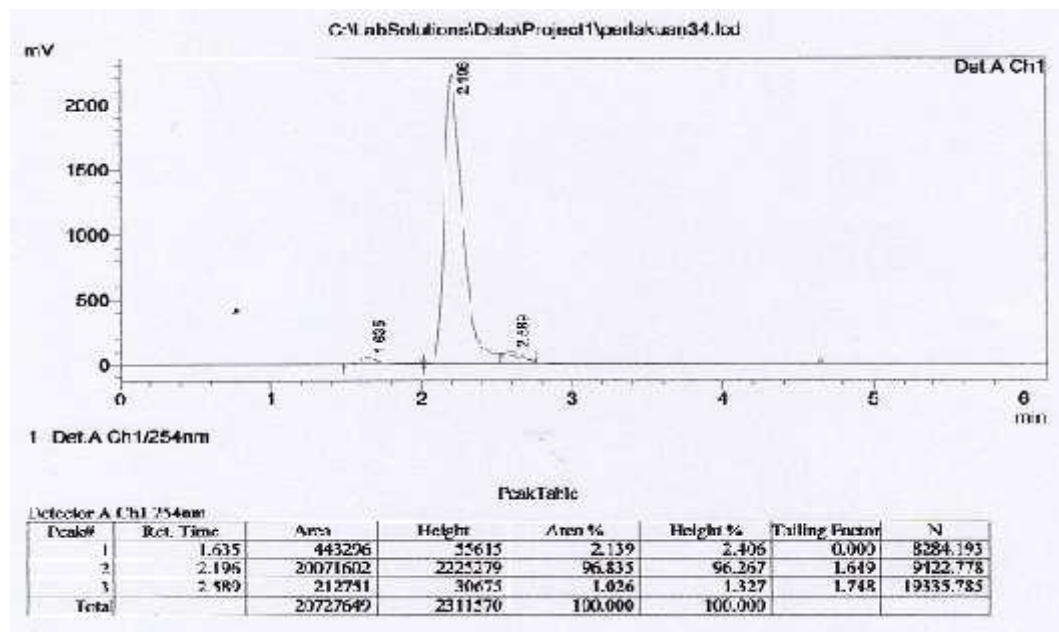
Gambar 43. kromatogram uji stabilitas H₂O₂ 3% replikasi 3



Gambar44. kromatogram uji stabilitas H₂O₂ 30% replikasi 1

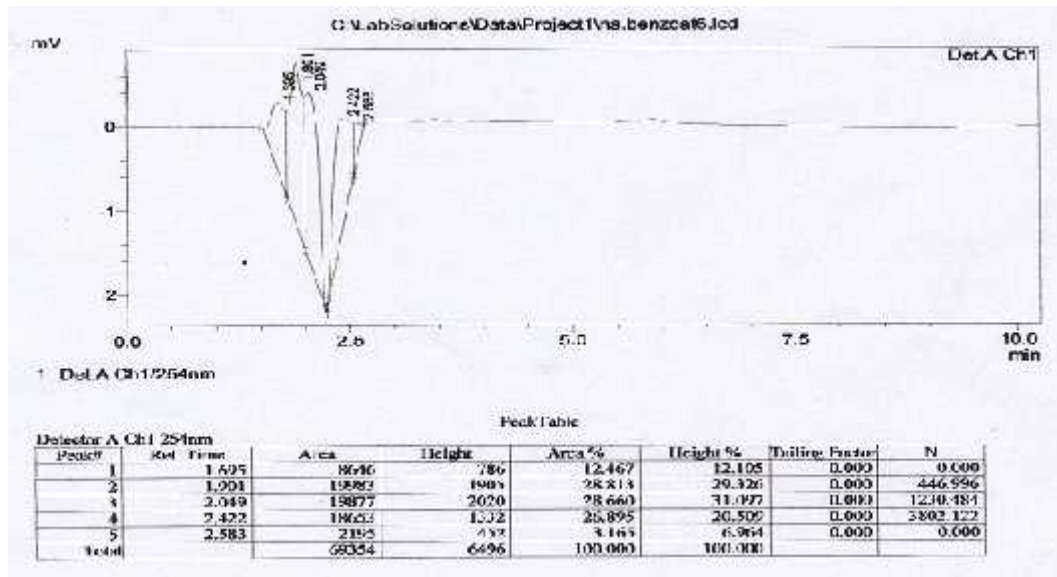


Gambar45. kromatogram uji stabilitas H₂O₂ 30% replikasi 2

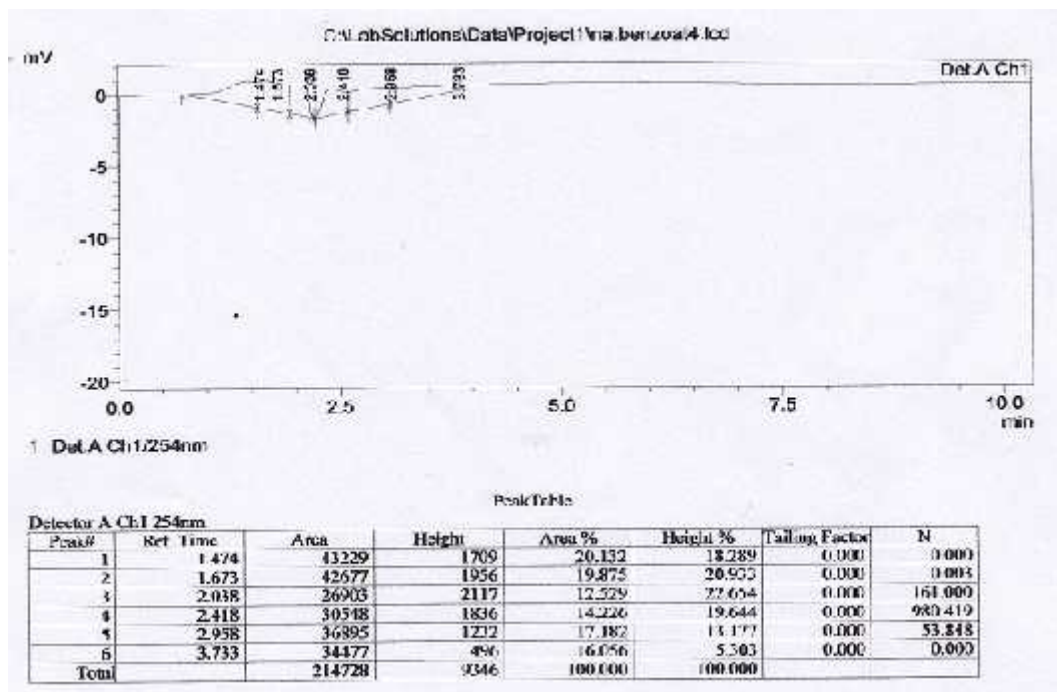


Gambar 46. kromatogram uji stabilitas oksidasi H₂O₂ 30% replikasi 3

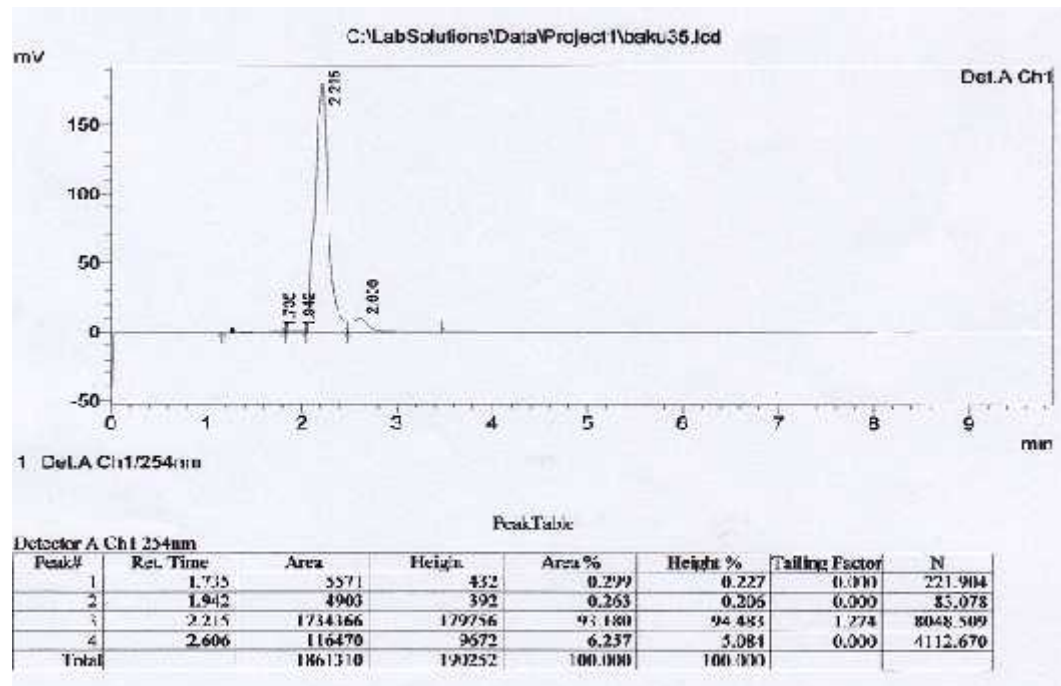
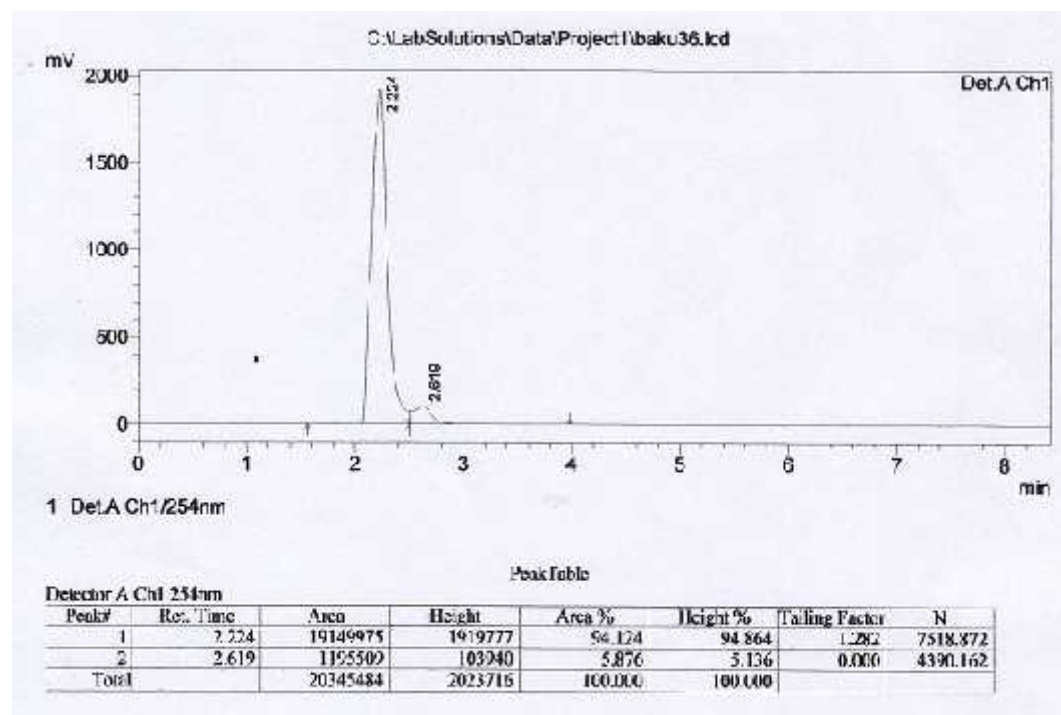
lampiran 23. gambar kromatogram blanko



Gambar 47. kromatogram blanko NaOH 0,1N



Gambar 48. kromatogram blanko HCl 0,1N

Gambar 49. kromatogram blanko H₂O₂ 3%Gambar 50. kromatogram blanko H₂O₂ 30%

Lampiran 24. Gambar alat yang digunakan**Gambar 51. syringe 25µl****Gambar 52. alat KCKT****Gambar 53. timbangan analitik**

Lampiran. 25. Tabel nilai distribusi uji t

Tabel 9. Nilai distribusi uji t

Two-sided: One-sided: d.f.:	40% 20% $t_{0,80}$	20% 10% $t_{0,90}$	10% 5% $t_{0,95}$	5% 2.50% $t_{0,975}$	1% 0.50% $t_{0,995}$
1	1.376382	3.077684	6.313752	12.7062	63.65674
2	1.06066	1.885618	2.919986	4.302453	9.924843
3	0.978472	1.637744	2.353363	3.182446	5.840909
4	0.940965	1.533206	2.131847	2.776445	4.604055
5	0.919544	1.475884	2.015048	2.570582	4.032143
6	0.905703	1.436756	1.94318	2.446912	3.707459
7	0.89603	1.414924	1.894579	2.364624	3.499483
8	0.88889	1.396815	1.859548	2.306004	3.355367
9	0.883404	1.383029	1.833113	2.262157	3.249836
10	0.879059	1.372184	1.812481	2.228139	3.169273
11	0.87553	1.36343	1.795885	2.200985	3.105807
12	0.872609	1.356217	1.782288	2.178813	3.05454
13	0.870152	1.350171	1.770933	2.160369	3.012276
14	0.868055	1.34503	1.76191	2.144787	2.976943
15	0.866245	1.340606	1.75305	2.13145	2.946713
16	0.864667	1.336757	1.745884	2.119905	2.920762
17	0.863279	1.333379	1.739607	2.109816	2.898231
18	0.862049	1.330361	1.734064	2.100922	2.87844
19	0.860951	1.327728	1.729133	2.093024	2.860935
20	0.859964	1.325341	1.724718	2.085963	2.84534
21	0.859074	1.323188	1.720743	2.079614	2.83136
22	0.858266	1.321237	1.717144	2.073873	2.818756
23	0.85753	1.31946	1.713872	2.068658	2.807336
24	0.856855	1.317836	1.710882	2.063899	2.796939
25	0.856236	1.316345	1.708141	2.059539	2.787436
26	0.855665	1.314972	1.705618	2.055529	2.778715
27	0.855137	1.313703	1.703288	2.05183	2.770663
28	0.854647	1.312527	1.701131	2.048407	2.763262
29	0.854192	1.311434	1.699127	2.04523	2.756366
30	0.853767	1.310415	1.697261	2.042272	2.749906
31	0.85337	1.309464	1.695519	2.039513	2.744042
32	0.852998	1.308573	1.693889	2.036933	2.738481
33	0.852649	1.307737	1.69236	2.034515	2.733277
34	0.852321	1.306952	1.690924	2.032244	2.728364
35	0.852012	1.306212	1.689572	2.030108	2.723806
36	0.85172	1.305514	1.688298	2.028094	2.719485
37	0.851444	1.304854	1.687094	2.026192	2.715409
38	0.851183	1.30423	1.685954	2.024394	2.711558
39	0.850935	1.303639	1.684875	2.022691	2.707913
40	0.8507	1.303077	1.683851	2.021075	2.704459
41	0.850476	1.302543	1.682878	2.019541	2.701161
42	0.850263	1.302035	1.681952	2.018082	2.698066
43	0.85006	1.301552	1.681071	2.016692	2.695102
44	0.849867	1.30109	1.68023	2.015368	2.692278
45	0.849682	1.300649	1.679427	2.014103	2.689565
46	0.849505	1.300228	1.67866	2.012896	2.687013
47	0.849336	1.299825	1.677927	2.01174	2.684556
48	0.849174	1.299439	1.677224	2.010635	2.682204
49	0.849018	1.299069	1.676551	2.009575	2.679962
50	0.848869	1.298714	1.675905	2.008559	2.677793
75	0.84644	1.292941	1.665425	1.992102	2.642963
100	0.84523	1.290075	1.660234	1.983971	2.625891
500	0.842341	1.283247	1.647907	1.96472	2.585688
infinity	0.841621	1.281652	1.644865	1.959966	2.575834

Created with

