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APPENDIX I

UV SPECTRUM OF *C. asiatica* (UK lab.)

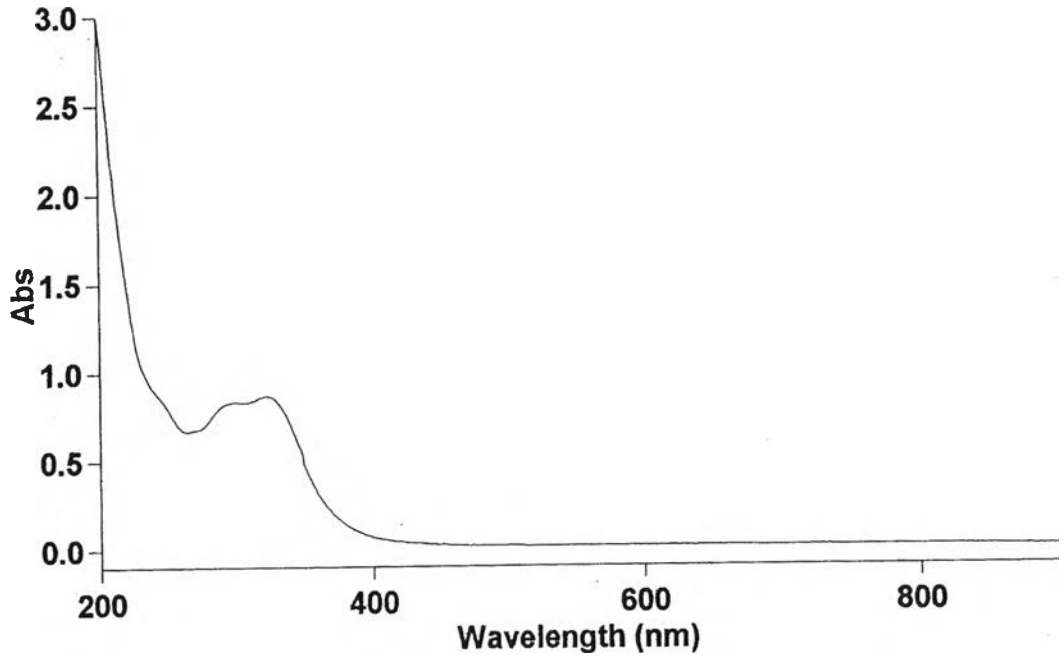


Figure 1A Spectrum of *C. asiatica* fresh leaves in ethanol extract (UK lab.)

Scan Report

Batch	ethanol extract
Software version :	01.00 (6)

Peak table

Peak type	peaks
Peak Threshold	0.1000
Range	900.00 nm to 200.00 nm

Wavelength (nm)	**Abs**
322.00	1.7446
255.00	0.2351
220.00	0.4421

Because of the most widely used detectors for liquid chromatography are based upon absorption of UV or visible radiation. As result for ethanol extract as above the functional groups of **asiaticoside** and other from ***C. asiatica*** fresh leaves absorb as above region.

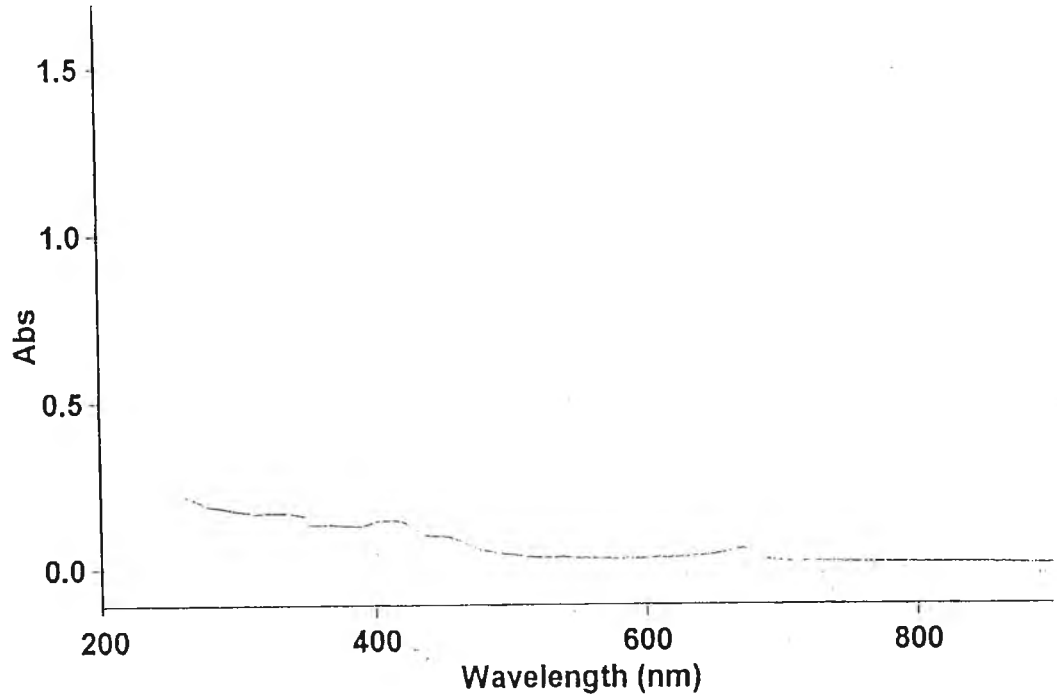


Figure 1B Spectrum of hexane extract from ***C. asiatica*** fresh leaves.(UK lab).

Scan Report

Batch	hexane extract
Software version :	01.00 (6)

Peak table

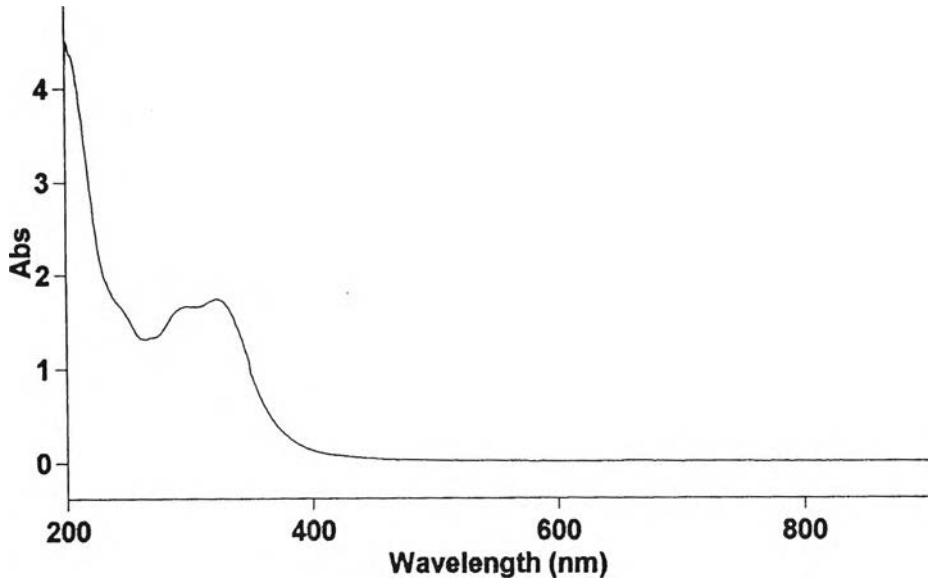
Peak type	peaks
Peak Threshold	0.2000
Range	900.00 nm to 202.00 nm

No peak found above threshold.

For hexane extract, there are no peak absorbtion result. Because of non polarity of hexane. **Asiaticoside** is polarity so the result is as above.

03/08/01 15:50:07 Page 1 of 1

Kingston University
Department of Chemistry
Instrument Serial Number EL 9806 3586



Scan ReportFri 03 Aug 03:46:30 PM 2001

Batch:
Software version: 01.00(6)
Operator: Suvipha S.

Sample Name: CA

Collection Time	03/08/01 15:45:09

Peak Table

Peak Type	Peaks
Peak Threshold	0.0100
Range	900.00nm to 200.00nm

Wavelength (nm)	Abs
322.00	1.7446
205.00	4.3648
201.00	4.5043

Figure 1C Spectrum of chloroform extract from ***C. asiatica*** fresh leaves.(UK lab)

Scan Report

Batch	chloroform extract
Software version:	01.00 (6)

Peak table

Peak type	peaks
Peak Threshold	0.0100
Range	900.00 nm to 200.00 nm

Wavelength (nm)	**Abs**
322.00	1.7446
205.00	4.3648
201.00	4.5043

Figure 1 C shows UV Spectrum of chloroform extract in the second steps in Method 1.2. The spectrum show more than 1 peak, it demonstrate the peak at 201, 205 and 322 nm

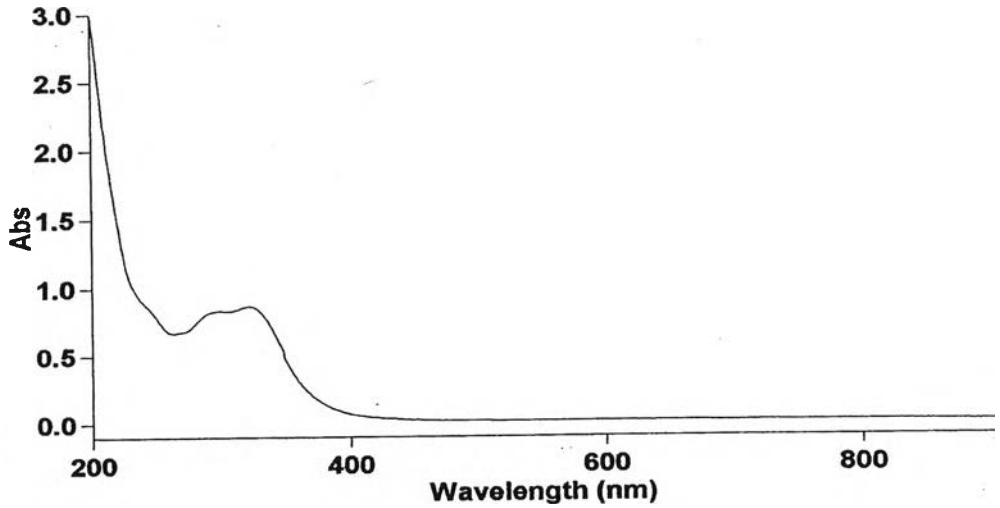


Figure1D Spectrum of isobuthanol extract from ***C. asiatica*** fresh leaves.(UK lab).

Scan Report

Batch	isobuthanol extract
Software version:	01.00 (6)
Peak table	
Peak type	peaks
Peak Threshold	0.0100
Range	900.00 nm to 200.00 nm
Wavelength (nm)	**Abs**
322.00	0.8605
255.00	0.9885
205.00	1.5042

In isobuthanol extract, it present peak at 322 nm. as shown in Figure 1D. From crude extract asiaticoside cannot identify by using UV In isobuthanol extract, it present peak at 322 nm. as shown in spectrophotometer.

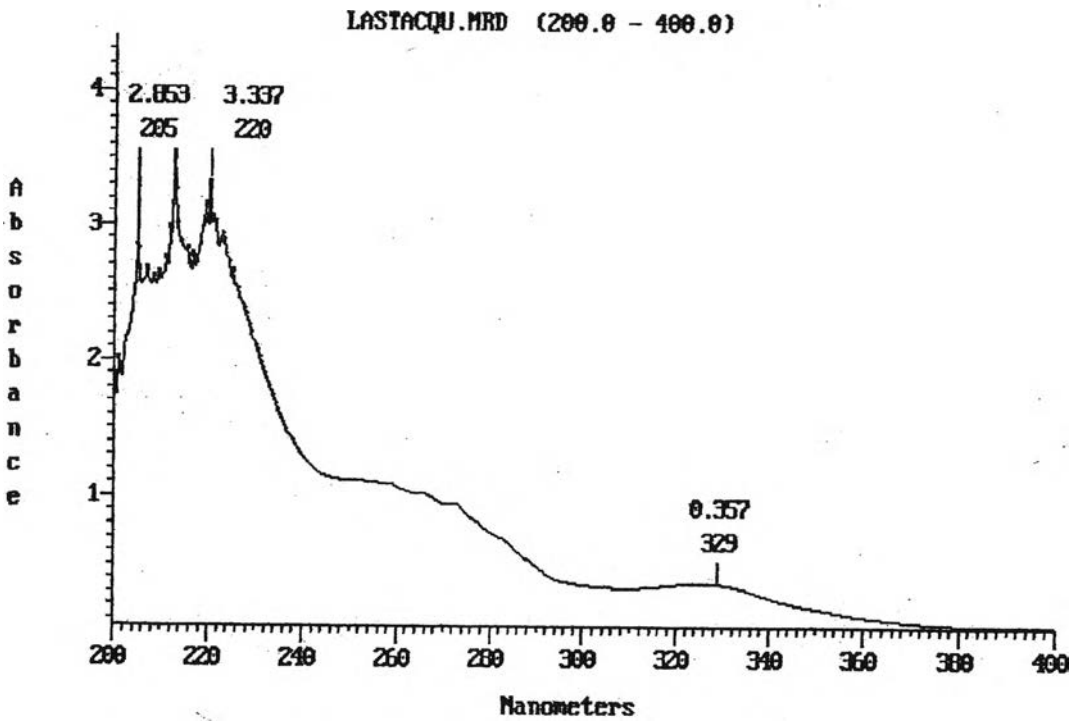


Figure 1 E UV spectrum of purified **asiaticoside** from ***C. asiatica*** fresh leaves.

Scan Report

Batch	buthanol extract
Software version:	01.00 (6)
Peak table	
Peak type	peaks
Peak Threshold	0.0100
Range	200.00 nm to 400.00 nm
Wavelength (nm)	**Abs**
220.00	3.337
205.00	2.853

This figure we can find that the wavelength of 220 nm. , **asiaticoside** can absorb as the report result.

APPENDIX II

CHROMATOGRAM OF ASIATICOSIDE

External Standard Report

Asiaticoside from *Centella asiatica* in microemulsion gel (formula 1) for 72 hrs. in Franz diffusion cell

Method: C:\CLASS-VP\anne\methodAnne.met
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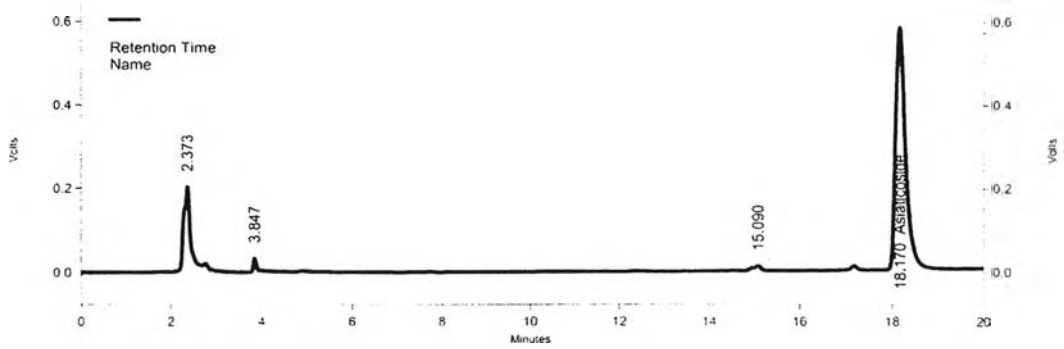
Printed: 4/16/02 7:15:33 AM



Detector A - 1
(220nm)

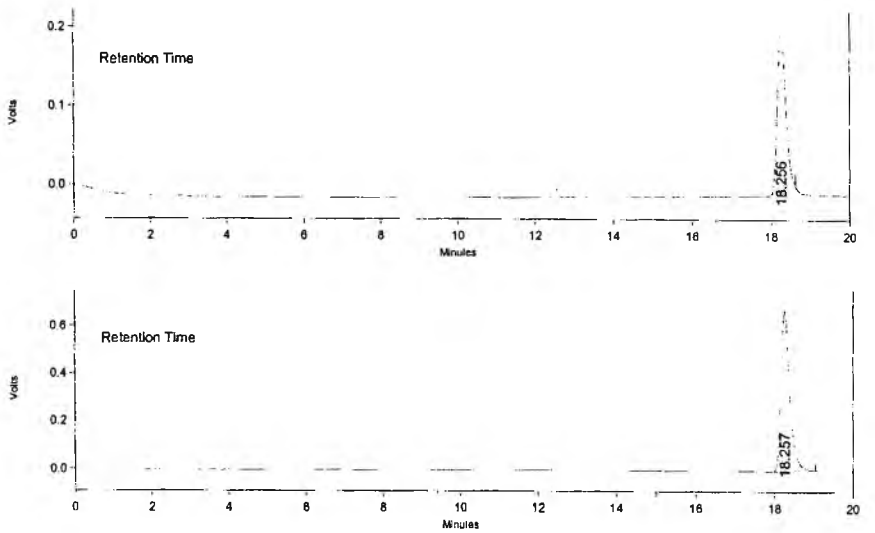
Pk #	Retention Time	Name	Area	ESTD concentration
4	18.170	Asiaticoside	8707124	0.063
Totals			8707124	0.063

Figure 2A Chromatogram of **asiaticoside** from fresh ***C. asiatica*** leaves in microemulsion gel formulation 1 (72 hrs.)

The retention time of purified **asiaticoside** in the matrix of microemulsion gel for formula 1 is 18.170. Peak area is 8707124 cm^2 when the concentration is about 0.0630 g. /ml. That means the penetration in Franz diffusion cell of **asiaticoside** when calculate in flux rate will show most outstanding when compare with other formula. This part of **asiaticoside** is increasing collagen. In the contrary the amount of **asiaticoside** that cover for skin lost water has just a few. When calculate it has about 0.0370 g./ml.

Shimadzu CLASS-VP **Franz diffusion cell of *Centella asiatica***
(Microemulsion gel formula 1) ***Area % Report***

Method Name: C:\CLASS-VP\anna\methodAnne.met
Data Name: C:\CLASS-VP\anne\Suvipha\FranzCen72hr.fo1
User: Suvipha
Acquired: 4/1/02 4:44:17 AM
Printed: 4/1/02 5:08:25 AM



Detector A - 1 (220nm)

Pk #	Retention Time	Area	Area %	Height	Height %
1	18.256	2942275	100.000	200827	100.000
Totals		2942275	100.000	200827	100.000

Detector A - 2 (255nm)

Pk #	Retention Time	Area	Area Percent	Height	Height Percent
1	18.257	10478002	100.00	673649	100.00
Totals		10478002	100.00	673649	100.00

Figure 2B Chromatogram of **asiaticoside** from fresh ***C. asiatica*** leaves in microemulsion gel formulation 1 (48 hrs.)

External Standard Report

Asiaticoside from fresh *Centella asiatica* in microemulsion gel for 72 hrs. in Franz diffusion cell (Formula 1)

Method: C:\CLASS-VP\anne\methodAnne.met
Data File: C:\CLASS-VP\anne\Suvipha\FCASH4-f3-m1-2
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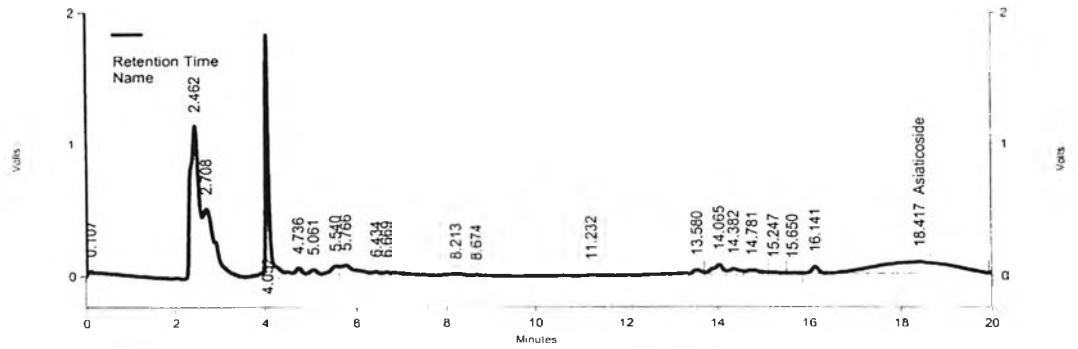

Detector A - 1
(220nm)

Pk #	Retention Time	Name	Area	ESTD concentration
21	18.417	Asiaticoside	10498276	0.069
Totals			10498276	0.069

Figure 2 C Chromatogram of asiaticoside in microemulsion gel for 72 hrs. (Formula 1)

We can observe that for concentration of asiaticoside in formula 1, it also get a good result for skin prenetration with Franz diffusion cell.

External Standard Report

The purified standard of asiaticoside in concentration 0.04 g./ml.

Method: C:\CLASS-VP\anne\methodAnne.met

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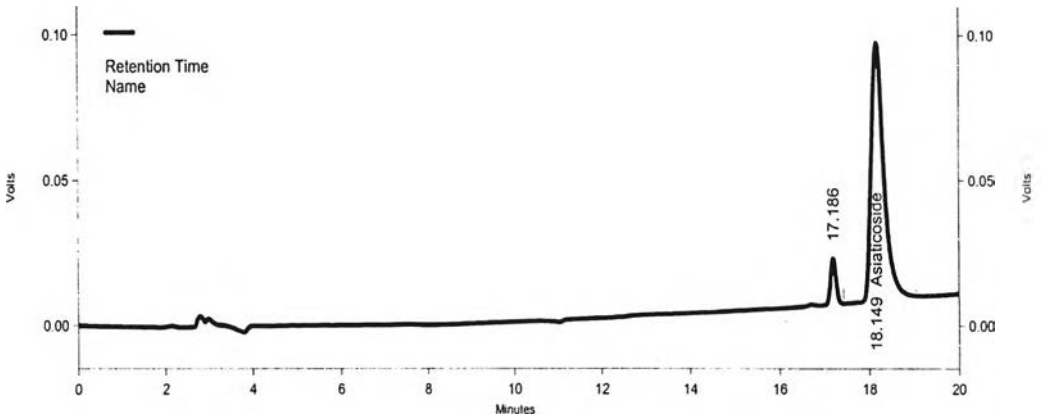


Detector A - 1 (220nm)

Pk #	Retention Time	Name	Area
2	18.149	Asiaticoside	1720482
Totals			1720482

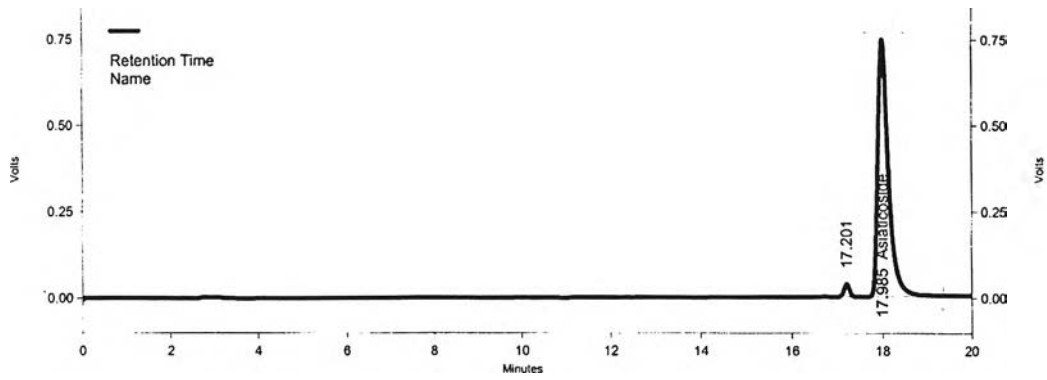
Figure 2 D Chromatogram of **asiaticoside** from fresh leaves of *C. asiatica*

Asiaticoside peak area 1720482 cm^2 and retention time 18149 for detector 220 nm.

External Standard Report

Asiaticoside

Method: C:\CLASS-VP\anne\methodAnne.met
Data File: C:\CLASS-VP\anne\A1\Asiaticoside.stand.0.08-3
User: **Suvipha**
Acquired: 4/11/02 10:27:00 PM
Printed: 4/18/02 3:38:36 PM



Detector A - 1
(220nm)

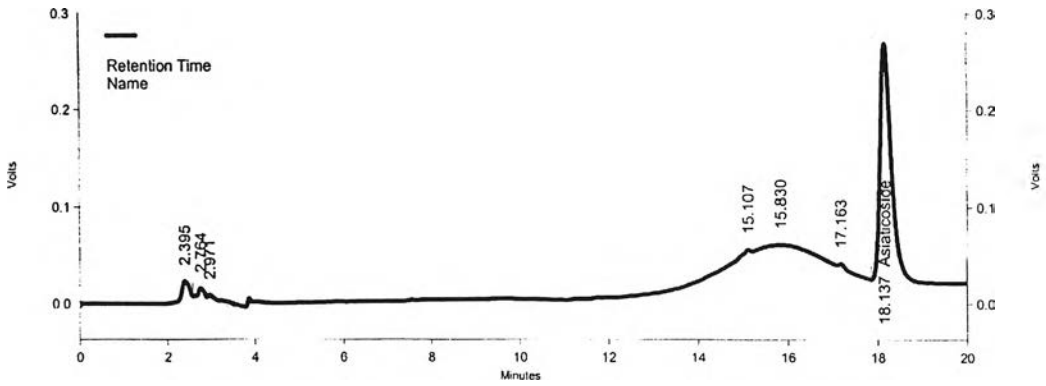
Pk #	Retention Time	Name	Area	ESTD concentration
2	17.985	Asiaticoside	12038078	0.080 CAL
Totals			12038078	0.080 CAL

Figure 2E The authentic **asiaticoside** for concentration 0.080 g/ml.

External Standard Report

Asiaticoside (Standard 0.08,1)

Method: C:\CLASS-VP\anne\methodAnne.met
Data File: C:\CLASS-VP\anne\Suvipha\Franz.Cenf1.72h
User: **Suvipha**
Acquired: 4/11/02 5:07:31 PM
Printed: 4/12/02 10:19:25 PM



Detector A - 1
(220nm)

Pk #	Retention Time	Name	Area	ESTD concentration
7	18.137	Asiaticoside	4416637	0.047
Totals			4416637	0.047

Figure 2 F Chromatogram of **asiaticoside** from fresh *C. asiatica* leaves.

The purified **asiaticoside** in microemulsion gel occurred in the retention time 18.137 with peak area 4416637 cm^2 and the concentration 0.047 g/ml. Present for the detector 220 nm. Compaired with authentic **asiaticoside** 0.08 g/ml for concentration in figure 2E.

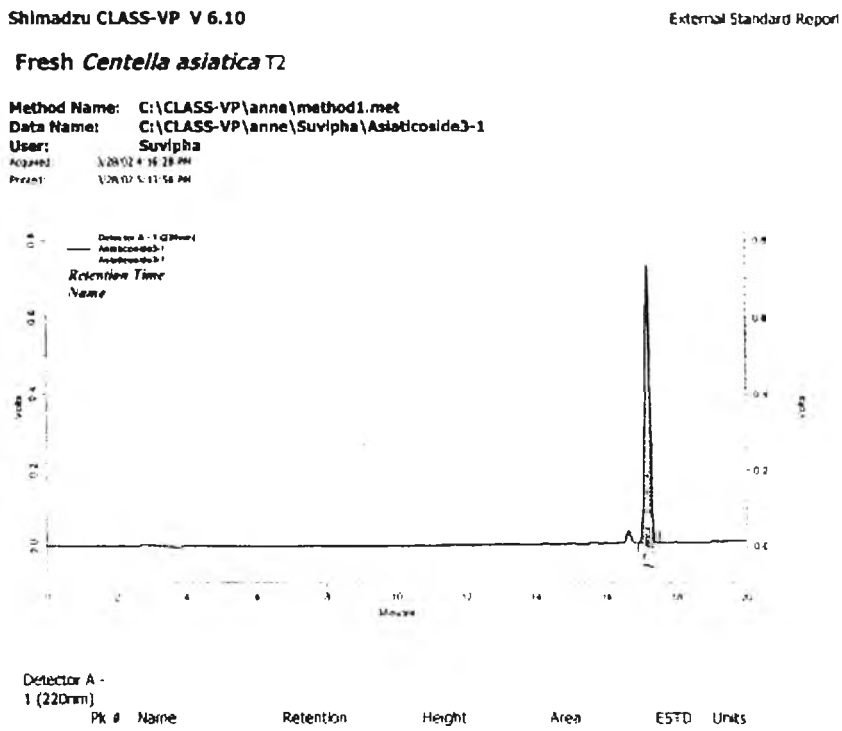


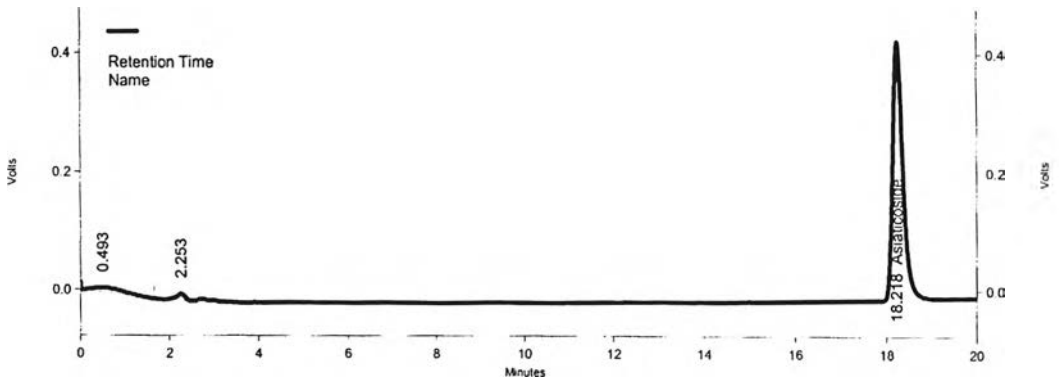
Figure 2 G Chromatogram of standard purified **asiaticoside**

58

External Standard Report

Asiaticoside

Method: C:\CLASS-VP\anne\methodAnne.met
Data File: C:\CLASS-VP\anne\Suvipha\8.dat
User: **Suvipha**
Acquired: 4/1/02 3:58:40 AM
Printed: 5/5/02 6:34:41 PM



Detector A - 1 (220nm)

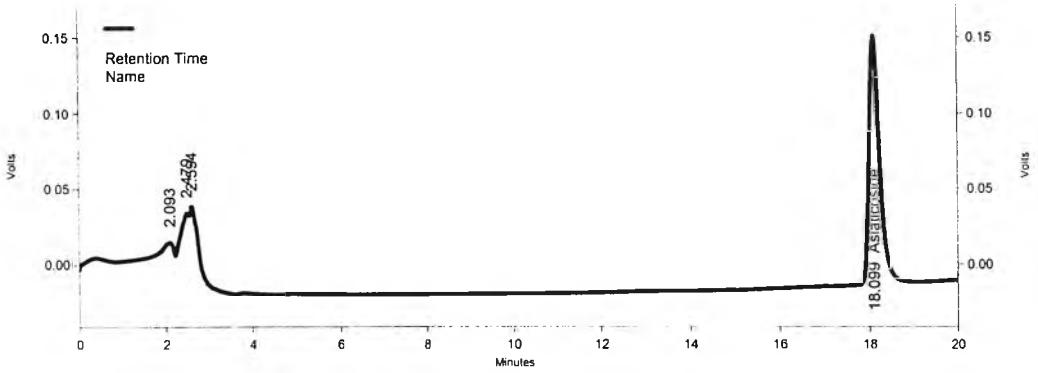
Pk #	Retention Time	Name	Area
3	18.218	Asiaticoside	6769615
Totals			6769615

Figure 2H Chromatogram of **asiaticoside** from fresh ***C.asiatica*** leaves extract.

External Standard Report

Asiaticoside

Method: C:\CLASS-VP\anne\methodAnne.met
Data File: C:\CLASS-VP\anne\Suvipha\6.dat
User: **Suvipha**
Acquired: 4/1/02 4:21:51 AM
Printed: 5/5/02 6:39:29 PM



Detector A - 1 (220nm)

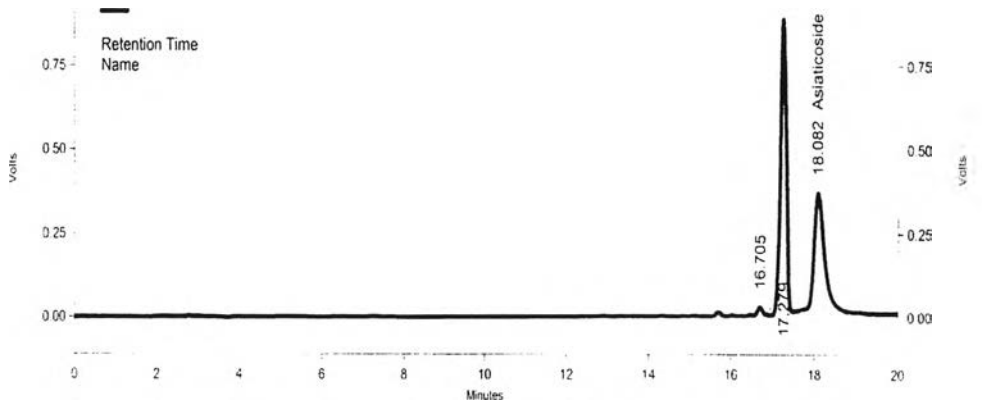
Pk #	Retention Time	Name	Area
4	18.099	Asiaticoside	2694672
Totals			2694672

Figure 2 I Chromatogram of **asiaticoside** from fresh *C. asiatica* leaves in microemulsion gel formula 3

External Standard Report

Asiaticoside from fresh *Centella asiatica* in microemulsion gel (formula6) for 72 hrs. in Franz diffusion cell

Method: C:\CLASS-VP\anne\methodAnne.met
Data File: C:\CLASS-VP\anne\Suvipha\Asiaticoside.s
User: **Suvipha**
Acquired: 4/11/02 11:28:03 PM
Printed: 4/16/02 7:55:00 AM



Detector A - 1
(220nm)

Pk #	Retention Time	Name	Area	ESTD concentration
3	18.082	Asiaticoside	6980365	0.057
Totals			6980365	0.057

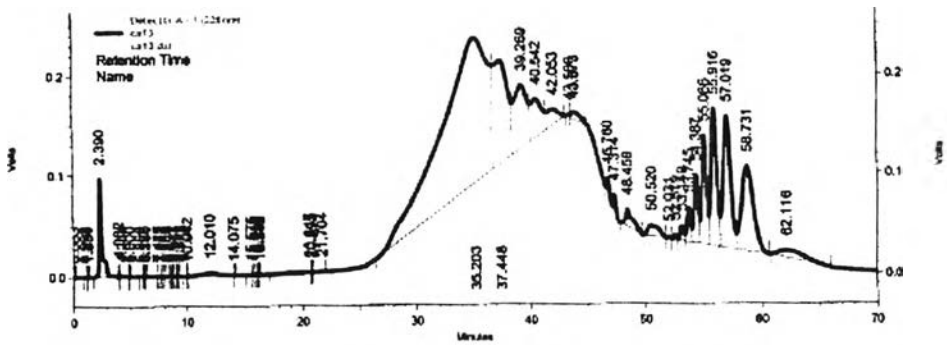
Figure 2 J; Chromatogram of **asiaticoside** from fresh ***C. asiatica*** leaves in microemulsion gel formula 6

The **asiaticoside** from fresh ***C. asiatica*** leaves in microemulsion gel formula 6 for 72 hr. in Franz diffusion cell. The retention time = 18.082 minutes, peak area = 6980365 cm^2. This formula is quite well for the penetration result that is = 0.057 g. /ml.for concentration of **asiaticoside**.

External Standard Report

Asiaticoside

Method: C:\CLASS-VP\anne\methodAnne.met
Data File: C:\CLASS-VP\anne\ca13.dat
User: Suvipha
Acquired: 1/25/02 10:01:29 PM
Printed: 4/18/02 2:55:53 PM



External Standard Report

Asiaticoside

Method: C:\CLASS-VP\anne\methodAnne.met
Data File: C:\CLASS-VP\anne\ca13.dat
User: Suvipha
Acquired: 1/25/02 10:01:29 PM
Printed: 4/18/02 2:55:53 PM

Figure 2K Chromatogram of **asiaticoside** from crude extract from drug store in formula 1

Microemulsion gel of *C. asiatica* from drug store which is undetectable for skin prenetration with Franz diffusion cell.

APPENDIX III

LOW AND HIGH RESOLUTION LC-MS WITH ELECTROSPRAY IONIZATION

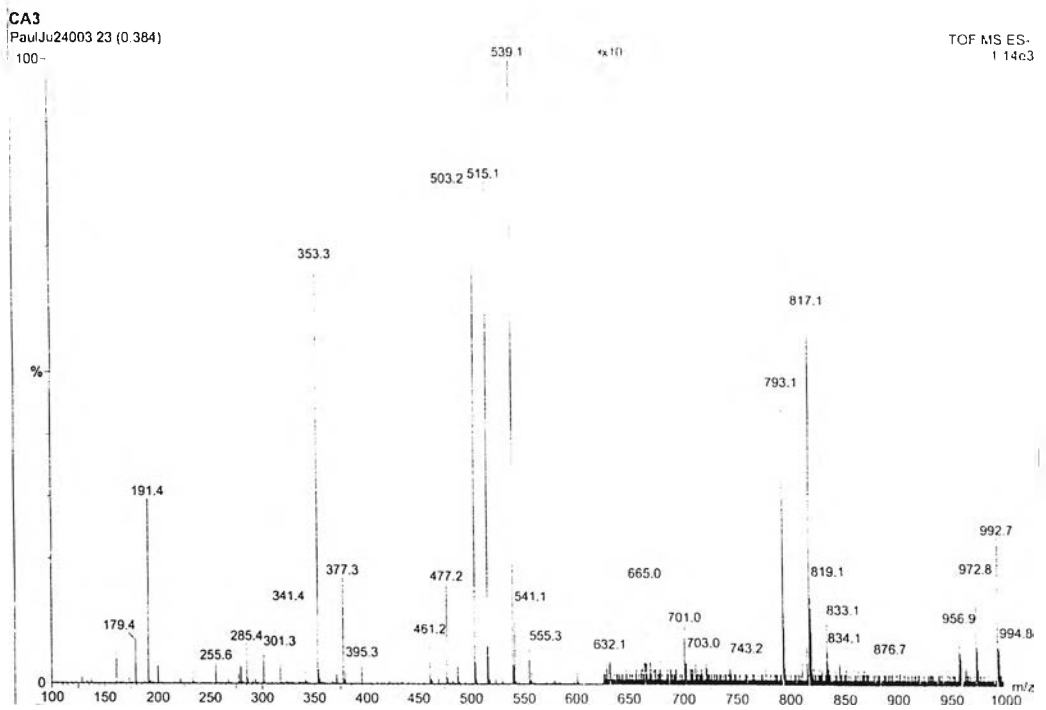


Figure 3 A Low resolution LC-MS with electrospray ionization of ***C. asiatica*** fresh leaves.

Asiaticoside in low resolution is 956.9 when compaired with authentic 957.13 $\pm$ 5%

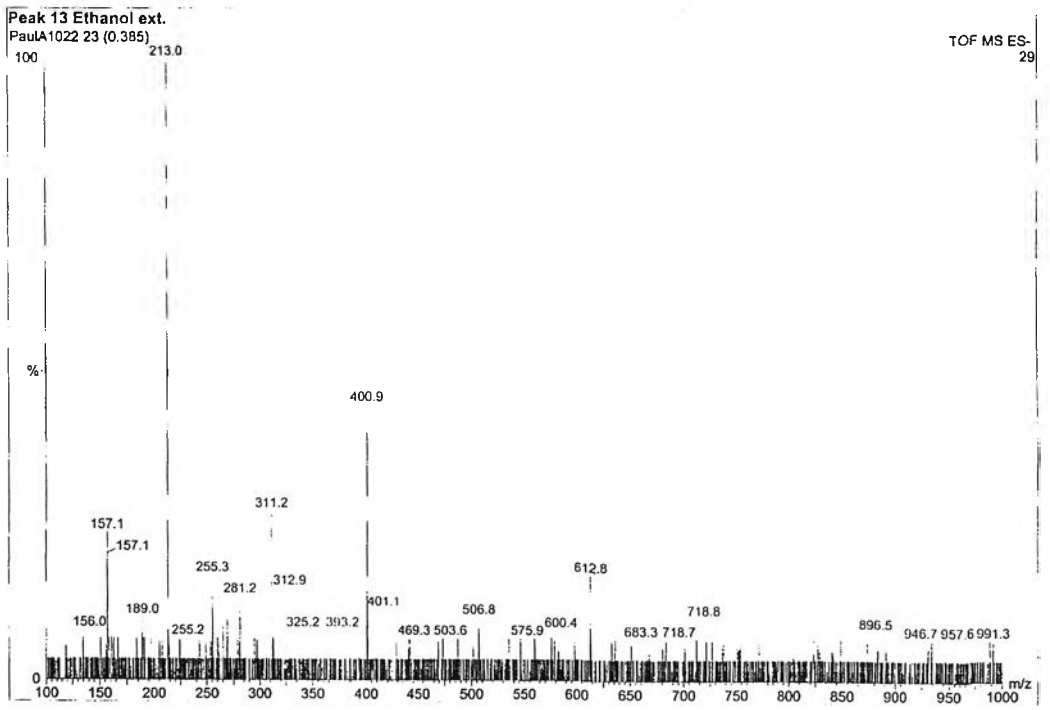


Figure 3 B Low resolution LC-MS with electrospray ionization of ***C. asiatica*** in ethanol extract.

Asiaticoside can found in ethanol with MW = 957.6 (authentic asiaticoside, MW is = 957.13± 5%

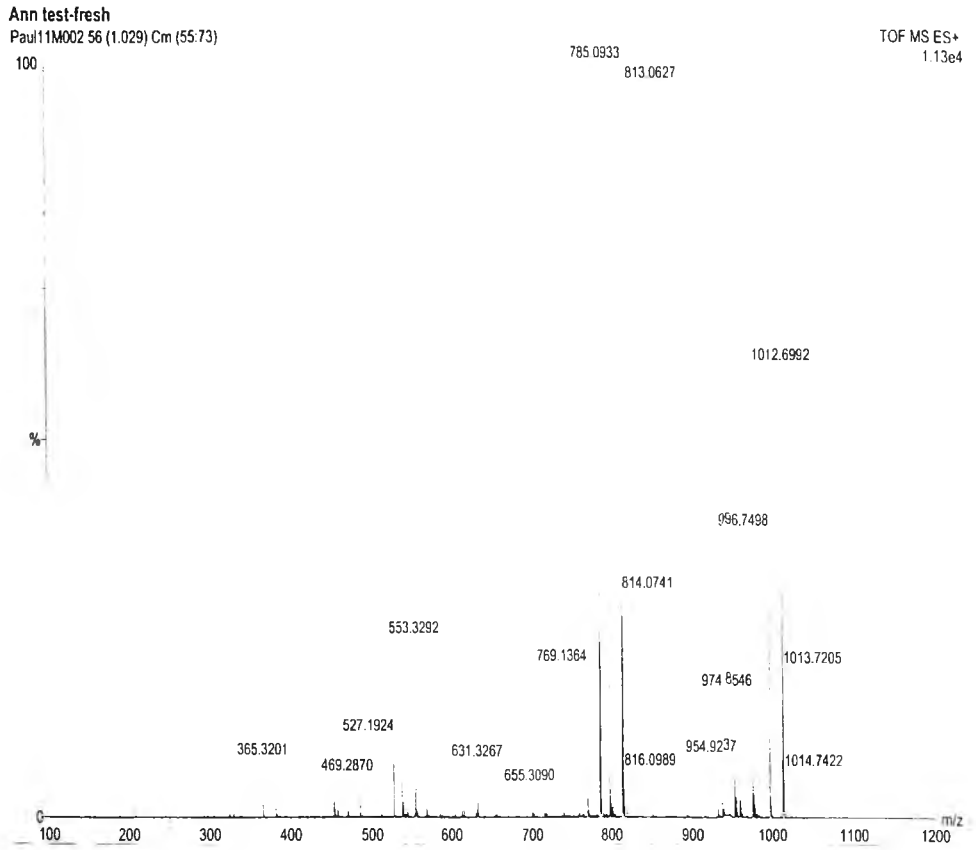


Figure 3C High resolution LC-MS with electrospray ionization of ***C. asiatica*** fresh leaves.

For high resolution we can get **asiaticoside** with Na^{+} for the molecular weight of Na = 23 and **asiaticoside** is 959.13±5%

APPENDIX IV

VISCOSITY OF MICROEMULSION GEL

Table 4 A Viscosity of **asiaticoside** in microemulsion gel for formula 1

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-471042

Operator: Suvipha Sample: Asiaticoside1fo1

Date: 04-04-2002 Time: 17:11:44

Method: Interactive Viscometer: H2

Spindle: ASTM 7 Version: Rheologic 1.0

Data Points. Page: 1

Reading no.	Shear Rate s-1	Shear Stress Nm^-2 x E-07	Viscosity mPas	Time s	% Torque	Temp C	Speed R.P.M.
1	100.00	117,667.20	1,176.67	1.43	0.37	24.98	100.00
2	100.00	141,673.60	1,416.74	2.91	0.44	24.91	100.00
3	100.00	129,670.40	1,296.70	4.39	0.41	24.91	100.00
4	100.00	129,670.40	1,296.70	5.88	0.41	24.91	100.00
5	100.00	129,670.40	1,296.70	7.36	0.41	24.91	100.00
6	100.00	129,670.40	1,296.70	8.84	0.41	24.91	100.00
7	100.00	129,670.40	1,296.70	10.27	0.41	24.91	100.00
8	100.00	129,670.40	1,296.70	11.70	0.41	24.91	100.00
9	100.00	129,670.40	1,296.70	13.13	0.41	24.91	100.00
10	100.00	117,667.20	1,176.67	14.56	0.37	24.91	100.00
11	100.00	117,667.20	1,176.67	15.98	0.37	24.91	100.00
12	100.00	117,667.20	1,176.67	17.41	0.37	24.91	100.00
13	100.00	117,667.20	1,176.67	18.84	0.37	24.91	100.00
14	100.00	105,664.00	1,056.64	20.27	0.33	24.91	100.00
15	100.00	105,664.00	1,056.64	21.70	0.33	24.91	100.00
16	100.00	105,664.00	1,056.64	23.12	0.33	24.91	100.00
17	100.00	105,664.00	1,056.64	24.55	0.33	24.91	100.00
18	100.00	105,664.00	1,056.64	25.98	0.33	24.91	100.00
19	100.00	105,664.00	1,056.64	27.41	0.33	24.91	100.00
20	100.00	105,664.00	1,056.64	28.84	0.33	24.91	100.00
21	100.00	105,664.00	1,056.64	30.26	0.33	24.91	100.00
22	100.00	105,664.00	1,056.64	31.69	0.33	24.91	100.00
23	100.00	105,664.00	1,056.64	33.12	0.33	24.91	100.00
24	100.00	105,664.00	1,056.64	34.55	0.33	24.83	100.00
25	100.00	105,664.00	1,056.64	35.98	0.33	24.83	100.00
26	100.00	105,664.00	1,056.64	37.46	0.33	24.83	100.00
27	100.00	105,664.00	1,056.64	38.94	0.33	24.83	100.00
28	100.00	105,664.00	1,056.64	40.43	0.33	24.83	100.00
29	100.00	105,664.00	1,056.64	41.91	0.33	24.83	100.00
30	100.00	105,664.00	1,056.64	43.39	0.33	24.83	100.00
31	100.00	105,664.00	1,056.64	44.87	0.33	24.83	100.00
32	100.00	105,664.00	1,056.64	46.36	0.33	24.83	100.00
33	100.00	105,664.00	1,056.64	47.84	0.33	24.83	100.00
34	100.00	105,664.00	1,056.64	49.32	0.33	24.83	100.00
35	100.00	105,664.00	1,056.64	50.81	0.33	24.83	100.00
36	100.00	105,664.00	1,056.64	52.29	0.33	24.83	100.00
37	100.00	105,664.00	1,056.64	53.77	0.33	24.83	100.00

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-471042

Operator: Suvipha Sample: Asiaticoside1fo1

Date: 04-04-2002 Time: 17:11:44

Table 4B Viscosity of **asiaticoside** in microemulsion gel for formula 2

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-4710

Operator: Suvipha Sample: Asiaticoside.fo2

Date: 04-04-2002 Time: 18:24:03

Method: Interactive Viscometer: H2

Spindle: ASTM 7 Version: Rheologic 1.0

Data Points. Page: 1

Reading no.	Shear Rate s-1	Shear Stress Nm^-2 x E-07	Viscosity mPas	Time s	% Torque	Temp C	Speed R.P.M.
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	100.00	7,163,545.60	71,635.46	4.77	22.39	24.46	100.00
3	100.00	4,366,800.00	43,668.00	10.20	13.65	24.39	100.00
4	100.00	3,766,640.00	37,666.40	15.64	11.77	24.39	100.00
5	100.00	3,490,566.40	34,905.66	21.08	10.91	24.46	100.00
6	100.00	3,106,464.00	31,064.64	26.52	9.71	24.46	100.00
7	100.00	2,806,384.00	28,063.84	31.96	8.77	24.46	100.00
8	100.00	2,614,332.80	26,143.33	37.39	8.17	24.46	100.00
9	100.00	2,434,284.80	24,342.85	42.83	7.61	24.46	100.00
10	100.00	2,338,259.20	23,382.59	48.32	7.31	24.46	100.00
11	100.00	2,134,204.80	21,342.05	53.82	6.67	24.46	100.00
12	100.00	1,966,160.00	19,661.60	59.25	6.14	24.46	100.00
13	100.00	1,786,112.00	17,861.12	64.69	5.58	24.46	100.00
14	100.00	1,630,070.40	16,300.70	70.13	5.09	24.46	100.00
15	100.00	1,474,028.80	14,740.29	75.57	4.61	24.46	100.00
16	100.00	1,366,000.00	13,660.00	81.00	4.27	24.46	100.00
17	100.00	1,245,968.00	12,459.68	86.44	3.89	24.46	100.00
18	100.00	1,137,939.20	11,379.39	91.93	3.56	24.46	100.00
19	100.00	1,053,916.80	10,539.17	97.43	3.29	24.46	100.00
20	100.00	981,897.60	9,818.98	102.86	3.07	24.46	100.00
21	100.00	10,248,368.00	102,483.68	108.30	32.03	24.46	100.00
22	100.00	19,154,742.40	191,547.42	113.74	59.86	24.46	100.00
23	100.00	18,326,521.60	183,265.22	119.18	57.27	24.46	100.00
24	100.00	18,482,563.20	184,825.63	124.61	57.76	24.46	100.00
25	100.00	18,482,563.20	184,825.63	130.05	57.76	24.46	100.00

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-4710

Operator: Suvipha Sample: Asiaticoside.fo2

Date: 04-04-2002 Time: 18:24:03

Table 4C Viscosity of **asiaticoside** in microemulsion gel for formula 3

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-471042

Operator: Suvipha Sample: Cenofo3

Date: 04-04-2002 Time: 22:34:59

Method: Interactive Viscometer: H2

Spindle: ASTM 7 Version: Rheologic 1.0

Data Points. Page: 1

Reading no.	Shear Rate s-1	Shear Stress Nm^-2 x E-07	Viscosity mPas	Time s	% Torque	Temp C	Speed R.P.M.
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	100.00	165,680.00	1,656.80	5.49	0.52	26.10	100.00
3	100.00	153,676.80	1,536.77	10.93	0.48	26.10	100.00
4	100.00	153,676.80	1,536.77	16.37	0.48	26.10	100.00
5	100.00	165,680.00	1,656.80	21.81	0.52	26.10	100.00
6	100.00	165,680.00	1,656.80	27.24	0.52	26.10	100.00
7	100.00	165,680.00	1,656.80	32.68	0.52	26.10	100.00
8	100.00	165,680.00	1,656.80	38.12	0.52	26.10	100.00
9	100.00	165,680.00	1,656.80	43.61	0.52	26.10	100.00
10	100.00	153,676.80	1,536.77	49.10	0.48	26.10	100.00
11	100.00	153,676.80	1,536.77	54.60	0.48	26.10	100.00

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-471042

Operator: Suvipha Samole: Cenofo3

Table 4D Viscosity of **asiaticoside** in microemulsion gel for formula 4

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-47104

Operator: SSSSS Sample: CENFO4

Date: 04-04-2002 Time: 16:14:46

Method: Interactive Viscometer: H2

Spindle: ASTM 7 Version: Rheologic 1.0

Data Points. Page: 1

Reading no.	Shear Rate s-1	Shear Stress Nm^-2 x E-07	Viscosity mPas	Time s	% Torque	Temp C	Speed R.P.M.
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	100.00	1,654,076.80	16,540.77	0.79	5.17	24.83	100.00
3	100.00	4,486,832.00	44,868.32	2.22	14.02	24.83	100.00
4	100.00	6,083,257.60	60,832.58	3.65	19.01	24.83	100.00
5	100.00	6,455,356.80	64,553.57	5.08	20.17	24.83	100.00
6	100.00	6,275,308.80	62,753.09	6.51	19.61	24.83	100.00
7	100.00	6,023,241.60	60,232.42	7.93	18.82	24.83	100.00
8	100.00	5,807,184.00	58,071.84	9.36	18.15	24.83	100.00
9	100.00	5,699,155.20	56,991.55	10.79	17.81	24.83	100.00
10	100.00	5,639,139.20	56,391.39	12.22	17.62	24.83	100.00
11	100.00	5,555,116.80	55,551.17	13.65	17.36	24.83	100.00
12	100.00	5,483,097.60	54,830.98	15.07	17.13	24.83	100.00
13	100.00	5,603,129.60	56,031.30	16.50	17.51	24.83	100.00
14	100.00	5,675,148.80	56,751.49	17.93	17.73	24.83	100.00
15	100.00	5,615,132.80	56,151.33	19.36	17.55	24.83	100.00
16	100.00	5,471,094.40	54,710.94	20.84	17.10	24.83	100.00
17	100.00	5,363,065.60	53,630.66	22.32	16.76	24.83	100.00
18	100.00	5,135,004.80	51,350.05	23.81	16.05	24.83	100.00
19	100.00	4,858,931.20	48,589.31	25.29	15.18	24.83	100.00
20	100.00	5,351,062.40	53,510.62	26.77	16.72	24.83	100.00
21	100.00	5,723,161.60	57,231.62	28.26	17.88	24.83	100.00
22	100.00	5,699,155.20	56,991.55	29.74	17.81	24.83	100.00
23	100.00	5,615,132.80	56,151.33	31.22	17.55	24.83	100.00
24	100.00	5,483,097.60	54,830.98	32.70	17.13	24.83	100.00
25	100.00	5,327,056.00	53,270.56	34.19	16.65	24.83	100.00
26	100.00	5,219,027.20	52,190.27	35.67	16.31	24.83	100.00
27	100.00	5,110,998.40	51,109.98	37.15	15.97	24.83	100.00
28	100.00	5,002,969.60	50,029.70	38.64	15.63	24.83	100.00
29	100.00	4,870,934.40	48,709.34	40.12	15.22	24.83	100.00
30	100.00	4,786,912.00	47,869.12	41.60	14.96	24.83	100.00
31	100.00	4,726,896.00	47,268.96	43.03	14.77	24.83	100.00
32	100.00	4,690,886.40	46,908.86	44.46	14.66	24.83	100.00
33	100.00	4,642,873.60	46,428.74	45.89	14.51	24.83	100.00
34	100.00	4,606,864.00	46,068.64	47.32	14.40	24.83	100.00
35	100.00	4,558,851.20	45,588.51	48.74	14.25	24.83	100.00
36	100.00	4,522,841.60	45,228.42	50.17	14.13	24.83	100.00
37	100.00	4,486,832.00	44,868.32	51.60	14.02	24.83	100.00
38	100.00	4,450,822.40	44,508.22	53.03	13.91	24.83	100.00
39	100.00	4,414,812.80	44,148.13	54.46	13.80	24.83	100.00
40	100.00	4,378,803.20	43,788.03	55.88	13.68	24.83	100.00
41	100.00	4,354,796.80	43,547.97	57.31	13.61	24.83	100.00
42	100.00	4,390,806.40	43,908.06	58.74	13.72	24.83	100.00
43	100.00	4,426,816.00	44,268.16	60.17	13.83	24.83	100.00
44	100.00	4,438,819.20	44,388.19	61.60	13.87	24.83	100.00

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-47104

Operator: SSSSS Sample: CENFO4

Table 4E Viscosity of **asiaticoside** in microemulsion gel for formula 5

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-471042

Operator: Suvipha Sample: Asiaticoside.fo5

Date: 04-04-2002 Time: 22:52:30

Method: Interactive Viscometer: H2

Spindle: ASTM 7 Version: Rheologic 1.0

Data Points. Page: 1

Reading no.	Shear Rate s-1	Shear Stress Nm^-2 x E-07	Viscosity mPas	Time s	% Torque	Temp C	Speed R.P.M.
1	100.00	381,737.60	3,817.38	4.98	1.19	24.98	100.00
2	100.00	381,737.60	3,817.38	10.47	1.19	24.98	100.00
3	100.00	381,737.60	3,817.38	15.96	1.19	24.98	100.00
4	100.00	369,734.40	3,697.34	21.40	1.16	24.98	100.00
5	100.00	345,728.00	3,457.28	26.84	1.08	24.98	100.00
6	100.00	333,724.80	3,337.25	32.28	1.04	25.06	100.00
7	100.00	309,718.40	3,097.18	37.71	0.97	25.06	100.00
8	100.00	285,712.00	2,857.12	43.15	0.89	25.06	100.00
9	100.00	249,702.40	2,497.02	48.59	0.78	24.98	100.00
10	100.00	225,696.00	2,256.96	54.08	0.71	24.98	100.00

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-471042

Operator: Suvipha Sample: Asiaticoside.fo5

Date: 04-04-2002 Time: 22:52:30

Method: Interactive Viscometer: H2

Spindle: ASTM 7 Version: Rheologic 1.0

Data Points. Page: 1

Table 4F Viscosity ot **asiaticoside** in microemulsion gel for formula 6

Rheologic Data Output Rheology International Shannon Ltd. Tel: +353-61-471632 Fax: +353-61-4710

Operator:	Suvipha	Sample:	Cen.fo6
Date:	04-04-2002	Time:	23:33:29
Method:	Interactive	Viscometer:	H2
Spindle:	ASTM 7	Version:	Rheologic 1.0

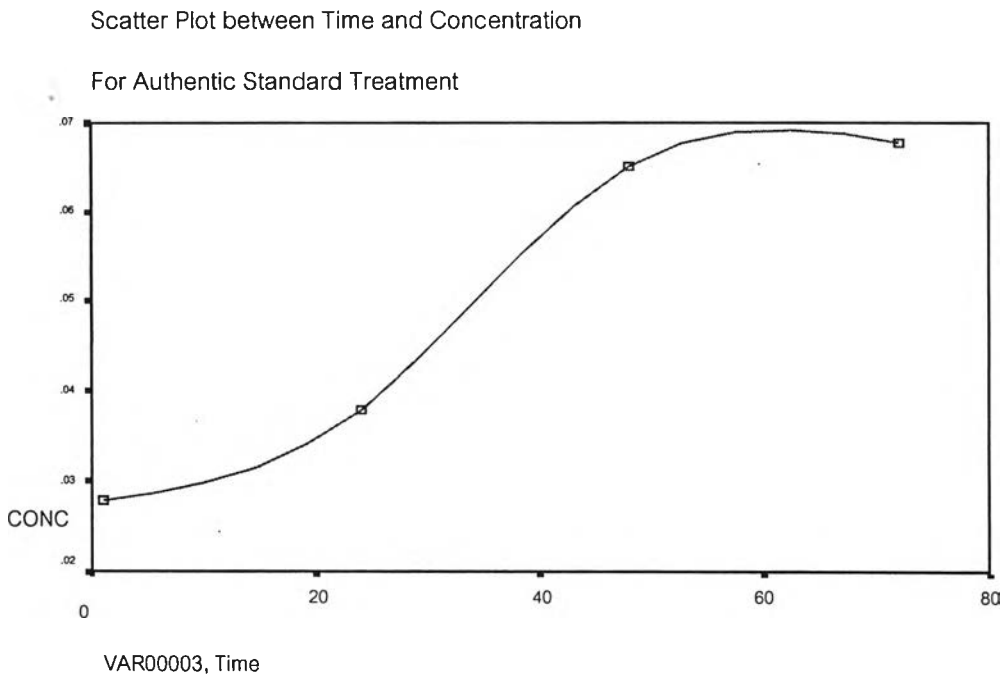
Data Points. Page: 1

Reading no.	Shear Rate s-1	Shear Stress Nm^-2 x E-07	Viscosity mPas	Time s	% Torque	Temp C	Speed R.P.M.
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	100.00	3,430,550.40	34,305.50	5.14	10.72	24.46	100.00
3	100.00	3,430,550.40	34,305.50	10.52	10.72	24.46	100.00
4	100.00	2,746,368.00	27,463.68	15.96	8.58	24.46	100.00
5	100.00	2,338,259.20	23,382.59	21.40	7.31	24.46	100.00
6	100.00	2,122,201.60	21,222.02	26.84	6.63	24.46	100.00
7	100.00	2,014,172.80	20,141.73	32.27	6.29	24.46	100.00
8	100.00	1,894,140.80	18,941.41	37.77	5.92	24.46	100.00
9	100.00	1,798,115.20	17,981.15	43.26	5.62	24.46	100.00
10	100.00	1,714,092.80	17,140.93	48.75	5.36	24.46	100.00
11	100.00	1,618,067.20	16,180.67	54.19	5.06	24.46	100.00
12	100.00	1,546,048.00	15,460.48	59.63	4.83	24.46	100.00

APPENDIX V

STATISTIC FOR PERMEABILITY STUDY

Statistic Analysis



Dependent variable.. CONC **Independent variable: TIME**

Method.. QUADRATI

R Square	.92944
Adjusted R Square	.78833
Standard Error	.00909

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	.00108804	.00054402
Residuals	1	.00008259	.00008259

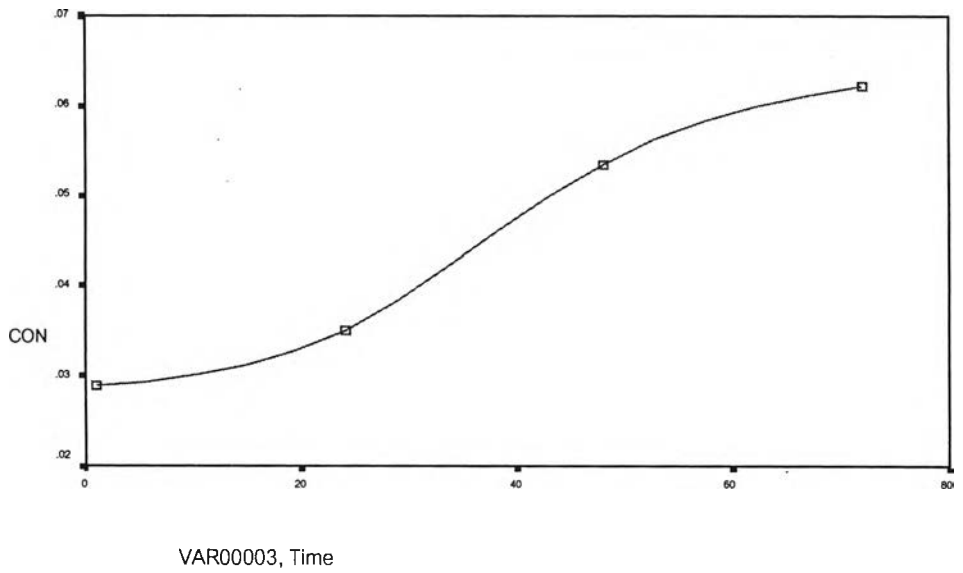
F = 6.58662 Signif F = .2656

---------- **Variables in the Equation** ----------

Variable	B	SE B	Beta	T	Sig T
VAR00003	.000886	.000619	1.372266	1.430	.8471
VAR00003**2	-3.67108125E-06	8.1427E-06	.432563	-.451	.9326
(Constant)	.024988	.009268		2.696	.8065

Scatter Plot between Time and Concentration

For Formula 1



Dependent variable.. CONC Independent variable: TIME

Method.. QUADRATI

R Square	.96836
Adjusted R Square	.90507
Standard Error	.00481

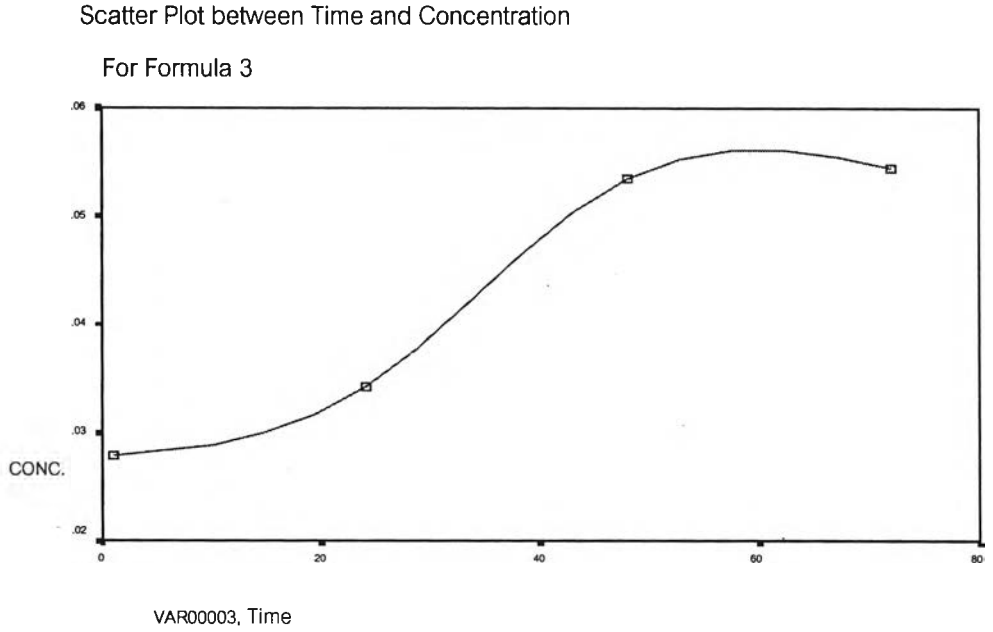
Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	.00070856	.00035428
Residuals	1	.00002315	.00002315

F = 15.30067 Signif F = .1779

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
VAR00003	.000438	.000328	.858885	1.337	.8522
VAR00003**2	8.69425312E-07	4.3113E-06	.129577	.202	.9683
(Constant)	.027352	.004907		5.574	.7783



Dependent variable.. CONC Independent variable: TIME

Method.. QUADRATI

R Square	.91551
Adjusted R Square	.74652
Standard Error	.00677

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	.00049691	.00024845
Residuals	1	.00004586	.00004586

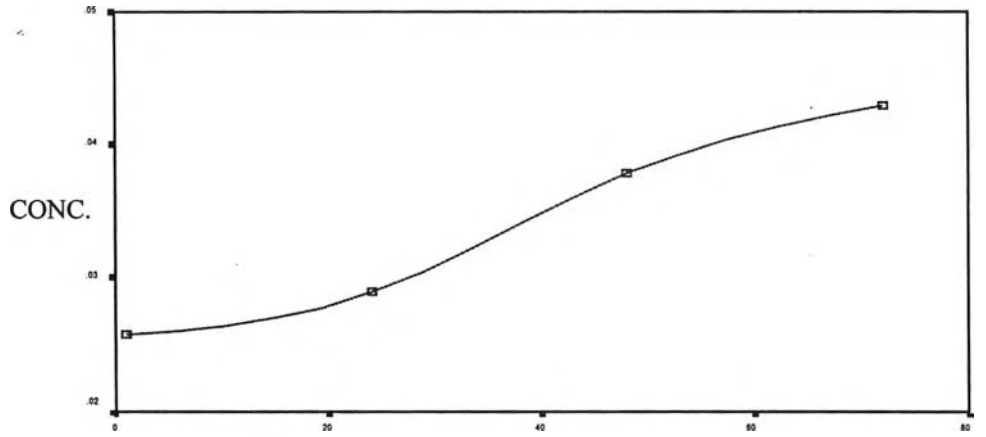
F = 5.41770 Signif F = .2907

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
VAR00003	.000612	.000462	1.392218	1.326	.8528
VAR00003**2	-2.67008718E-06	6.0675E-06	-.462045	-.440	.9340
(Constant)	.025803	.006906		3.736	.7916

Scatter Plot between Time and Concentration

for Formula 6



VAR00003, Time

Dependent variable.. CONC **Method.. QUADRATI**

R Square	.97728
Adjusted R Square	.93184
Standard Error	.00207

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	.00018404	.00009202
Residuals	1	.00000428	.00000428

F = 21.50832 Signif F = .1507

---------- **Variables in the Equation** ----------

Variable	**B**	**SE B**	**Beta**	**T**	**Sig T**
VAR00003	.000199	.000141	.770401	1.415	.8479
VAR00003**2	7.65899931E-07	1.8532E-06	.225004	.413	.9376
(Constant)	.025041	.002109		11.871	.7634

Comparative R^2 in microemulsion gel

1) Authentic **asiaticoside**

   Conc = $0.024988 + 0.006886*time + -3.67108125 \times 10^{-6}*time^2$

   R^2 = 0.92944

2) Microemulsion gel Formula 1

   Conc = $0.027352 + 0.00438*time + 8.69425312 \times 10^{-7}*time^2$

   R^2 = 0.96836

3) Microemulsion gel Formula 6

   Conc = $0.025041 + 0.000199*time + 7.6559993 \times 10^{-7}*time^2$

   R^2 = 0.97728

4) Microemulsion gel Formula 3

   Conc = $0.025803 + 0.000612*time + 2.6700817 \times 10^{-6}*time^2$

   R^2 = 0.91551

As the statistic analysis can conclude the flux rate of **asiaticoside** in microemulsion gel formula 1 is the best formula when compared with other formulations.

VITA

Mrs. Suvipha Sermboonsang was born on June 7, 1957 in Bangkok, Thailand. She received her Bachelor Degree of Science from Kasetsart University, Bangkok, Thailand in 1982. After graduation, she had worked in Department of Medical Professional Product, Johnson & Johnson (Thailand) Ltd., during 1982 –1986; and Organics Department, East Asiatic Company Ltd. (Thailand), during 1986-1990. Then she worked as the director of Research and Development, Cosmetic Department of CNN International Co. Ltd., during 1996-2000 before enrolling the Master's Degree in Pharmaceutical Technology (International) Program, Faculty of Pharmaceutical Sciences, at Chulalongkorn University.