APPENDIX

APPENDIX A THE CALIBRATION CURVE AND CHROMATOGRAMS

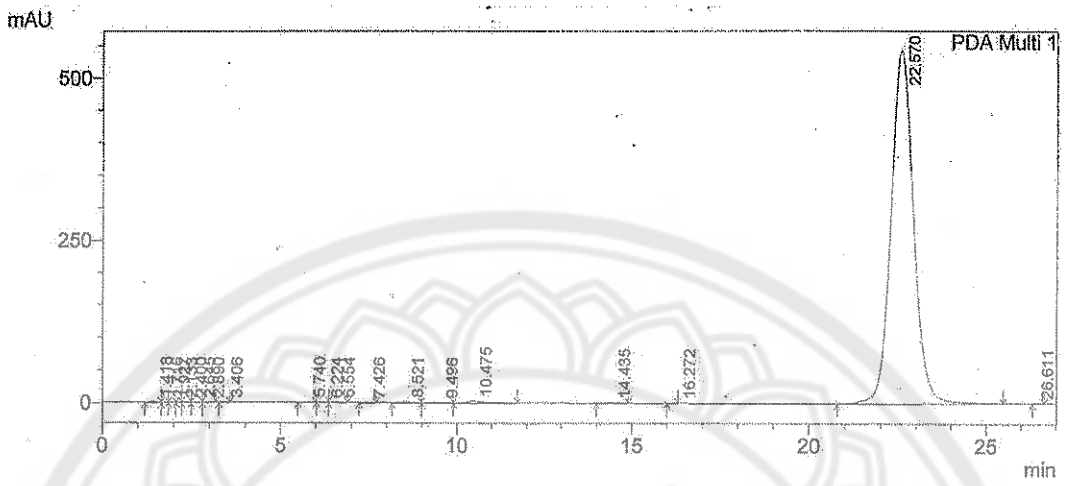


Figure 42 The HPLC chromatogram of artocarpin standard of 0.2 mg/mL.

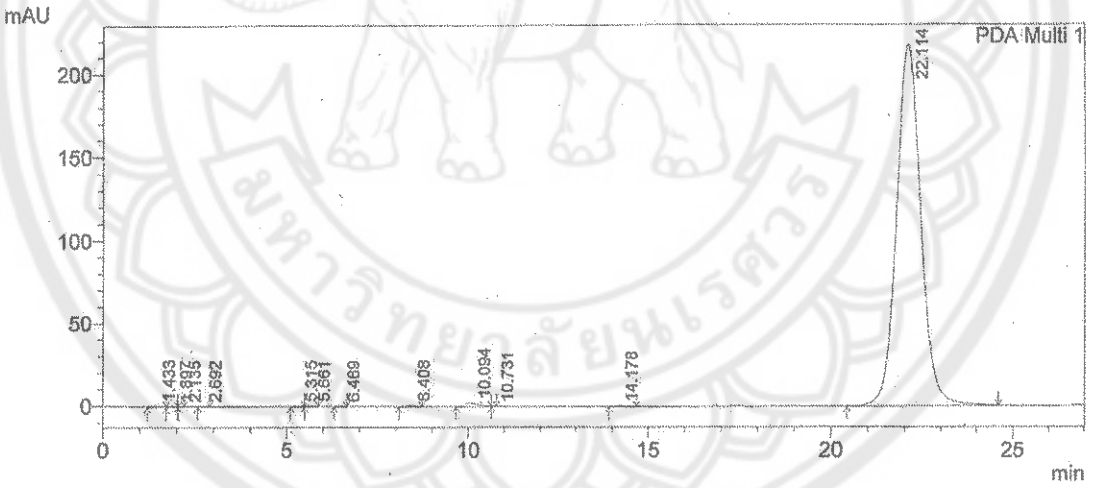


Figure 43 The HPLC chromatogram of artocarpin standard of 0.04 mg/mL.

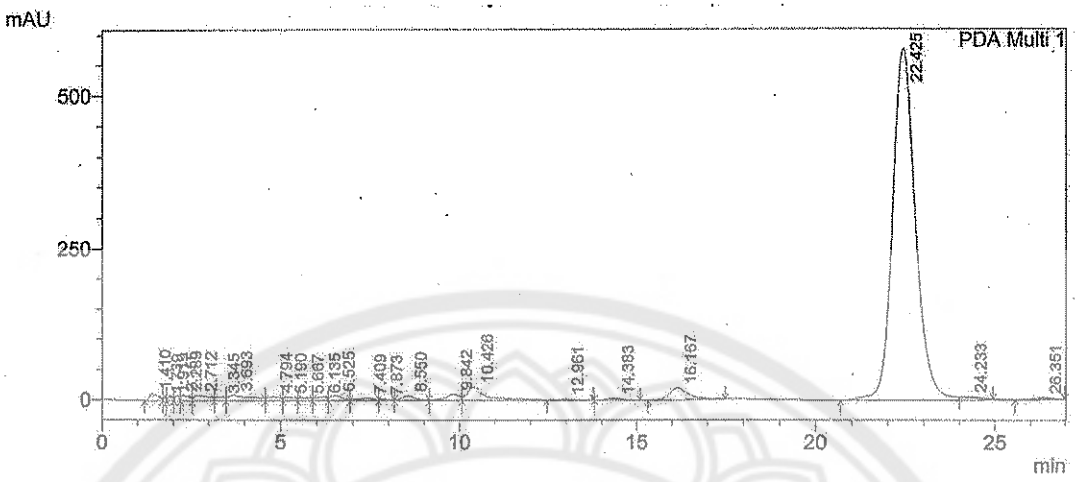


Figure 44 The HPLC chromatogram of *A. incisus* extract.

Table 8 The peak areas of artocarpin at various concentrations of artocarpin standard regarding to the absorbance at wavelength of 282 nm.

Artocarpin Conc. (mg/mL)	Absorbance of Peak Areas						Mean (SD)
	Sample No.1		Sample No.2		Sample No.3		
0.04	4862647	4862870	4851238	4850056	4840112	4870286	4856202 (11006)
0.08	9924699	9824561	10010195	9784231	9834523	9875642	9875642 (81446)
0.12	14219456	14265722	14804851	14346772	14007782	13950851	14265906 (304974)
0.16	18967894	18841557	18987967	19083791	18876798	18795841	18925641 (106757)
0.20	23698650	23736219	23801231	23783047	23576886	23851351	23741231 (96252)

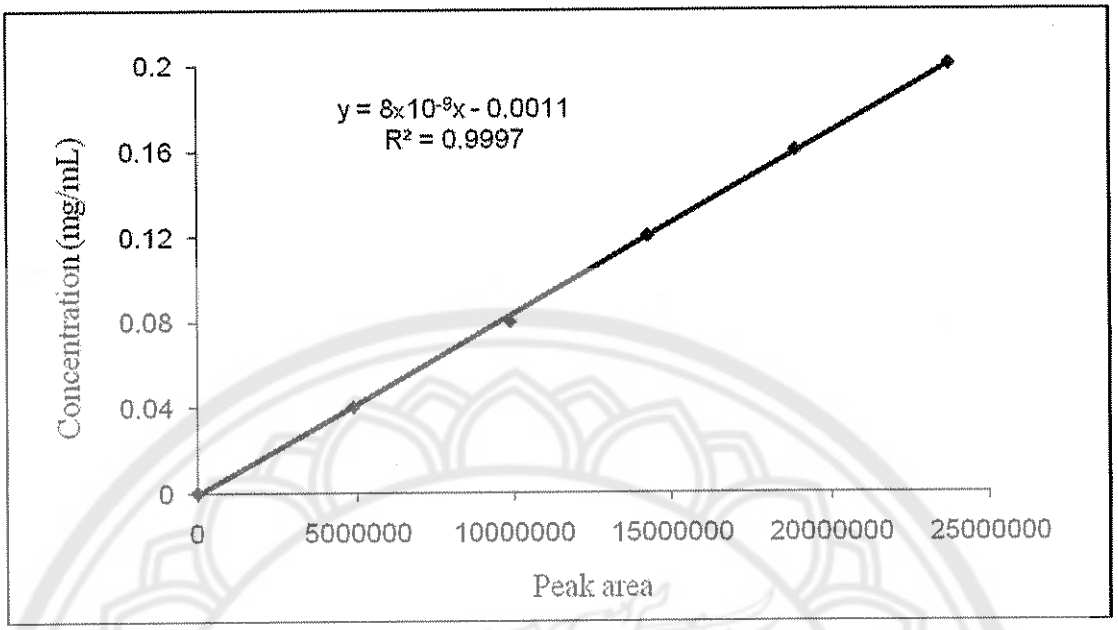


Figure 45 The calibration curve of artocarpin standard.

Where; y = Concentration (mg/ml)

x = Peak area

Table 9 The content of artocarpin contained in extract of *A. incisus's* heartwood.

Samples	Sample	Peak area	Artocarpin content (mg)	Mean of artocarpin content (mg±SD)
1.0 mg/mL of *A. incisus* extract	1	27858463	4.44	4.44±0.01
	2	27965892	4.45	
	3	27895648	4.44	
	4	28056471	4.47	

The calculation of artocarpin content of *A. incisus* extracts

Example:

The concentration (y) can be calculated by using the equation;

$$y = 8x10^{-9}(x) - 0.0011$$

If peak area of 0.5 mg/mL *A. incisus* extract is 27858463, therefore, the concentration is calculated as follow:

$$y = 8x10^{-9}(27858463) - 0.0011$$

$$y = 0.222$$

Therefore, Artocarpin content of 1.0 mg/mL *A. incisus* extract is calculated as follow:

$$= 0.222 \times 2$$

$$= 0.444$$

The methods of artocarpin content calculation are the following:

1. 1.0 mg/mL of the extract was prepared by dissolving 10.0 mg original weight of the extract with methanol. At this concentration, the extract provided the 0.444 mg/mL of artocarpin.

2. Then, to multiply the concentration with 10 mL, the final volume of the extract, therefore, the content of artocarpin contained in the extract of *A incisus*'s heartwood;

$$= 0.444 \text{ mg/mL} \times 10 \text{ mL}$$

$$= 4.44 \text{ mg}$$

3. The obtained artocarpin was calculated in the term of percent artocarpin content;

$$= (4.44 \text{ mg} / \text{original weight}) \times 100$$

$$= (4.44 \text{ mg} / 10 \text{ mg}) \times 100$$

$$= 44.4\% \text{ w/w}$$

APPENDIX B DETERMINATION OF CELL VIABILITY AND MELANIN CONTENT BY USING CELL CULTURE

Table 10 The cell number of time course study.

Time (day)	Cell number x 10^5			Mean ±SD
	Sample 1	Sample 2	Sample 3	
0	1.4	1.1	1.2	1.2 ±0.2
1	2.1	2.6	2.3	2.3±0.3
2	4.9	5.1	5.4	5.1±0.3
3	11.9	12.1	12.5	12.2±0.3
4	23.9	24.1	24.3	24.1±0.2
5	27.8	28.4	28.1	28.1±0.3
6	28.0	27.7	28.1	27.9±0.2
7	28.2	27.8	27.9	28.0±0.2

Table 11 The effect of *A. incisus* extract on cells number.

Sample	Day 1				Day 2				Day 3				Day 4			
	1	2	3	Mean (SD)	1	2	3	Mean (SD)	1	2	3	Mean (SD)	1	2	3	Mean (SD)
Control	2.39	2.42	2.35	2.39 (0.04)	5.24	5.08	5.38	5.23 (0.15)	14.93	14.84	14.67	14.81 (0.13)	24.78	24.69	24.83	24.77 (0.07)
10 µg/mL *A. incisus* extract	2.29	2.46	2.32	2.36 (0.09)	4.79	4.89	5.12	4.93 (0.17)	14.35	14.46	14.39	14.4 (0.06)	21.54	21.63	21.59	21.59 (0.05)
40 µg/mL *A. incisus* extract	1.76	1.81	1.92	1.83 (0.08)	4.23	4.31	4.39	4.31 (0.08)	12.84	12.92	12.76	12.84 (0.08)	20.97	20.83	20.76	20.85 (0.11)
100 µg/mL *A. incisus* extract	1.42	1.49	1.54	1.48 (0.06)	3.56	3.61	3.64	3.60 (0.04)	8.97	8.87	8.74	8.86 (0.12)	12.81	12.68	12.84	12.78 (0.09)

Table 12 The melanin content.

Sample	Absorbance (490 nm)			% melanin content			
	1	2	3	1	2	3	Mean (SD)
Control	0.119	0.124	0.121	100.0	100.0	100.0	100.0 (0.0)
100 µg/mL *A. incisus* extract	0.043	0.046	0.049	35.4	37.9	40.4	37.9 (2.5)
80 µg/mL *A. incisus* extract	0.049	0.045	0.053	40.4	37.1	43.7	40.4 (3.3)
40 µg/mL *A. incisus* extract	0.058	0.056	0.061	47.8	46.2	50.3	48.1 (2.1)
25 µg/mL *A. incisus* extract	0.091	0.084	0.089	75.0	69.2	73.4	72.5 (3.0)
15 µg/mL *A. incisus* extract	0.097	0.101	0.099	79.9	83.2	81.6	81.6 (1.6)
10 µg/mL *A. incisus* extract	0.106	0.102	0.109	87.4	84.1	89.8	87.1 (2.9)
100 µg/mL Kojic acid	0.044	0.049	0.04	35.4	37.9	40.4	36.5 (3.7)
80 µg/mL Kojic acid	0.049	0.052	0.054	40.4	37.1	43.7	41.2 (1.4)
60 µg/mL Kojic acid	0.051	0.058	0.049	47.8	46.2	50.3	43.4 (3.9)
40 µg/mL Kojic acid	0.067	0.071	0.076	75.0	69.2	73.4	58.8 (3.7)
25 µg/mL Kojic acid	0.087	0.083	0.089	79.9	83.2	81.6	71.2 (2.5)
15 µg/mL Kojic acid	0.103	0.106	0.098	87.4	84.1	89.8	84.3 (3.3)
10 µg/mL Kojic acid	0.111	0.108	0.104	35.4	37.9	40.4	89.6 (4.2)

APPENDIX C DETERMINATION OF ANTIOXIDANT ACTIVITY BY USING DPPH ASSAY

Table 13 The antioxidant activity of *A. incisus* extract.

Concentrations (μg/mL)	Sample No.	Absorbance (515 nm)		
		Sample	Blank of sample	Blank (DPPH without sample)
0.5	1	1.178	0.001	1.225
	2	1.158	0.001	1.185
	3	1.162	0.001	1.207
1.0	1	1.121	0.001	1.225
	2	1.114	0.001	1.185
	3	1.112	0.001	1.207
5.0	1	1.089	0.002	1.225
	2	1.091	0.002	1.185
	3	1.061	0.002	1.207
10	1	1.069	0.002	1.225
	2	1.051	0.002	1.185
	3	1.005	0.003	1.207
25	1	0.982	0.003	1.225
	2	0.953	0.004	1.185
	3	0.979	0.005	1.207
50	1	0.769	0.005	1.225
	2	0.782	0.006	1.185
	3	0.759	0.005	1.207

Table 13 (Cont.)

Concentrations (μg/mL)	Sample No.	Absorbance (515 nm)		
		Sample	Blank of sample	Blank (DPPH without sample)
100	1	0.506	0.009	1.225
	2	0.546	0.100	1.185
	3	0.531	0.110	1.207
200	1	0.553	0.201	1.225
	2	0.502	0.203	1.185
	3	0.54	0.203	1.207
500	1	0.412	0.215	1.225
	2	0.396	0.212	1.185
	3	0.403	0.211	1.207
2000	1	0.337	0.270	1.225
	2	0.336	0.250	1.185
	3	0.327	0.250	1.207

Table 14 The antioxidant activity of L-ascorbic acid.

Concentrations (μg/mL)	Sample No.	Absorbance (515 nm)		
		Sample	Blank of sample	Blank (DPPH without sample)
0.25	1	1.215	0.001	1.326
	2	1.199	0.001	1.231
	3	1.231	0.001	1.351
0.50	1	1.115	0.001	1.326
	2	1.108	0.001	1.231
	3	1.106	0.001	1.351

Table 14 (Cont.)

Concentrations (μg/mL)	Sample No.	Absorbance (515 nm)		
		Sample	Blank of sample	Blank (DPPH without sample)
2.5	1	0.781	0.001	1.326
	2	0.759	0.001	1.231
	3	0.776	0.001	1.351
5.0	1	0.398	0.001	1.326
	2	0.387	0.001	1.231
	3	0.401	0.001	1.351
25	1	0.152	0.001	1.326
	2	0.16	0.001	1.231
	3	0.154	0.001	1.351
50	1	0.075	0.001	1.326
	2	0.071	0.001	1.231
	3	0.069	0.001	1.351
125	1	0.084	0.002	1.326
	2	0.08	0.002	1.231
	3	0.077	0.002	1.351
250	1	0.084	0.002	1.326
	2	0.075	0.002	1.231
	3	0.078	0.002	1.351
1000	1	0.079	0.002	1.326
	2	0.077	0.002	1.231
	3	0.081	0.002	1.351
2500	1	0.08	0.006	1.326
	2	0.078	0.006	1.231
	3	0.076	0.007	1.351

Table 15 The antioxidant activity of butylated hydroxytoluene (BHT).

Concentrations (μg/mL)	Sample No.	Absorbance (515 nm)		
		Sample	Blank of sample	Blank (DPPH without sample)
0.25	1	1.238	0.007	1.375
	2	1.165	0.007	1.381
	3	1.172	0.007	1.362
0.50	1	1.166	0.009	1.375
	2	1.169	0.008	1.381
	3	1.158	0.009	1.362
2.5	1	0.689	0.061	1.375
	2	0.671	0.065	1.381
	3	0.663	0.068	1.362
5.0	1	0.385	0.103	1.375
	2	0.409	0.098	1.381
	3	0.396	0.101	1.362
25	1	0.108	0.047	1.375
	2	0.128	0.045	1.381
	3	0.184	0.055	1.362
50	1	0.098	0.029	1.375
	2	0.101	0.028	1.381
	3	0.105	0.033	1.362
125	1	1.238	0.007	1.375
	2	1.165	0.007	1.381
	3	1.172	0.007	1.362

Table 15 (Cont.)

Concentrations (μg/mL)	Sample No.	Absorbance (515 nm)		
		Sample	Blank of sample	Blank (DPPH without sample)
250	1	0.074	0.013	1.375
	2	0.079	0.008	1.381
	3	0.064	0.010	1.362
1000	1	0.079	0.043	1.375
	2	0.092	0.048	1.381
	3	0.086	0.041	1.362
2500	1	0.076	0.035	1.375
	2	0.064	0.031	1.381
	3	0.079	0.032	1.362

The calculation of % free radical scavenging

Example

At the concentration of 2000 μg/mL *A. incisus* extract dissolved in DMSO, the % free radical scavenging is calculated by using the equation:

% Free radical scavenging $= [\ 1- (\ A_S/\ A_B)\ ] \times 100$

Where; A_S is an absorbance of DPPH with tested sample

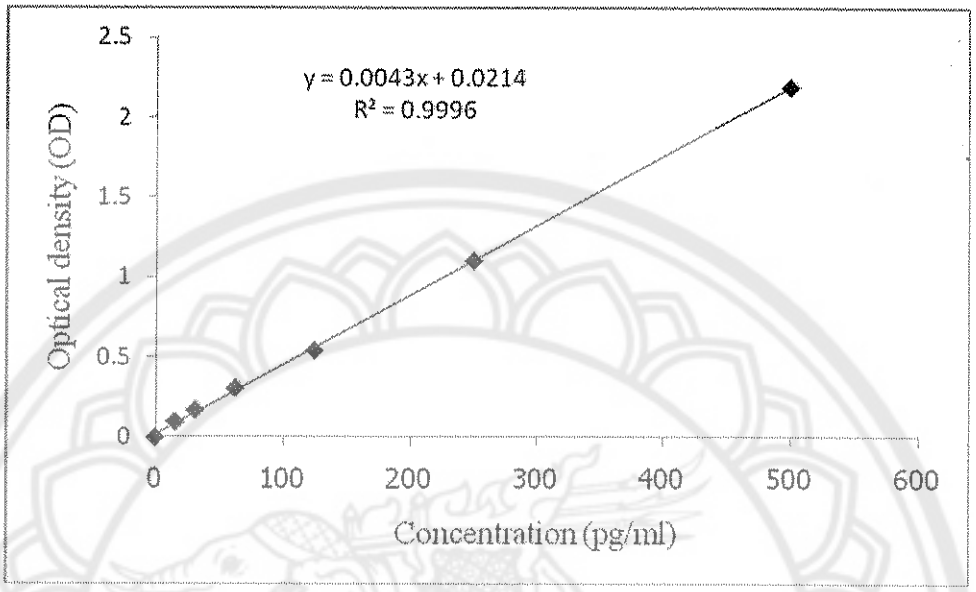
A_B is an absorbance of DPPH without tested sample

Therefore, % Free radical scavenging $= [\ 1- (\ (0.327-0.250)\ /1.207\ )\ ] \times 100$

$= [\ 1- (\ 0.077/\ 1.207\ )\ ] \times 100$

$= 93.6$

APPENDIX D DETERMINATION OF ANTI-INFLAMMATORY ACTIVITY



Where; y = Optical density

x = Concentration (pg/mL)

Figure 46 The standard curve of mouse TNF-α ELISA Ready-SET-Go.

Table 16 The inhibitory effect of *A. incisus* extract on TNF-α release.

Concentration (μg/mL)	Type	Absorbance (490 nm)			% TNF-α release			
		1	2	3	1	2	3	Mean (SD)
Control (untreated)	Sample	0.7421	0.7554	0.7312	100.0	100.0	100.0	100.0 (0.0)
	Blank of sample	0.00	0.00	0.00				
	Δ	0.7421	0.7554	0.7312				
40	Sample	0.6076	0.6302	0.6118	80.7	83.5	81.0	81.8 (1.6)
	Blank of sample	0.004	0.006	0.006				
	Δ	0.6036	0.6242	0.6058				
60	Sample	0.5782	0.5616	0.5672	76.1	74.0	74.8	74.9 (1.0)
	Blank of sample	0.008	0.006	0.006				
	Δ	0.5702	0.5556	0.5612				
80	Sample	0.5795	0.5608	0.5285	67.4	66.0	62.5	65.3 (2.5)
	Blank of sample	0.072	0.063	0.056				
	Δ	0.5075	0.4978	0.4725				
100	Sample	0.6624	0.7019	0.4624	59.7	62.4	58.5	60.2 (2.0)
	Blank of sample	0.021	0.023	0.019				
	Δ	0.4524	0.4719	0.4434				

Table 16 (cont.)

Concentration (μg/mL)	Type	Absorbance (490 nm)			% TNF-α release			
		1	2	3	1	2	3	Mean (SD)
120	Sample	0.5365	0.528	0.5157	54.3	50.5	49.1	51.3 (2.7)
	Blank of sample	0.123	0.142	0.140				
	Δ	0.4135	0.386	0.3757				
140	Sample	0.4999	0.4498	0.4516	42.8	38.0	37.2	39.3 (3.0)
	Blank of sample	0.170	0.154	0.162				
	Δ	0.3299	0.2958	0.2896				
160	Sample	0.4585	0.4443	0.4277	34.1	32.7	31.2	32.6 (1.4)
	Blank of sample	0.192	0.187	0.181				
	Δ	0.2665	0.2573	0.2467				

Note: Δ represents to the different absorbance between sample and blank of sample.

Table 17 The inhibitory effect of prednisolone on TNF-α release.

Concentration (μg/mL)	Type	Absorbance (490 nm)			% TNF-α release			
		1	2	3	1	2	3	Mean (SD)
Control (untreated)	Sample	0.7421	0.7554	0.7312	100.0	100.0	100.0	100.0 (0.0)
	Blank of sample	0.00	0.00	0.00				
	Δ	0.7421	0.7554	0.7312				
5	Sample	0.6738	0.6813	0.6664	90.3	91.3	89.3	90.3 (1.0)
	Blank of sample	0.001	0.001	0.001				
	Δ	0.6728	0.6803	0.6654				
10	Sample	0.6059	0.6271	0.5933	80.9	83.8	79.1	81.3 (2.4)
	Blank of sample	0.001	0.001	0.001				
	Δ	0.6049	0.6261	0.5923				
15	Sample	0.5456	0.5621	0.5267	72.5	74.8	69.9	72.4 (2.5)
	Blank of sample	0.001	0.001	0.001				
	Δ	0.5446	0.5611	0.5257				
20	Sample	0.4624	0.4215	0.4592	61.0	55.3	60.5	58.9 (3.2)
	Blank of sample	0.001	0.001	0.001				
	Δ	0.4614	0.4205	0.4582				

Table 17 (cont.)

Concentration (μg/mL)	Type	Absorbance (490 nm)			% TNF-α release			
		1	2	3	1	2	3	Mean (SD)
25	Sample	0.3835	0.3459	0.3783	49.9	44.8	49.2	48.0 (2.7)
	Blank of sample	0.002	0.001	0.002				
	Δ	0.3815	0.3449	0.3763				
30	Sample	0.2766	0.3063	0.3282	35.1	39.2	42.2	38.8 (3.6)
	Blank of sample	0.002	0.002	0.002				
	Δ	0.2746	0.3043	0.3262				
35	Sample	0.2343	0.2124	0.2226	29.2	26.2	27.7	27.7 (1.5)
	Blank of sample	0.002	0.002	0.001				
	Δ	0.2323	0.2104	0.2216				

Note: Δ represents to the different absorbance between sample and blank of sample.

Table 18 The inhibitory effect of *A. incisus* extract on cell viability.

Concentration (µg/mL)	Type	Absorbance (490 nm)			%Cell viability			
		1	2	3	1	2	3	Mean (SD)
Control (untreated)	Sample	0.7523	0.7678	0.7412	100.0	100.0	100.0	100.0 (0.0)
	Blank of sample	0.00	0.00	0.00				
	Δ	0.7523	0.7678	0.7412				
40	Sample	0.7363	0.7274	0.7525	98.8	97.3	99.7	99.0 (1.7)
	Blank of sample	0.002	0.004	0.004				
	Δ	0.7343	0.7234	0.7485				
60	Sample	0.7182	0.7152	0.7278	95.6	95.3	96.9	95.9 (0.9)
	Blank of sample	0.007	0.006	0.007				
	Δ	0.7112	0.7092	0.7208				
80	Sample	0.7537	0.7599	0.7525	95.3	96.5	94.3	95.4 (1.1)
	Blank of sample	0.045	0.042	0.051				
	Δ	0.7087	0.7179	0.7015				
100	Sample	0.7672	0.7563	0.7776	92.8	91.9	94.7	93.1 (1.4)
	Blank of sample	0.076	0.072	0.073				
	Δ	0.6912	0.6843	0.7046				

Table 18 (cont.)

Concentration (µg/mL)	Type	Absorbance (490 nm)			%Cell viability			
		1	2	3	1	2	3	Mean (SD)
120	Sample	0.7772	0.7781	0.7625	90.1	89.8	87.7	89.2 (1.3)
	Blank of sample	0.106	0.109	0.108				
	Δ	0.6712	0.6691	0.6545				
140	Sample	0.7817	0.7894	0.7759	88.3	89.0	87.7	88.3 (0.6)
	Blank of sample	0.123	0.126	0.122				
	Δ	0.6587	0.6634	0.6539				
160	Sample	0.7793	0.7828	0.7737	84.7	86.1	84.2	85.0 (1.0)
	Blank of sample	0.147	0.140	0.145				
	Δ	0.6323	0.6428	0.6287				

Note: Δ represents to the different absorbance between sample and blank of sample.

Table 19 The inhibitory effect of prednisolone on cell viability.

Concentration (µg/mL)	Type	Absorbance (490 nm)			%Cell viability			
		1	2	3	1	2	3	Mean (SD)
Control (untreated)	Sample	0.7523	0.7678	0.7412	100.0	100.0	100.0	100.0 (0.0)
	Blank of sample	0.00	0.00	0.00				
	Δ	0.7523	0.7678	0.7412				
5	Sample	0.7418	0.7288	0.7336	99.7	97.9	98.6	98.7 (0.9)
	Blank of sample	0.001	0.001	0.001				
	Δ	0.7408	0.7278	0.7326				
10	Sample	0.7144	0.7077	0.7044	95.9	95.0	94.5	95.1 (0.7)
	Blank of sample	0.001	0.001	0.001				
	Δ	0.7134	0.7067	0.7034				
15	Sample	0.6886	0.6956	0.6764	92.3	93.3	90.6	92.1 (1.3)
	Blank of sample	0.001	0.001	0.001				
	Δ	0.6876	0.6946	0.6754				
20	Sample	0.6808	0.6879	0.6821	91.3	92.2	91.3	91.6 (0.6)
	Blank of sample	0.001	0.001	0.002				
	Δ	0.6798	0.6869	0.6801				

Table 19 (cont.)

Concentration (μg/mL)	Type	Absorbance (490 nm)			%Cell viability			
		1	2	3	1	2	3	Mean (SD)
25	Sample	0.6587	0.6698	0.6443	88.1	89.6	86.1	87.9 (1.8)
	Blank of sample	0.002	0.002	0.002				
	Δ	0.6567	0.6678	0.6423				
30	Sample	0.6377	0.6208	0.6265	85.1	82.9	83.6	83.9 (1.1)
	Blank of sample	0.002	0.001	0.002				
	Δ	0.6357	0.6198	0.6245				
35	Sample	0.5962	0.6027	0.6068	79.4	80.3	80.9	80.2 (0.7)
	Blank of sample	0.002	0.002	0.002				
	Δ	0.5942	0.6007	0.6048				

Note: Δ represents to the different absorbance between sample and blank of sample.

APPENDIX E DEVELOPMENT OF NANOEMULSION CONTAINING *A. INCISUS* EXTRACT

Table 20 Mean droplet size and polydispersity index value of nanoemulsions formulated with ceteareth-10.

Formulation ceteareth-10	Mean droplet size (nm)				Polydispersity index (PI)			
	1	2	3	Mean±SD	1	2	3	Mean±SD
C 4% + G 5%	512	533	492	512±20	0.51	0.46	0.48	0.48±0.03
C 8% + G 5%	309	326	339	325±15	0.32	0.29	0.31	0.31±0.02
C 10% + G 5%	414	448	421	428±18	0.43	0.38	0.40	0.40±0.02
C 12% + G 5%	659	634	676	656±21	0.65	0.59	0.62	0.62±0.03
C 16% + G 5%	875	857	892	875±18	0.87	0.78	0.83	0.83±0.04
C 8% + G 1%	395	410	435	413±20	0.41	0.37	0.38	0.39±0.02
C 8% + G 2%	372	388	408	389±18	0.39	0.35	0.36	0.37±0.02
C 8% + G 3%	364	358	373	365±8	0.36	0.33	0.34	0.34±0.02
C 8% + G 4%	335	358	321	338±19	0.34	0.30	0.32	0.32±0.02
C 8% + G 5%	309	326	339	325±15	0.32	0.29	0.31	0.31±0.02
C 8% + G 6%	612	638	607	619±17	0.62	0.55	0.58	0.58±0.03
C 8% + G 7%	742	763	725	743±19	0.74	0.66	0.71	0.70±0.03
C 8% + G 8%	956	978	932	955±23	0.95	0.85	0.90	0.90±0.04

Note: C = Ceteareth-10, G = GMS.

Table 21 Mean droplet size and polydispersity index value of nanoemulsions formulated with ceteareth-20.

Formulation ceteareth-10	Mean droplet size (nm)				Polydispersity index (PI)			
	1	2	3	Mean±SD	1	2	3	Mean±SD
C 4% + G 5%	493	513	526	511±17	0.51	0.46	0.48	0.48±0.03
C 8% + G 5%	527	542	518	529±12	0.53	0.47	0.49	0.50±0.03
C 10% + G 5%	642	671	656	656±15	0.65	0.59	0.62	0.62±0.03
C 12% + G 5%	754	767	781	767±14	0.76	0.69	0.74	0.73±0.04
C 16% + G 5%	804	837	813	818±17	0.81	0.73	0.76	0.77±0.04
C 8% + G 1%	702	729	682	704±24	0.70	0.63	0.66	0.66±0.03
C 8% + G 2%	651	641	667	653±13	0.65	0.58	0.63	0.62±0.03
C 8% + G 3%	612	633	601	615±16	0.61	0.55	0.58	0.58±0.03
C 8% + G 4%	536	511	521	523±13	0.52	0.47	0.48	0.49±0.03
C 8% + G 5%	584	553	568	568±16	0.56	0.51	0.53	0.53±0.03
C 8% + G 6%	745	721	732	733±12	0.73	0.66	0.69	0.69±0.04
C 8% + G 7%	691	683	712	695±15	0.69	0.62	0.66	0.66±0.03
C 8% + G 8%	868	864	843	858±13	0.85	0.77	0.81	0.81±0.04

Note: C = Ceteareth-20, G = GMS.

Table 22 Artocarpin remaining in nanoemulsion under 7 heat-cool cycles and after 1-3 months.

Condition	Sample No.	Peak area	Artocarpin content (mg)	% Artocarpin remaining	Mean±SD
Intitial	1	1907023	0.01416	100	100
	2	1925168	0.01430		
	3	1912547	0.01420		
Heat cool	1	1636735	0.01199	84.46	84.54±0.32
	2	1638019	0.01200	84.54	
	3	1639723	0.01202	84.63	
1 mo.	1	1885143	0.01398	98.46	98.61±0.08
	2	1894376	0.01406	98.98	
	3	1883895	0.01397	98.39	
2 mo.	1	1840242	0.01362	95.93	95.99±0.20
	2	1840842	0.01363	95.96	
	3	1842880	0.01364	96.08	
3 mo.	1	1792434	0.01324	93.23	93.01±0.08
	2	1787348	0.01320	92.95	
	3	1785764	0.01319	92.86	

Table 23 Droplet size of nanoemulsion under 7 heat-cool cycles and after 1-3 months.

Condition	Sample No.	Droplet size (nm)	Mean±SD
Intitial	1	309	325±15
	2	326	
	3	339	
Heat-cool	1	342	347±19
	2	368	
	3	331	
1 mo.	1	372	354±17
	2	351	
	3	338	
2 mo.	1	351	355±24
	2	334	
	3	381	
3 mo.	1	428	453±27
	2	451	
	3	481	

Table 24 Viscosity of nanoemulsion containing *A. incisus* extract under 7 heat-cool cycles and after 1-3 months.

Condition	Sample No.	Viscosity (cps)	Mean±SD
Intitial	1	766	749±17
	2	748	
	3	732	
Heat cool	1	732	726±9
	2	716	
	3	729	
1 mo.	1	723	708±14
	2	695	
	3	706	
2 mo.	1	711	688±21
	2	682	
	3	671	
3 mo.	1	695	673±20
	2	666	
	3	657	

Table 25 pH values of nanoemulsion containing *A. incisus* extract under 7 heat-cool cycles and after 1-3 months.

Condition	Sample No.	pH values	Mean±SD
Intitial	1	5.52	5.52±0.01
	2	5.53	
	3	5.51	
Heat cool	1	5.53	5.53±0.01
	2	5.52	
	3	5.53	
1 mo.	1	5.52	5.52±0.01
	2	5.53	
	3	5.52	
2 mo.	1	5.53	5.53±0.01
	2	5.54	
	3	5.52	
3 mo.	1	5.51	5.52±0.01
	2	5.52	
	3	5.51	

APPENDIX F *IN VITRO* PERMEATION STUDIES THROUGH MOUSE SKIN

Table 26 The percentage of cumulative of artocarpin release of nanoemulsion were determined within 24 hr.

Time (hr)	Peak area			Artocarpin concentration (mg/mL)			% drug release				
	1	2	3	1	2	3	1	2	3	mean	SD
0.25	138946	138797	139032	$1.16x10^{-5}$	$1.04x10^{-5}$	$1.23x10^{-5}$	12.68	11.37	13.43	12.49	1.0
0.5	139867	139727	140152	$1.89x10^{-5}$	$1.78x10^{-5}$	$2.08x10^{-5}$	21.54	20.23	23.62	21.80	1.7
1	140828	141050	141135	$2.66x10^{-5}$	$2.36x10^{-5}$	$2.88x10^{-5}$	31.27	27.79	33.85	30.97	3.0
3	141945	141882	142029	$3.08x10^{-5}$	$3.19x10^{-5}$	$3.62x10^{-5}$	37.62	38.46	43.94	40.01	3.4
6	142635	142434	142649	$3.71x10^{-5}$	$3.55x10^{-5}$	$3.88x10^{-5}$	46.65	44.60	49.23	46.83	2.3
9	144159	143931	144253	$4.69x10^{-5}$	$4.34x10^{-5}$	$4.84x10^{-5}$	59.93	55.77	62.44	59.38	3.4
12	145173	144831	145295	$5.42x10^{-5}$	$5.18x10^{-5}$	$5.44x10^{-5}$	71.15	67.95	72.26	70.46	2.2
16	146047	145948	146430	$5.96x10^{-5}$	$5.48x10^{-5}$	$6.02x10^{-5}$	80.77	74.72	82.43	79.31	4.1
24	147050	146906	146610	$6.04x10^{-5}$	$6.24x10^{-5}$	$6.25x10^{-5}$	85.75	86.87	89.01	87.21	1.6

Table 27 The percentage of cumulative of artocarpin release of solution were determined within 24 hr.

Time (hr)	Peak area			Artocarpin concentration (mg/mL)			% drug release				
	1	2	3	1	2	3	1	2	3	mean	SD
0.25	138393	138466	138427	$7.14x10^{-6}$	$7.73x10^{-6}$	$7.42x10^{-6}$	7.83	8.47	8.13	8.14	0.3
0.5	139093	139066	139112	$1.27x10^{-5}$	$1.25x10^{-5}$	$1.29x10^{-5}$	14.46	14.26	14.64	14.45	0.2
1	139666	139522	139652	$1.73x10^{-5}$	$1.61x10^{-5}$	$1.72x10^{-5}$	20.35	19.11	20.26	19.91	0.7
3	140554	140418	140450	$2.44x10^{-5}$	$2.33x10^{-5}$	$2.36x10^{-5}$	29.32	28.08	28.43	28.61	0.6
6	141022	141159	140983	$2.82x10^{-5}$	$2.93x10^{-5}$	$2.79x10^{-5}$	35.10	36.17	34.72	35.33	0.8
12	141538	141976	141273	$3.24x10^{-5}$	$3.58x10^{-5}$	$3.02x10^{-5}$	41.55	45.34	39.17	42.02	3.1
9	142060	142210	142490	$3.65x10^{-5}$	$3.77x10^{-5}$	$3.99x10^{-5}$	48.34	49.84	51.91	50.03	1.8
18	142467	143170	142961	$3.97x10^{-5}$	$4.54x10^{-5}$	$4.37x10^{-5}$	54.41	60.84	58.77	58.01	3.3
24	143015	143459	143135	$4.41x10^{-5}$	$4.77x10^{-5}$	$4.51x10^{-5}$	61.94	66.48	63.29	63.90	2.3

APPENDIX G *IN VIVO* STUDIES ON C57BL/6 MICE WITH UVB-INDUCED HYPERPIGMENTATION

Table 28 The Effect of nanoemulsion containing *A. incisus* extract and *A. incisus* extract solution on UVB-induced hyperpigmentation in C57BL/6 mice skin.

Formulation	Time (week)	Melanin values			
		1	2	3	mean±SD
nanoemulsion	0	376	382	369	376±7
	1	365	370	373	369±4
	2	352	358	361	357±5
	3	340	348	332	340±8
	4	312	318	322	317±5
	5	309	302	310	307±4
	6	297	292	286	292±6
solution	0	378	381	367	375±7
	1	374	371	369	371±3
	2	365	368	370	368±3
	3	358	350	355	354±4
	4	348	346	340	345±4
	5	335	332	336	334±2
	6	328	325	319	324±5