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APPENDICES

APPENDIX I

The data of material

Lipoid E 80

Description Fatfree egg lechithin with 80% phosphatidyl choline

Chemical composition

Phospholipid (g/100)

Phosphatidyl choline	80.0-85.0
Phosphatidyl ethanolamine	7.0-9.5
Lysophosphatidyl choline	n.m.t. 3.0
Lysophosphatidyl ethanolamine	n.m.t.0.5
Sphingomyelin	2.0-3.0

Non-polar lipids (g/100ml)

Triglycerides	n.m.t. 3.0
Cholesterol	n.m.t. 1.0
Free fatty acid	n.m.t.0.05
DL- α -Tocopherol	0.05-0.1

Typical fatty acid composition in % to total fatty acids

Palmitic acid	28-34
Steric acid	12-15
Oleic acid	26-30
Linoleic acid	13-18
Linolenic acid	13-18
Polyunsaturated fatty acids	
C20 and higer	6-10

Analytical data

Phosphorus (g/100g)	3.7-4.0
Water (g/100g)	n.m.t. 2.0
Ethanol (g/100g)	n.m.t. 0.2
Peroxide value	n.m.t. 0.2
Iodine value	65-69
Acid value	7-10
Heavy metaks (ppm)	n.m.t. 10

Physical data

Consistency	coarse agglomerates
Color	yellowish-yellow
Solubility (5% solution)	
Water	dispersible 20 °C
Fat	soluble 60 °C
Chlorinated hydrocarbons	soluble 20 °C
Ethanol	soluble 20 °C

Cholesterol

Formula	$C_{27}H_{46}O$
Density	1.07 g/cm^3 (20°C)
Molar mass	386.67 g/mol
Bulk density	260 Kg/m^3
Storage	+15 °C to + 25 °C

Chemical and physical data

Odour	almost odourless
Form	solid
Color	white
Solubility in water (20 °C)	insoluble
Solubility in chloroform (20 °C)	freely soluble
Boiling point	~360 °C decomposition
Melting point	147-150 °C

Gallic acid

Molecular Formula	$(\text{OH})_3\text{C}_6\text{H}_2\text{CO}_2\text{H}$
Molecular weight	170.12
Appearance	White to yellow with a tan cast powder
Solubility	clear to very slightly hazy yellow solution at 50 mg/ml in ethanol
Loss on drying	Maximum 10%
Purity by sodium hydroxide titration	Maximum 97%
Purity by gas chromatography	Maximum 97%



APPENDIX II

P. emblica extract powder

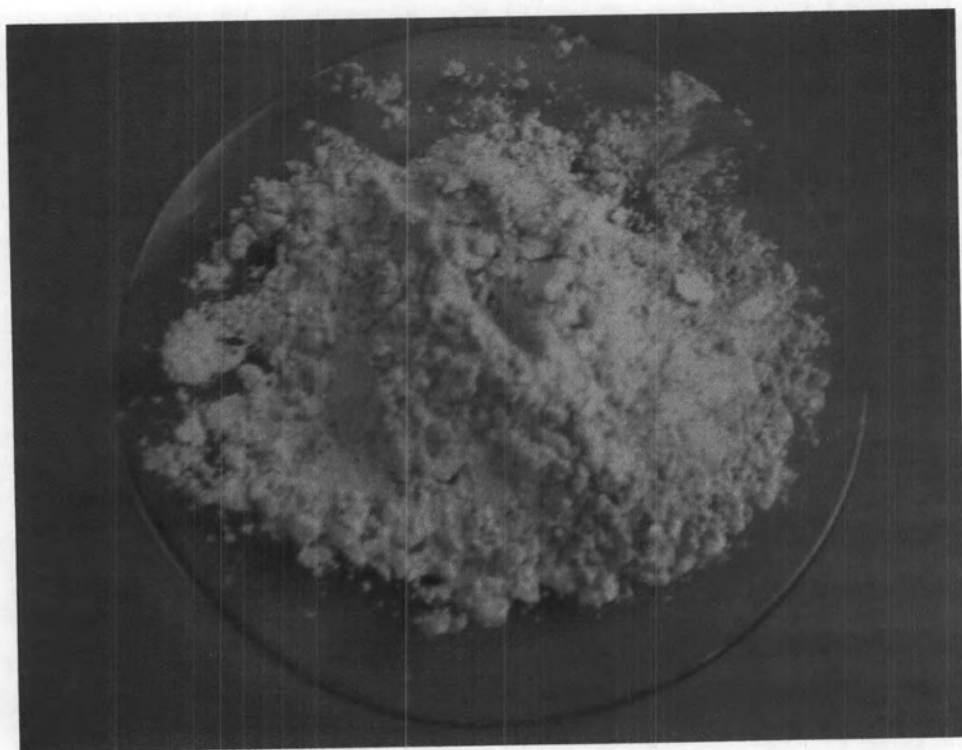


Figure IV-1 *P. emblica* extract powder from transparent juice

APPENDIX III

The data of standard curve

Table 14 Relation between concentration of gallic acid and absorbance

Concentration of gallic acid ($\mu\text{g/mL}$)	Absorbance				
	N1	N2	N3	Mean	SD
5	0.052	0.051	0.053	0.052	0.001
10	0.097	0.093	0.096	0.095	0.002
20	0.211	0.208	0.211	0.210	0.002
40	0.428	0.423	0.429	0.427	0.003
60	0.643	0.649	0.652	0.648	0.005
80	0.846	0.841	0.847	0.845	0.003

Table 15 Relation between concentration of *P.emblica* extract in buffer solution pH 5.5 and absorbance

Concentration of <i>P.emblica</i> extract (mg/mL)	Absorbance				
	N1	N2	N3	Mean	SD
0.04 mg/mL	0.139	0.128	0.129	0.132	0.006
0.08 mg/mL	0.253	0.269	0.258	0.260	0.008
0.12 mg/mL	0.377	0.382	0.396	0.385	0.010
0.16 mg/mL	0.502	0.504	0.524	0.510	0.012
0.20 mg/mL	0.639	0.631	0.632	0.634	0.004

Table 16 Relation between final concentration of *P.emblica* extract in buffer solution pH 5.5 and GAE

Concentration of <i>P.emblica</i>					
extract (mg/mL)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0.04 mg/mL	13.40	12.38	12.47	12.75	0.57
0.08 mg/mL	24.04	25.53	24.51	24.69	0.76
0.12 mg/mL	35.61	36.08	37.38	36.36	0.92
0.16 mg/mL	47.27	47.46	49.32	48.02	1.14
0.20 mg/mL	60.05	59.31	59.40	59.59	0.41

Table 17 Relation between concentration of *P.emblica* extract in buffer solution pH 7.4 and absorbance

Concentration of <i>P.emblica</i>					
extract (mg/mL)	Absorbance			Mean	SD
	N1	N2	N3		
1 mg/mL	0.139	0.131	0.117	0.129	0.011
2 mg/mL	0.251	0.259	0.258	0.256	0.004
3 mg/mL	0.371	0.382	0.378	0.377	0.006
4 mg/mL	0.491	0.482	0.506	0.493	0.012
5 mg/mL	0.612	0.615	0.608	0.612	0.004

Table 18 Relation between final concentration of *P. emblica* extract in buffer solution pH 7.4 and GAE

Concentration of <i>P. emblica</i> extract (mg/mL)	GAE (mg/mL)			Mean	SD
	N1	N2	N3		
0.04 mg/mL	13.40	12.66	11.35	12.47	1.04
0.08 mg/mL	23.85	24.60	24.51	24.32	0.41
0.12 mg/mL	35.05	36.08	35.70	35.61	0.52
0.16 mg/mL	46.25	45.41	47.65	46.43	1.13
0.2 mg/mL	57.54	57.82	57.16	57.50	0.33

APPENDIX IV

Encapsulation efficiency

Table 19 Absorbance of supernatant of *P. emblica* extract in liposomes pH 5.5

Concentration of <i>P. emblica</i> in liposomes pH 5.5	Absorbance		
	N1	N2	N3
1 mg/mL pH 5.5	0.048	0.051	0.051
2 mg/mL pH 5.5	0.115	0.112	0.112
3 mg/mL pH 5.5	0.168	0.162	0.165
4 mg/mL pH 5.5	0.251	0.246	0.232
5mg/mL pH 5.5	0.245	0.232	0.239

Table 20 GAE of supernatant of *P. emblica* extract in liposomes pH 5.5

Concentration of <i>P. emblica</i> in liposomes pH 5.5	GAE ($\mu\text{g/mL}$)		
	N1	N2	N3
1 mg/mL pH 5.5	4.91	5.19	5.19
2 mg/mL pH 5.5	11.17	10.89	10.86
3 mg/mL pH 5.5	16.11	15.55	15.81
4 mg/mL pH 5.5	23.85	23.39	22.09
5mg/mL pH 5.5	23.29	22.08	22.71

Table 21 Absorbance of precipitant of *P. emblica* extract in liposomes pH 5.5

Concentration of <i>P. emblica</i> in liposomes pH 5.5	Absorbance		
	N1	N2	N3
1 mg/mL pH 5.5	0.057	0.052	0.046
2 mg/mL pH 5.5	0.078	0.063	0.080
3 mg/mL pH 5.5	0.135	0.132	0.132
4 mg/mL pH 5.5	0.136	0.161	0.157
5mg/mL pH 5.5	0.196	0.174	0.172

Table 22 GAE of precipitant of *P. emblica* extract in liposomes pH 5.5

Concentration of <i>P. emblica</i> in liposomes pH 5.5	GAE ($\mu\text{g/mL}$)		
	N1	N2	N3
1 mg/mL pH 5.5	5.75	5.29	4.69
2 mg/mL pH 5.5	7.71	6.31	7.87
3 mg/mL pH 5.5	13.03	12.75	12.71
4 mg/mL pH 5.5	13.12	15.46	15.10
5mg/mL pH 5.5	18.72	16.67	16.51

Table 23 Absorbance of supernatant of *P. emblica* extract in liposomes pH 7.4

Concentration of <i>P. emblica</i> in liposomes pH 5.5	Absorbance		
	N1	N2	N3
1 mg/mL pH 7.4	0.081	0.079	0.072
2 mg/mL pH 7.4	0.146	0.139	0.150
3 mg/mL pH 7.4	0.211	0.219	0.206
4 mg/mL pH 7.4	0.307	0.292	0.294
5mg/mL pH 7.4	0.219	0.211	0.207

Table 24 GAE of supernatant of *P. emblica* extract in liposomes pH 7.4

Concentration of <i>P. emblica</i> in liposomes pH 5.5	GAE ($\mu\text{g/mL}$)		
	N1	N2	N3
1 mg/mL pH 7.4	7.99	7.81	7.15
2 mg/mL pH 7.4	14.06	13.40	14.41
3 mg/mL pH 7.4	20.12	20.87	19.64
4 mg/mL pH 7.4	29.08	27.68	27.83
5mg/mL pH 7.4	20.87	20.12	19.74

Table 25 Absorbance of precipitant of *P. emblica* extract in liposomes pH 7.4

Concentration of <i>P.emblica</i> in liposomes pH 5.5	Absorbance		
	N1	N2	N3
1 mg/mL pH 7.4	0.039	0.036	0.038
2 mg/mL pH 7.4	0.079	0.085	0.071
3 mg/mL pH 7.4	0.086	0.099	0.096
4 mg/mL pH 7.4	0.139	0.145	0.149
5mg/mL pH 7.4	0.052	0.065	0.050

Table 26 GAE of precipitant of *P. emblica* extract in liposomes pH 7.4

Concentration of <i>P.emblica</i> in liposomes pH 5.5	GAE ($\mu\text{g/mL}$)		
	N1	N2	N3
1 mg/mL pH 7.4	4.07	3.79	3.98
2 mg/mL pH 7.4	7.81	8.37	7.09
3 mg/mL pH 7.4	8.46	9.67	9.38
4 mg/mL pH 7.4	13.40	13.96	14.35
5mg/mL pH 7.4	5.29	6.50	5.09

Table 27 % Encapsulation efficiency of *P. emblica* extract in liposomes pH 5.5

<i>P. emblica</i> extract in liposomes	% Encapsulation efficiency				
	N1	N2	N3	Mean	SD
1 mg/mL pH 5.5	56.23	52.63	49.63	52.83	3.31
2 mg/mL pH 5.5	41.82	37.66	43.02	40.84	2.81
3 mg/mL pH 5.5	45.40	45.76	45.25	45.47	0.26
4 mg/mL pH 5.5	35.92	40.24	41.09	39.08	2.77
5mg/mL pH 5.5	45.03	43.51	42.56	43.70	1.24

Table 28 % Recovery of *P. emblica* extract in liposomes pH 5.5

<i>P. emblica</i> extract in liposomes	% Recovery			Mean	SD
	N1	N2	N3		
1 mg/mL pH 5.5	76.33	81.16	75.75	77.75	2.97
2 mg/mL pH 5.5	76.71	65.65	74.62	72.33	5.88
3 mg/mL pH 5.5	80.61	77.24	75.11	77.65	2.77
4 mg/mL pH 5.5	77.30	80.93	74.52	77.58	3.22
5mg/mL pH 5.5	69.24	64.60	65.29	66.38	2.50

Table 29 % Encapsulation efficiency of *P. emblica* extract in liposomes pH 7.4

<i>P. emblica</i> extract in liposomes	% Encapsulation efficiency			Mean	SD
	N1	N2	N3		
1 mg/mL pH 7.4	35.03	33.99	37.21	35.41	1.65
2 mg/mL pH 7.4	36.43	39.21	33.64	36.43	2.78
3 mg/mL pH 7.4	30.06	32.13	32.82	31.67	1.44
4 mg/mL pH 7.4	31.88	33.89	34.39	33.38	1.33
5mg/mL pH 7.4	20.56	24.82	20.86	22.08	2.38

Table 30 % Recovery of *P. emblica* extract in liposomes pH 7.4

<i>P. emblica</i> extract in liposomes	% Recovery			Mean	SD
	N1	N2	N3		
1 mg/mL pH 7.4	86.78	88.21	94.25	89.74	3.97
2 mg/mL pH 7.4	89.83	86.73	85.96	87.51	2.05
3 mg/mL pH 7.4	80.30	83.45	80.07	81.27	1.89
4 mg/mL pH 7.4	90.92	90.75	87.61	89.76	1.86
5mg/mL pH 7.4	44.70	45.29	42.67	44.22	1.38

APPENDIX V

Stability of *P. emblica* extract in buffer solution

Table 31 Absorbance of *P.emblica* extract 1 mg/mL in buffer 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.139	0.128	0.129	0.132	0.006
1	0.136	0.135	0.128	0.133	0.004
2	0.129	0.134	0.132	0.132	0.003
4	0.135	0.127	0.131	0.131	0.004
8	0.072	0.076	0.074	0.074	0.002
12	0.045	0.053	0.057	0.052	0.006

Table 32 GAE of *P.emblica* extract 1 mg/mL in buffer 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	13.40	12.38	12.47	12.75	0.57
1	13.12	13.03	12.38	12.84	0.41
2	12.47	12.94	12.75	12.72	0.23
4	13.03	12.28	12.66	12.66	0.37
8	7.15	7.53	7.34	7.34	0.19
12	4.63	5.38	5.75	5.26	0.57

Table 33 Absorbance of *P.emblica* extract 2 mg/mL in buffer 5.5 stored 4oC

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.253	0.269	0.258	0.260	0.008
1	0.258	0.259	0.265	0.261	0.004
2	0.261	0.257	0.256	0.258	0.003
4	0.254	0.256	0.251	0.254	0.003
8	0.153	0.158	0.152	0.154	0.003
12	0.121	0.123	0.118	0.121	0.003

Table 34 GAE of *P.emblica* extract 2 mg/mL in buffer 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	24.04	25.53	24.51	24.69	0.76
1	24.51	24.60	25.16	24.76	0.35
2	24.79	24.41	24.32	24.51	0.25
4	24.13	24.32	23.85	24.10	0.23
8	14.71	15.18	14.62	14.84	0.30
12	11.73	11.91	11.45	11.69	0.23

Table 35 Absorbance of *P.emblica* extract 3 mg/mL in buffer 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.377	0.382	0.396	0.385	0.010
1	0.379	0.385	0.387	0.384	0.004
2	0.387	0.385	0.386	0.386	0.001
4	0.375	0.372	0.388	0.378	0.009
8	0.248	0.246	0.239	0.244	0.005
12	0.195	0.192	0.203	0.197	0.006

Table 36 GAE of *P.emblica* extract 3 mg/mL in buffer 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	35.61	36.08	37.38	36.36	0.92
1	35.80	36.36	36.54	36.23	0.39
2	36.54	36.36	36.45	36.45	0.09
4	35.42	35.14	36.64	35.73	0.79
8	23.57	23.39	22.73	23.23	0.44
12	18.63	18.35	19.38	18.78	0.53

Table 37 Absorbance of *P.emblica* extract 4 mg/mL in buffer 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.502	0.504	0.524	0.510	0.012
1	0.507	0.514	0.517	0.513	0.005
2	0.519	0.516	0.512	0.516	0.004
4	0.518	0.503	0.504	0.508	0.008
8	0.368	0.362	0.369	0.366	0.004
12	0.248	0.252	0.256	0.252	0.004

Table 38 GAE of *P.emblica* extract 4 mg/mL in buffer 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	47.27	47.46	49.32	48.02	1.14
1	47.74	48.39	48.67	48.27	0.48
2	48.86	48.58	48.21	48.55	0.33
4	48.77	47.37	47.46	47.86	0.78
8	34.77	34.21	34.86	34.61	0.35
12	23.57	23.95	24.32	23.95	0.37

Table 39 Absorbance of *P.emblica* extract 5 mg/mL in buffer 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.639	0.631	0.632	0.634	0.004
1	0.621	0.623	0.614	0.619	0.005
2	0.591	0.593	0.582	0.589	0.006
4	0.562	0.559	0.563	0.561	0.002
8	0.421	0.430	0.425	0.425	0.005
12	0.351	0.358	0.362	0.357	0.006

Table 40 GAE of *P.emblica* extract 5 mg/mL in buffer 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	60.05	59.31	59.40	59.59	0.41
1	58.38	58.56	57.72	58.22	0.44
2	55.58	55.76	54.74	55.36	0.55
4	52.87	52.59	52.96	52.81	0.19
8	39.72	40.55	40.09	40.12	0.42
12	33.18	33.84	34.21	33.74	0.52

Table 41 Absorbance of *P.emblica* extract 1 mg/mL in buffer 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.139	0.128	0.129	0.132	0.006
1	0.126	0.134	0.136	0.132	0.005
2	0.132	0.127	0.129	0.129	0.003
4	0.129	0.135	0.127	0.130	0.004
8	0.092	0.094	0.083	0.090	0.006
12	0.056	0.051	0.052	0.053	0.003

Table 42 GAE of *P.emblica* extract 1 mg/mL in buffer 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	13.40	12.38	12.47	12.75	0.57
1	12.19	12.94	13.12	12.75	0.49
2	12.75	12.28	12.47	12.50	0.23
4	12.47	13.03	12.28	12.60	0.39
8	9.02	9.21	8.18	8.80	0.55
12	5.66	5.19	5.29	5.38	0.25



Table 43 Absorbance of *P.emblica* extract 2 mg/mL in buffer 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.253	0.269	0.258	0.260	0.008
1	0.249	0.267	0.268	0.261	0.011
2	0.266	0.255	0.266	0.262	0.006
4	0.255	0.266	0.265	0.262	0.006
8	0.205	0.208	0.204	0.206	0.002
12	0.125	0.127	0.131	0.128	0.003

Table 44 GAE of *P.emblica* extract 2 mg/mL in buffer 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	24.04	25.53	24.51	24.69	0.76
1	23.67	25.35	25.44	24.82	1.00
2	25.25	24.23	25.25	24.91	0.59
4	24.23	25.25	25.16	24.88	0.57
8	19.56	19.84	19.47	19.62	0.19
12	12.10	12.28	12.66	12.35	0.29

Table 45 Absorbance of *P.emblica* extract 3 mg/mL in buffer 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.377	0.382	0.396	0.385	0.010
1	0.372	0.379	0.3389	0.363	0.021
2	0.386	0.38	0.385	0.384	0.003
4	0.382	0.386	0.384	0.384	0.002
8	0.233	0.238	0.234	0.235	0.003
12	0.199	0.192	0.197	0.196	0.004

Table 46 GAE of *P.emblica* extract 3 mg/mL in buffer 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	35.61	36.08	37.38	36.36	0.92
1	35.14	35.80	32.06	34.33	2.00
2	36.45	35.89	36.36	36.23	0.30
4	36.08	36.45	36.26	36.26	0.19
8	22.17	22.64	22.27	22.36	0.25
12	0.306	0.308	0.301	0.305	0.00

Table 47 Absorbance of *P.emblica* extract 4 mg/mL in buffer 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.502	0.504	0.524	0.510	0.012
1	0.506	0.518	0.505	0.510	0.007
2	0.503	0.511	0.509	0.508	0.004
4	0.521	0.501	0.514	0.512	0.010
8	0.339	0.341	0.348	0.343	0.005
12	0.306	0.308	0.301	0.305	0.004

Table 48 GAE of *P.emblica* extract 4 mg/mL in buffer 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	47.27	47.46	49.32	48.02	1.14
1	47.65	48.77	47.55	47.99	0.67
2	47.37	48.11	47.93	47.80	0.39
4	49.05	47.18	48.39	48.21	0.95
8	32.06	32.25	32.90	32.41	0.44
12	28.99	29.17	28.52	28.89	0.34

Table 49 Absorbance of *P.emblica* extract 5 mg/mL in buffer 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.639	0.631	0.632	0.634	0.004
1	0.621	0.628	0.625	0.625	0.004
2	0.612	0.605	0.602	0.606	0.005
4	0.599	0.592	0.593	0.595	0.004
8	0.526	0.521	0.518	0.522	0.004
12	0.434	0.431	0.435	0.433	0.002

Table 50 GAE of *P.emblica* extract 4 mg/mL in buffer 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	60.05	59.31	59.40	59.59	0.41
1	58.38	59.03	58.75	58.72	0.33
2	57.54	56.88	56.60	57.01	0.48
4	56.32	55.67	55.76	55.92	0.35
8	49.51	49.05	48.77	49.11	0.38
12	40.93	40.65	41.02	40.87	0.19

Table 51 Absorbance of *P.emblica* extract 1 mg/mL in buffer 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.139	0.131	0.117	0.129	0.011
1	0.135	0.139	0.134	0.136	0.003
2	0.129	0.134	0.13	0.131	0.003
4	0.126	0.134	0.132	0.131	0.004
8	0.107	0.104	0.101	0.104	0.003
12	0.066	0.063	0.065	0.065	0.002

Table 52 GAE of *P.emblica* extract 1 mg/mL in buffer 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	13.40	12.66	11.35	12.47	1.04
1	13.03	13.40	12.94	13.12	0.25
2	12.47	12.94	12.56	12.66	0.25
4	12.19	12.94	12.75	12.63	0.39
8	10.42	10.14	9.86	10.14	0.28
12	6.59	6.31	6.50	6.47	0.14

Table 53 Absorbance of *P.emblica* extract 2 mg/mL in buffer 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.251	0.259	0.258	0.256	0.004
1	0.249	0.251	0.254	0.251	0.003
2	0.251	0.247	0.248	0.249	0.002
4	0.249	0.253	0.252	0.251	0.002
8	0.115	0.117	0.111	0.114	0.003
12	0.098	0.093	0.095	0.095	0.003

Table 54 GAE of *P.emblica* extract 2 mg/mL in buffer 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	23.85	24.60	24.51	24.32	0.41
1	23.67	23.85	24.13	23.89	0.23
2	23.85	23.48	23.57	23.64	0.19
4	23.67	24.04	23.95	23.89	0.19
8	11.17	11.35	10.79	11.10	0.29
12	9.58	9.11	9.30	9.33	0.23

Table 55 Absorbance of *P.emblica* extract 3 mg/mL in buffer 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.371	0.382	0.378	0.377	0.006
1	0.375	0.37	0.365	0.370	0.005
2	0.368	0.367	0.373	0.369	0.003
4	0.373	0.375	0.368	0.372	0.004
8	0.205	0.208	0.205	0.206	0.002
12	0.192	0.193	0.198	0.194	0.003

Table 56 GAE of *P.emblica* extract 3 mg/mL in buffer 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	35.05	36.08	35.70	35.61	0.52
1	35.42	34.96	34.49	34.96	0.47
2	34.77	34.68	35.24	34.89	0.30
4	35.24	35.42	34.77	35.14	0.34
8	19.56	19.84	19.56	19.66	0.16
12	18.35	18.44	18.91	18.57	0.30

Table 57 Absorbance of *P.emblica* extract 4 mg/mL in buffer 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.491	0.482	0.506	0.493	0.012
1	0.502	0.494	0.505	0.500	0.006
2	0.501	0.492	0.481	0.491	0.010
4	0.492	0.486	0.489	0.489	0.003
8	0.292	0.295	0.287	0.291	0.004
12	0.261	0.265	0.259	0.262	0.003

Table 58 GAE of *P.emblica* extract 4 mg/mL in buffer 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	46.25	45.41	47.65	46.43	1.13
1	47.27	46.53	47.55	47.12	0.53
2	47.18	46.34	45.31	46.28	0.93
4	46.34	45.78	46.06	46.06	0.28
8	27.68	27.96	27.21	27.62	0.38
12	24.79	25.16	24.60	24.85	0.29

Table 59 Absorbance of *P.emblica* extract 5 mg/mL in buffer 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.612	0.615	0.608	0.612	0.004
1	0.605	0.594	0.598	0.599	0.006
2	0.586	0.584	0.582	0.584	0.002
4	0.561	0.562	0.568	0.564	0.004
8	0.435	0.432	0.441	0.436	0.005
12	0.358	0.352	0.355	0.355	0.003

Table 60 GAE of *P.emblica* extract 5 mg/mL in buffer 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	57.54	57.82	57.16	57.50	0.33
1	56.88	55.86	56.23	56.32	0.52
2	55.11	54.92	54.74	54.92	0.19
4	52.78	52.87	53.43	53.03	0.35
8	41.02	40.74	41.58	41.11	0.43
12	33.84	33.28	33.56	33.56	0.28

Table 61 Absorbance of *P.emblica* extract 1 mg/mL in buffer 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.139	0.131	0.117	0.129	0.011
1	0.137	0.135	0.138	0.137	0.002
2	0.132	0.134	0.131	0.132	0.002
4	0.135	0.13	0.128	0.131	0.004
8	0.072	0.075	0.071	0.073	0.002
12	0.035	0.038	0.047	0.040	0.006

Table 62 GAE of *P.emblica* extract 1 mg/mL in buffer 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	13.40	12.66	11.35	12.47	1.04
1	13.22	13.03	13.31	13.19	0.14
2	12.75	12.94	12.66	12.78	0.14
4	13.03	12.56	12.38	12.66	0.34
8	7.15	7.43	7.06	7.22	0.19
12	3.70	3.98	4.82	4.17	0.58

Table 63 Absorbance of *P.emblica* extract 2 mg/mL in buffer 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.251	0.259	0.258	0.256	0.004
1	0.254	0.251	0.25	0.252	0.002
2	0.249	0.257	0.252	0.253	0.004
4	0.241	0.246	0.252	0.246	0.006
8	0.155	0.158	0.149	0.154	0.005
12	0.075	0.072	0.076	0.074	0.002

Table 64 GAE of *P.emblica* extract 2 mg/mL in buffer 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	23.85	24.60	24.51	24.32	0.41
1	24.13	23.85	23.76	23.92	0.19
2	23.67	24.41	23.95	24.01	0.38
4	22.92	23.39	23.95	23.42	0.51
8	14.90	15.18	14.34	14.80	0.43
12	7.43	7.15	7.53	7.37	0.19

Table 65 Absorbance of *P.emblica* extract 3 mg/mL in buffer 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.371	0.382	0.378	0.377	0.006
1	0.372	0.369	0.375	0.372	0.003
2	0.368	0.376	0.364	0.369	0.006
4	0.365	0.372	0.371	0.369	0.004
8	0.248	0.246	0.241	0.245	0.004
12	0.137	0.132	0.131	0.133	0.003

Table 66 GAE of *P.emblica* extract 3 mg/mL in buffer 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	35.05	36.08	35.70	35.61	0.52
1	35.14	34.86	35.42	35.14	0.28
2	34.77	35.52	34.40	34.89	0.57
4	34.49	35.14	35.05	34.89	0.35
8	23.57	23.39	22.92	23.29	0.34
12	13.22	12.75	12.66	12.88	0.30

Table 67 Absorbance of *P.emblica* extract 4 mg/mL in buffer 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.491	0.482	0.506	0.493	0.012
1	0.487	0.492	0.495	0.491	0.004
2	0.496	0.485	0.489	0.490	0.006
4	0.486	0.482	0.482	0.483	0.002
8	0.293	0.291	0.298	0.294	0.004
12	0.236	0.238	0.231	0.235	0.004

Table 68 GAE of *P.emblica* extract 4 mg/mL in buffer 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	46.25	45.41	47.65	46.43	1.13
1	45.87	46.34	46.62	46.28	0.38
2	46.71	45.69	46.06	46.15	0.52
4	45.78	45.41	45.41	45.53	0.22
8	27.77	27.59	28.24	27.87	0.34
12	22.45	22.64	21.99	22.36	0.34

Table 69 Absorbance of *P.emblica* extract 5 mg/mL in buffer 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.612	0.615	0.608	0.612	0.004
1	0.606	0.601	0.598	0.602	0.004
2	0.603	0.592	0.593	0.596	0.006
4	0.581	0.579	0.575	0.578	0.003
8	0.425	0.421	0.428	0.425	0.004
12	0.343	0.348	0.341	0.344	0.004

Table 70 GAE of *P.emblica* extract 4 mg/mL in buffer 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	57.54	57.82	57.16	57.50	0.33
1	56.98	56.51	56.23	56.57	0.38
2	56.70	55.67	55.76	56.04	0.57
4	54.64	54.46	54.08	54.39	0.29
8	40.09	39.72	40.37	40.06	0.33
12	32.44	32.90	32.25	32.53	0.34

APPENDIX VI

Stability of *P. emblica* extract in liposomes

Table 71 Absorbance of *P.emblica* extract 1 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.128	0.119	0.116	0.121	0.006
1	0.118	0.124	0.126	0.123	0.004
2	0.121	0.124	0.119	0.121	0.003
4	0.123	0.118	0.115	0.119	0.004
8	0.116	0.118	0.119	0.118	0.002
12	0.082	0.082	0.085	0.083	0.002

Table 72 GAE of *P.emblica* extract 1 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	12.38	11.54	11.26	11.73	0.58
1	11.45	12.00	12.19	11.88	0.39
2	11.73	12.00	11.54	11.76	0.23
4	11.91	11.45	11.17	11.51	0.38
8	11.26	11.45	11.54	11.41	0.14
12	8.09	8.09	8.37	8.18	0.16

Table 73 Absorbance of *P.emblica* extract 2 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.253	0.242	0.243	0.246	0.006
1	0.253	0.249	0.245	0.249	0.004
2	0.252	0.252	0.244	0.249	0.005
4	0.251	0.249	0.247	0.249	0.002
8	0.248	0.242	0.242	0.244	0.003
12	0.183	0.186	0.188	0.186	0.003

Table 74 GAE of *P.emblica* extract 2 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	GAE (µg/mL)			Mean	SD
	N1	N2	N3		
0	24.04	23.01	23.11	23.39	0.57
1	24.04	23.67	23.29	23.67	0.37
2	23.95	23.95	23.20	23.70	0.43
4	23.85	23.67	23.48	23.67	0.19
8	23.57	23.01	23.01	23.20	0.32
12	17.51	17.79	17.98	17.76	0.23

Table 75 Absorbance of *P.emblica* extract 3 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.368	0.363	0.355	0.362	0.007
1	0.365	0.365	0.352	0.361	0.008
2	0.364	0.362	0.352	0.359	0.006
4	0.362	0.362	0.352	0.359	0.006
8	0.360	0.362	0.352	0.358	0.005
12	0.301	0.308	0.308	0.306	0.004

Table 76 GAE of *P.emblica* extract 3 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	34.77	34.30	33.56	34.21	0.61
1	34.49	34.49	33.28	34.09	0.70
2	34.40	34.21	33.28	33.96	0.60
4	34.21	34.21	33.28	33.90	0.54
8	34.02	34.21	33.28	33.84	0.49
12	28.52	29.17	29.17	28.95	0.38

Table 77 Absorbance of *P.emblica* extract 4 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.489	0.476	0.487	0.484	0.007
1	0.489	0.489	0.473	0.484	0.009
2	0.476	0.482	0.481	0.480	0.003
4	0.483	0.483	0.472	0.479	0.006
8	0.475	0.478	0.472	0.475	0.003
12	0.404	0.402	0.405	0.404	0.002

Table 78 GAE of *P.emblica* extract 4 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	46.06	44.85	45.87	45.59	0.65
1	46.06	46.06	44.57	45.56	0.86
2	44.85	45.41	45.31	45.19	0.30
4	45.50	45.50	44.47	45.16	0.59
8	44.75	45.03	44.47	44.75	0.28
12	38.13	37.94	38.22	38.10	0.14

Table 79 Absorbance of *P.emblica* extract 5 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.522	0.518	0.517	0.519	0.003
1	0.525	0.522	0.515	0.521	0.005
2	0.518	0.518	0.515	0.517	0.002
4	0.515	0.511	0.518	0.515	0.004
8	0.515	0.511	0.511	0.512	0.002
12	0.428	0.428	0.426	0.427	0.001

Table 80 GAE of *P.emblica* extract 5 mg/mL in liposomes pH 5.5 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	49.14	48.77	48.67	48.86	0.25
1	49.42	49.14	48.49	49.01	0.48
2	48.77	48.77	48.49	48.67	0.16
4	48.49	48.11	48.77	48.45	0.33
8	48.49	48.11	48.11	48.24	0.22
12	40.37	40.37	40.18	40.31	0.11

Table 81 Absorbance of *P.emblica* extract 1 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.128	0.119	0.116	0.121	0.006
1	0.119	0.124	0.126	0.123	0.004
2	0.122	0.124	0.118	0.121	0.003
4	0.118	0.116	0.115	0.116	0.002
8	0.118	0.116	0.120	0.118	0.002
12	0.078	0.075	0.078	0.077	0.002

Table 82 GAE of *P.emblica* extract 1 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	12.38	11.54	11.26	11.73	0.58
1	11.54	12.00	12.19	11.91	0.34
2	11.82	12.00	11.45	11.76	0.29
4	11.45	11.26	11.17	11.29	0.14
8	11.45	11.26	11.63	11.45	0.19
12	7.71	7.43	7.71	7.62	0.16

Table 83 Absorbance of *P.emblica* extract 2 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.253	0.242	0.243	0.246	0.006
1	0.248	0.245	0.245	0.246	0.002
2	0.251	0.251	0.249	0.250	0.001
4	0.252	0.246	0.242	0.247	0.005
8	0.243	0.245	0.245	0.244	0.001
12	0.176	0.165	0.165	0.169	0.006

Table 84 GAE of *P.emblica* extract 2 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	24.04	23.01	23.11	23.39	0.57
1	23.57	23.29	23.29	23.39	0.16
2	23.85	23.85	23.67	23.79	0.11
4	23.95	23.39	23.01	23.45	0.47
8	23.11	23.29	23.29	23.23	0.11
12	16.86	15.83	15.83	16.17	0.59

Table 85 Absorbance of *P.emblica* extract 3 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.368	0.363	0.355	0.362	0.007
1	0.361	0.360	0.358	0.360	0.002
2	0.365	0.365	0.359	0.363	0.003
4	0.361	0.362	0.356	0.360	0.003
8	0.359	0.355	0.355	0.356	0.002
12	0.298	0.298	0.295	0.297	0.002

Table 86 GAE of *P.emblica* extract 3 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	34.77	34.30	33.56	34.21	0.61
1	34.12	34.02	33.84	33.99	0.14
2	34.49	34.49	33.93	34.30	0.32
4	34.12	34.21	33.65	33.99	0.30
8	33.93	33.56	33.56	33.68	0.22
12	28.24	28.24	27.96	28.15	0.16

Table 87 Absorbance of *P.emblica* extract 4 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.489	0.476	0.487	0.484	0.007
1	0.486	0.486	0.479	0.48367	0.004
2	0.485	0.484	0.478	0.48233	0.004
4	0.483	0.482	0.478	0.481	0.003
8	0.483	0.481	0.477	0.48033	0.003
12	0.402	0.399	0.403	0.40133	0.002

Table 88 GAE of *P.emblica* extract 4 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	46.06	44.85	45.87	45.59	0.65
1	45.78	45.78	45.13	45.56	0.38
2	45.69	45.59	45.03	45.44	0.35
4	45.50	45.41	45.03	45.31	0.25
8	45.50	45.31	44.94	45.25	0.29
12	37.94	37.66	38.04	37.88	0.19

Table 89 Absorbance of *P.emblica* extract 5 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.522	0.518	0.517	0.519	0.003
1	0.515	0.518	0.521	0.518	0.003
2	0.506	0.509	0.502	0.506	0.004
4	0.496	0.496	0.491	0.494	0.003
8	0.473	0.473	0.478	0.475	0.003
12	0.403	0.411	0.411	0.408	0.005

Table 90 GAE of *P.emblica* extract 4 mg/mL in liposomes pH 5.5 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	49.14	48.77	48.67	48.86	0.25
1	48.49	48.77	49.05	48.77	0.28
2	47.65	47.93	47.27	47.61	0.33
4	46.71	46.71	46.25	46.56	0.27
8	44.57	44.57	45.03	44.72	0.27
12	38.04	38.78	38.78	38.53	0.43

Table 91 Absorbance of *P.emblica* extract 1 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.128	0.119	0.113	0.120	0.008
1	0.123	0.125	0.119	0.122	0.003
2	0.121	0.118	0.125	0.121	0.004
4	0.128	0.123	0.124	0.125	0.003
8	0.127	0.115	0.118	0.120	0.006
12	0.093	0.095	0.095	0.094	0.001

Table 92 GAE of *P.emblica* extract 1 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	12.38	11.54	10.98	11.63	0.70
1	11.91	12.10	11.54	11.85	0.29
2	11.73	11.45	12.10	11.76	0.33
4	12.38	11.91	12.00	12.10	0.25
8	12.28	11.17	11.45	11.63	0.58
12	9.11	9.30	9.30	9.24	0.11

Table 93 Absorbance of *P.emblica* extract 2 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.218	0.227	0.224	0.223	0.005
1	0.221	0.219	0.227	0.222	0.004
2	0.219	0.224	0.226	0.223	0.004
4	0.221	0.222	0.222	0.222	0.001
8	0.218	0.219	0.218	0.218	0.001
12	0.172	0.178	0.181	0.177	0.005

Table 94 GAE of *P.emblica* extract 2 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	20.78	21.61	21.33	21.24	0.43
1	21.06	20.87	21.61	21.18	0.39
2	20.87	21.33	21.52	21.24	0.34
4	21.06	21.15	21.15	21.12	0.05
8	20.78	20.87	20.78	20.81	0.05
12	16.48	17.04	17.32	16.95	0.43

Table 95 Absorbance of *P. emblica* extract 3 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.348	0.338	0.349	0.345	0.006
1	0.341	0.346	0.342	0.343	0.003
2	0.339	0.339	0.342	0.340	0.002
4	0.337	0.335	0.343	0.338	0.004
8	0.334	0.342	0.339	0.338	0.004
12	0.289	0.285	0.285	0.286	0.002

Table 96 GAE of *P. emblica* extract 3 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	32.90	31.97	33.00	32.62	0.57
1	32.25	32.72	32.34	32.44	0.25
2	32.06	32.06	32.34	32.16	0.16
4	31.88	31.69	32.44	32.00	0.39
8	31.60	32.34	32.06	32.00	0.38
12	27.40	27.03	27.03	27.15	0.22



Table 97 Absorbance of *P.emblica* extract 4 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.458	0.449	0.449	0.452	0.005
1	0.451	0.456	0.447	0.451	0.005
2	0.455	0.455	0.449	0.453	0.003
4	0.453	0.451	0.453	0.452	0.001
8	0.449	0.446	0.451	0.449	0.003
12	0.392	0.397	0.397	0.395	0.003

Table 98 GAE of *P.emblica* extract 4 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	43.17	42.33	42.33	42.61	0.48
1	42.51	42.98	42.14	42.55	0.42
2	42.89	42.89	42.33	42.70	0.32
4	42.70	42.51	42.70	42.64	0.11
8	42.33	42.05	42.51	42.30	0.23
12	37.01	37.48	37.48	37.32	0.27

Table 99 Absorbance of *P.emblica* extract 5 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.485	0.493	0.486	0.488	0.004
1	0.491	0.491	0.485	0.489	0.003
2	0.487	0.482	0.481	0.483	0.003
4	0.485	0.482	0.489	0.485	0.004
8	0.481	0.478	0.485	0.481	0.004
12	0.388	0.387	0.383	0.386	0.003

Table 100 GAE of *P.emblica* extract 5 mg/mL in liposomes pH 7.4 stored 4°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	45.69	46.43	45.78	45.97	0.41
1	46.25	46.25	45.69	46.06	0.32
2	45.87	45.41	45.31	45.53	0.30
4	45.69	45.41	46.06	45.72	0.33
8	45.31	45.03	45.69	45.34	0.33
12	36.64	36.54	36.17	36.45	0.25

Table 101 Absorbance of *P.emblica* extract 1 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.128	0.119	0.113	0.120	0.008
1	0.127	0.117	0.114	0.119	0.007
2	0.123	0.115	0.118	0.119	0.004
4	0.112	0.115	0.112	0.113	0.002
8	0.118	0.112	0.11	0.113	0.004
12	0.065	0.065	0.062	0.064	0.002

Table 102 GAE of *P.emblica* extract 1 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	12.38	11.54	10.98	11.63	0.70
1	12.28	11.35	11.07	11.57	0.64
2	11.91	11.17	11.45	11.51	0.38
4	10.89	11.17	10.89	10.98	0.16
8	11.45	10.89	10.70	11.01	0.39
12	6.50	6.50	6.22	6.41	0.16

Table 103 Absorbance of *P.emblica* extract 2 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.218	0.227	0.224	0.223	0.005
1	0.227	0.225	0.215	0.222	0.006
2	0.225	0.221	0.217	0.221	0.004
4	0.225	0.223	0.218	0.222	0.004
8	0.222	0.219	0.215	0.219	0.004
12	0.215	0.151	0.152	0.173	0.037

Table 104 GAE of *P.emblica* extract 2 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	20.78	21.61	21.33	21.24	0.43
1	21.61	21.43	20.50	21.18	0.60
2	21.43	21.06	20.68	21.06	0.37
4	21.43	21.24	20.78	21.15	0.34
8	21.15	20.87	20.50	20.84	0.33
12	14.58	14.52	14.62	14.57	0.05



Table 105 Absorbance of *P.emblica* extract 3 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.348	0.338	0.349	0.345	0.006
1	0.346	0.356	0.337	0.346	0.010
2	0.345	0.345	0.334	0.341	0.006
4	0.338	0.336	0.336	0.337	0.001
8	0.339	0.332	0.332	0.334	0.004
12	0.258	0.258	0.255	0.257	0.002

Table 106 GAE of *P.emblica* extract 3 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	32.90	31.97	33.00	32.62	0.57
1	32.72	33.65	31.88	32.75	0.89
2	32.62	32.62	31.60	32.28	0.59
4	31.97	31.78	31.78	31.85	0.11
8	32.06	31.41	31.41	31.63	0.38
12	24.51	24.51	24.23	24.41	0.16

Table 107 Absorbance of *P.emblica* extract 4 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.458	0.449	0.449	0.452	0.005
1	0.457	0.452	0.443	0.451	0.007
2	0.456	0.454	0.442	0.451	0.008
4	0.454	0.452	0.446	0.451	0.004
8	0.449	0.442	0.442	0.444	0.004
12	0.358	0.351	0.351	0.353	0.004

Table 108 GAE of *P.emblica* extract 4 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	43.17	42.33	42.33	42.61	0.48
1	43.07	42.61	41.77	42.48	0.66
2	42.98	42.79	41.67	42.48	0.71
4	42.79	42.61	42.05	42.48	0.39
8	42.33	41.67	41.67	41.89	0.38
12	33.84	33.18	33.18	33.40	0.38

Table 109 Absorbance of *P.emblica* extract 5 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	Absorbance			Mean	SD
	N1	N2	N3		
0	0.485	0.493	0.486	0.488	0.004
1	0.491	0.491	0.485	0.489	0.003
2	0.489	0.491	0.486	0.489	0.003
4	0.489	0.489	0.485	0.488	0.002
8	0.486	0.481	0.481	0.483	0.003
12	0.335	0.338	0.335	0.336	0.002

Table 110 GAE of *P.emblica* extract 4 mg/mL in liposomes pH 7.4 stored 25°C

Time (week)	GAE ($\mu\text{g/mL}$)			Mean	SD
	N1	N2	N3		
0	45.69	46.43	45.78	45.97	0.41
1	46.25	46.25	45.69	46.06	0.32
2	46.06	46.25	45.78	46.03	0.23
4	46.06	46.06	45.69	45.94	0.22
8	45.78	45.31	45.31	45.47	0.27
12	31.69	31.97	31.69	31.78	0.16

APPENDIX VII

Statistical analysis

Table 111 Mean particle size of *P.emblica* extract in liposomes

		Multiple Comparisons				
		Mean particle size of <i>P.emblica</i> in liposomes				
		Tukey HSD				
				95% Confidence		
		Mean			Interval	
(I)	(J)	Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Liposomes pH 5.5 fresh	Liposomes pH 5.5 4°C	.23722	.21957	.887	-.4144	.8889
	Liposomes pH 5.5 25°C	-.37144	.21957	.544	-1.0231	.2802
	Liposomes pH 7.4 fresh	-.32856	.21957	.668	-.9802	.3231
	Liposomes pH 7.4 4°C	-4.19389*	.21957	.000	-4.8455	-3.5422
	Liposomes pH 7.4 25°C	-3.37378*	.21957	.000	-4.0254	-2.7221
Liposomes pH 5.5 4°C	Liposomes pH 5.5 fresh	-.23722	.21957	.887	-.8889	.4144
	Liposomes pH 5.5 25°C	-.60867	.21957	.080	-1.2603	.0430
	Liposomes pH 7.4 fresh	-.56578	.21957	.123	-1.2174	.0859
	Liposomes pH 7.4 4°C	-4.43111*	.21957	.000	-5.0828	-3.7795
	Liposomes pH 7.4 25°C	-3.61100*	.21957	.000	-4.2627	-2.9593
Liposomes pH 5.5 25°C	Liposomes pH 5.5 fresh	.37144	.21957	.544	-.2802	1.0231
	Liposomes pH 5.5 4°C	.60867	.21957	.080	-.0430	1.2603
	Liposomes pH 7.4 fresh	.04289	.21957	1.000	-.6088	.6945
	Liposomes pH 7.4 4°C	-3.82244*	.21957	.000	-4.4741	-3.1708
	Liposomes pH 7.4 25°C	-3.00233*	.21957	.000	-3.6540	-2.3507

(I)	VAR00003 (J) VAR00003	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
iposomes pH 7.4 fresh	Liposomes pH 5.5 fresh	.32856	.21957	.668	-.3231	.9802
	Liposomes pH 5.5 4°C	.56578	.21957	.123	-.0859	1.2174
	Liposomes pH 5.5 25°C	-.04289	.21957	1.000	-.6945	.6088
	Liposomes pH 7.4 4°C	-3.86533*	.21957	.000	-4.5170	-3.2137
	Liposomes pH 7.4 25°C	-3.04522*	.21957	.000	-3.6969	-2.3936
Liposomes pH 7.4 4°C	Liposomes pH 5.5 fresh	4.19389*	.21957	.000	3.5422	4.8455
	Liposomes pH 5.5 4°C	4.43111*	.21957	.000	3.7795	5.0828
	Liposomes pH 5.5 25°C	3.82244*	.21957	.000	3.1708	4.4741
	Liposomes pH 7.4 fresh	3.86533*	.21957	.000	3.2137	4.5170
	Liposomes pH 7.4 25°C	.82011*	.21957	.006	.1685	1.4718
Liposomes pH 7.4 25°C	Liposomes pH 5.5 fresh	3.37378*	.21957	.000	2.7221	4.0254
	Liposomes pH 5.5 4°C	3.61100*	.21957	.000	2.9593	4.2627
	Liposomes pH 5.5 25°C	3.00233*	.21957	.000	2.3507	3.6540
	Liposomes pH 7.4 fresh	3.04522*	.21957	.000	2.3936	3.6969
	Liposomes pH 7.4 4°C	-.82011*	.21957	.006	-1.4718	-.1685

*. The mean difference is significant at the 0.05 level.

Table 112 Particle size distribution of *P.emblica* extract in liposomes**Multiple Comparisons**

Span value of emblica in liposomes

Tukey HSD

(I)	(J) VAR00001	Mean		Sig.	95% Confidence Interval	
		Difference (I-J)	Std. Error		Lower Bound	Upper Bound
pH 5-5 fresh	pH 5-5 4 °C	-.76633	.35350	.272	-1.8155	.2828
	pH 5-5 25 °C	-6.46922*	.35350	.000	-7.5184	-5.4201
	pH 7-4 fresh	-.13122	.35350	.999	-1.1804	.9179
	pH 7-4 4 °C	-8.57311*	.35350	.000	-9.6223	-7.5240
	pH 7-4 25 °C	-9.02189*	.35350	.000	-10.0710	-7.9727
pH 5-5 4 °C	pH 5-5 fresh	.76633	.35350	.272	-.2828	1.8155
	pH 5-5 25 °C	-5.70289*	.35350	.000	-6.7520	-4.6537
	pH 7-4 fresh	.63511	.35350	.477	-.4140	1.6843
	pH 7-4 4 °C	-7.80678*	.35350	.000	-8.8559	-6.7576
	pH 7-4 25 °C	-8.25556*	.35350	.000	-9.3047	-7.2064
pH 5-5 25 °C	pH 5-5 fresh	6.46922*	.35350	.000	5.4201	7.5184
	pH 5-5 4 °C	5.70289*	.35350	.000	4.6537	6.7520
	pH 7-4 fresh	6.33800*	.35350	.000	5.2889	7.3871
	pH 7-4 4 °C	-2.10389*	.35350	.000	-3.1530	-1.0547
	pH 7-4 25 °C	-2.55267*	.35350	.000	-3.6018	-1.5035

(I)	(J) VAR00001	Mean		Sig.	95% Confidence Interval	
		Difference (I-J)	Std. Error		Lower Bound	Upper Bound
pH 7-4 fresh	pH 5-5 fresh	.13122	.35350	.999	-.9179	1.1804
	pH 5-5 4 °C	-.63511	.35350	.477	-1.6843	.4140
	pH 5-5 25 °C	-6.33800*	.35350	.000	-7.3871	-5.2889
	pH 7-4 4 °C	-8.44189*	.35350	.000	-9.4910	-7.3927
	pH 7-4 25 °C	-8.89067*	.35350	.000	-9.9398	-7.8415
pH 7-4 4 °C	pH 5-5 fresh	8.57311*	.35350	.000	7.5240	9.6223
	pH 5-5 4 °C	7.80678*	.35350	.000	6.7576	8.8559
	pH 5-5 25 °C	2.10389*	.35350	.000	1.0547	3.1530
	pH 7-4 fresh	8.44189*	.35350	.000	7.3927	9.4910
	pH 7-4 25 °C	-.44878	.35350	.800	-1.4979	.6004
pH 7-4 25 °C	pH 5-5 fresh	9.02189*	.35350	.000	7.9727	10.0710
	pH 5-5 4 °C	8.25556*	.35350	.000	7.2064	9.3047
	pH 5-5 25 °C	2.55267*	.35350	.000	1.5035	3.6018
	pH 7-4 fresh	8.89067*	.35350	.000	7.8415	9.9398
	pH 7-4 4 °C	.44878	.35350	.800	-.6004	1.4979

*. The mean difference is significant at the 0.05 level.

Table 113 % Remaining of highest percent encapsulation of *P. emblica* emblica extract in liposomes

Multiple Comparisons

% Remaining of highest percent encapsulation of *P. emblica* extract in liposomes

Tukey HSD

(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1 mg/mL in liposomes pH 5.5 in refrigerator	1 mg/mL in liposomes pH 5.5 in room temperature	1.57000	1.25353	.614	-2.4442	5.5842
	2 mg/mL in liposomes pH 7.4 in refrigerator	-2.94000	1.25353	.166	-6.9542	1.0742
	2 mg/mL in liposomes pH 7.4 in room temperature	6.26667*	1.25353	.005	2.2524	10.2809

(I) VAR00001	(J) VAR00001	Mean		Sig.	95% Confidence Interval	
		Difference (I-J)	Std. Error		Lower Bound	Upper Bound
1 mg/mL in liposomes pH 5.5 in room temperature	1 mg/mL in liposomes pH 5.5 in refrigerator	-1.57000	1.25353	.614	-5.5842	2.4442
	2 mg/mL in liposomes pH 7.4 in refrigerator	-4.51000*	1.25353	.029	-8.5242	-.4958
	2 mg/mL in liposomes pH 7.4 in room temperature	4.69667*	1.25353	.023	.6824	8.7109
2 mg/mL in liposomes pH 7.4 in refrigerator	1 mg/mL in liposomes pH 5.5 in refrigerator	2.94000	1.25353	.166	-1.0742	6.9542
	1 mg/mL in liposomes pH 5.5 in room temperature	4.51000*	1.25353	.029	.4958	8.5242
	2 mg/mL in liposomes pH 7.4 in room temperature	9.20667*	1.25353	.000	5.1924	13.2209

(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
2 mg/mL in liposomes pH 7.4 in room temperature	1 mg/mL in liposomes pH 5.5 in refrigerator	-6.26667*	1.25353	.005	-10.2809	-2.2524
	1 mg/mL in liposomes pH 5.5 in room temperature	-4.69667*	1.25353	.023	-8.7109	-.6824
	2 mg/mL in liposomes pH 7.4 in refrigerator	-9.20667*	1.25353	.000	-13.2209	-5.1924

*. The mean difference is significant at the 0.05 level.

Table 114 % Remaining of highest percent remaining of *P. emblica* emblica extract in liposomes

Multiple Comparisons

% Remaining of highest percent remaining of *P. emblica* extract in liposomes

Tukey HSD

(I) VAR00001	(J) VAR00001	Mean		Sig.	95% Confidence Interval	
		Difference (I-J)	Std. Error		Lower Bound	Upper Bound
3 mg/mL in liposomes pH 5.5 in refrigerator	4 mg/mL in liposomes pH 5.5 in room temperature	1.57000	1.25353	.614	-2.4442	5.5842
	4 mg/mL in liposomes pH 7.4 in refrigerator	-2.94000	1.25353	.166	-6.9542	1.0742
	4 mg/mL in liposomes pH 7.4 in room temperature	6.26667*	1.25353	.005	2.2524	10.2809

(I) VAR00001	(J) VAR00001	Mean		Sig.	95% Confidence Interval	
		Difference (I-J)	Std. Error		Lower Bound	Upper Bound
4 mg/mL in liposomes pH 5.5 in room temperature	3 mg/mL in liposomes pH 5.5 in refrigerator	-1.57000	1.25353	.614	-5.5842	2.4442
	4 mg/mL in liposomes pH 7.4 in refrigerator	-4.51000*	1.25353	.029	-8.5242	-.4958
	4 mg/mL in liposomes pH 7.4 in room temperature	4.69667*	1.25353	.023	.6824	8.7109

Multiple Comparisons

Table 115 % Encapsulation efficiency of *P. emblica* extract in liposomes

Tukey HSD

(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1 mg/mL liposomes pH 5.5	2 mg/mL liposomes pH 5.5	11.99667*	1.93698	.001	5.6219	18.3714
	3 mg/mL liposomes pH 5.5	7.36000*	1.93698	.023	.9852	13.7348
	4 mg/mL liposomes pH 5.5	13.74667*	1.93698	.000	7.3719	20.1214
	5 mg/mL liposomes pH 5.5	9.13000*	1.93698	.006	2.7552	15.5048
2 mg/mL liposomes pH 5.5	1 mg/mL liposomes pH 5.5	-11.99667*	1.93698	.001	-18.3714	-5.6219
	3 mg/mL liposomes pH 5.5	-4.63667	1.93698	.194	-11.0114	1.7381
	4 mg/mL liposomes pH 5.5	1.75000	1.93698	.889	-4.6248	8.1248
	5 mg/mL liposomes pH 5.5	-2.86667	1.93698	.596	-9.2414	3.5081

(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
3 mg/mL liposomes pH 5.5	1 mg/mL liposomes pH 5.5	-7.36000*	1.93698	.023	-13.7348	-.9852
	2 mg/mL liposomes pH 5.5	4.63667	1.93698	.194	-1.7381	11.0114
	4 mg/mL liposomes pH 5.5	6.38667*	1.93698	.050	.0119	12.7614
	5 mg/mL liposomes pH 5.5	1.77000	1.93698	.885	-4.6048	8.1448
4 mg/mL liposomes pH 5.5	1 mg/mL liposomes pH 5.5	-13.74667*	1.93698	.000	-20.1214	-7.3719
	2 mg/mL liposomes pH 5.5	-1.75000	1.93698	.889	-8.1248	4.6248
	3 mg/mL liposomes pH 5.5	-6.38667*	1.93698	.050	-12.7614	-.0119
	5 mg/mL liposomes pH 5.5	-4.61667	1.93698	.197	-10.9914	1.7581

(I) VAR00001	(J) VAR00001	Mean		Sig.	95% Confidence Interval	
		Difference (I-J)	Std. Error		Lower Bound	Upper Bound
5 mg/mL liposomes pH 5.5	1 mg/mL liposomes pH 5.5	-9.13000*	1.93698	.006	-15.5048	-2.7552
	2 mg/mL liposomes pH 5.5	2.86667	1.93698	.596	-3.5081	9.2414
	3 mg/mL liposomes pH 5.5	-1.77000	1.93698	.885	-8.1448	4.6048
	4 mg/mL liposomes pH 5.5	4.61667	1.93698	.197	-1.7581	10.9914

*. The mean difference is significant at the 0.05 level.



VITA

Miss Pornpen Kongaimpatee was born on November 9, 1971 in Bangkok, Thailand. She received her Bachelor's Degree of Pharmacy from Rangsit University in 1995. After graduation, she worked at Janssen Pharmaceutica Company for 2 years. After that she has own business in chemist before entering the Master's Degree program in Pharmaceutical Technology at Chulalongkorn University.