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APPENDICES

APPENDIX A
The physical properties of core pellets

Table 1A Physical properties of core pellets

Properties	Propranolol hydrochloride pellets		Diclofenac sodium pellets	
	value	Mean (SD)	value	Mean (SD)
Moisture content (%)	0.40	0.43 (0.04)	0.71	0.76 (0.04)
	0.41		0.80	
	0.48		0.76	
Angle of repose (deg)	18.02	17.81 (0.20)	16.98	16.92 (0.20)
	17.98		16.60	
	17.54		16.85	
	17.71		17.06	
	17.80		17.10	
Flow rate (g/s)	11.64	11.71 (0.08)	13.35	13.33 (0.16)
	11.71		13.35	
	11.85		13.08	
	11.64		13.53	
	11.71		13.35	
Bulk density (g/cm ³)	0.6673	0.6673 (0.00)	0.7415	0.7426 (0.00)
	0.6673		0.7442	
	0.6673		0.7415	
	0.6673		0.7442	
	0.6673		0.7415	
Tapped density (g/cm ³)	0.6903	0.6903 (0.00)	0.7700	0.7712 (0.00)
	0.6903		0.7730	
	0.6903		0.7700	
	0.6903		0.7730	
	0.6903		0.7700	
Percent Compressibility (%)	3.33	3.33 (0.00)	3.70	3.71(0.01)
	3.33		3.72	
	3.33		3.70	
	3.33		3.72	
	3.33		3.70	

Apparent pellet density (g/cm³)	1.3260	1.3267 (0.00)	1.5183	1.5144 (0.00)
	1.3275		1.5155	
	1.3290		1.5153	
	1.3250		1.5114	
	1.3257		1.5115	
Percent friability (%)	0.01	0.01 (0.01)	0.01	0.01 (0.00)
	0.01		0.01	
	0.01		0.01	
	0.00		0.01	
	0.02		0.00	

Table 2A Image analysis and crushing force data of drug core pellets

No.	Mean diameter(μm)		Aspect ratio		Roundness		Crushing force (g)	
	PL	DS	PL	DS	PL	DS	PL	DS
1	956.86	891.83	1.1049	1.1132	1.1118	1.1202	805.192	894.339
2	957.93	900.09	1.0698	1.0524	1.1638	1.1184	908.368	868.269
3	962.36	901.14	1.0738	1.0618	1.1152	1.1190	976.305	967.136
4	967.58	911.73	1.2112	1.1004	1.1964	1.1278	1038.277	517.979
5	973.18	913.95	1.0101	1.0948	1.1207	1.1528	1116.266	1060.260
6	976.17	916.90	1.0808	1.0843	1.1625	1.1305	1378.293	1045.126
7	983.10	917.50	1.0770	1.1988	1.2361	1.1400	810.053	1117.150
8	986.78	917.76	1.2341	1.2002	1.2191	1.1502	782.215	1218.890
9	988.76	926.82	1.0995	1.2208	1.1202	1.1342	920.188	906.048
10	989.70	929.51	1.0440	1.0880	1.1123	1.1180	1536.482	900.635
11	991.20	933.19	1.1995	1.0587	1.1236	1.1151	524.938	1113.173
12	991.79	935.32	1.2059	1.0661	1.1357	1.1296	1001.712	680.475
13	992.83	935.57	1.1301	1.0801	1.1873	1.1066	706.766	1108.092
14	992.99	936.23	1.0305	1.1381	1.1576	1.1356	889.036	1124.883
15	993.70	938.08	1.0477	1.0565	1.1212	1.1145	1092.295	1206.186
16	993.96	939.22	1.0702	1.1351	1.1121	1.1158	1136.482	746.645
17	998.90	947.13	1.1058	1.1218	1.1959	1.1221	784.314	1258.989
18	1000.95	948.42	1.1774	1.0868	1.1287	1.1279	1245.292	1160.674
19	1005.88	948.44	1.0885	1.0150	1.1204	1.1212	1050.539	1165.093
20	1007.41	948.49	1.0226	1.1335	1.1165	1.1308	1258.216	1363.822
21	1007.58	951.08	1.0820	1.0504	1.1281	1.1219	743.441	1025.905
22	1008.11	952.19	1.0742	1.0910	1.2461	1.1332	711.295	818.890
23	1009.13	958.93	1.0377	1.1664	1.1619	1.1250	549.351	996.079
24	1012.55	963.59	1.0400	1.1262	1.1896	1.1149	603.701	895.222
25	1016.31	970.67	1.1258	1.0758	1.1244	1.1124	540.072	881.414
26	1017.33	970.84	1.0545	1.1176	1.1088	1.1160	522.839	610.660
27	1019.08	971.78	1.1344	1.0911	1.1293	1.1200	1343.165	862.524
28	1021.91	974.06	1.0380	1.0605	1.1151	1.1176	1112.179	940.293
29	1022.85	975.77	1.0479	1.0366	1.1288	1.1234	966.363	1058.934
30	1024.10	975.89	1.1759	1.0991	1.1477	1.1416	747.418	895.222

31	1024.18	977.53	1.1625	1.0667	1.1983	1.1264	785.198	731.842
32	1024.24	982.33	1.1212	1.0129	1.1407	1.1270	878.652	934.659
33	1026.19	987.55	1.1226	1.0943	1.1721	1.1079	960.177	1111.958
34	1026.54	987.74	1.1835	1.1326	1.1239	1.1281	844.518	863.739
35	1027.45	988.92	1.1335	1.0214	1.1729	1.1280	817.343	993.096
36	1028.95	991.22	1.0751	1.0165	1.1037	1.1452	1174.482	1020.713
37	1029.97	991.94	1.0339	1.0485	1.1244	1.1136	571.444	1066.667
38	1034.02	992.83	1.0473	1.0194	1.1096	1.1168	482.961	716.819
39	1035.51	996.67	1.1845	1.1314	1.1431	1.1532	831.925	779.674
40	1036.17	997.49	1.0676	1.1662	1.1155	1.1182	896.438	1200.994
41	1036.33	998.20	1.0457	1.1669	1.1140	1.1175	875.891	574.317
42	1037.88	999.91	1.1179	1.1409	1.1189	1.1319	1034.411	816.791
43	1038.06	1000.96	1.0711	1.0613	1.1414	1.1223	968.351	936.427
44	1040.24	1004.24	1.0718	1.0959	1.1238	1.1371	878.321	1153.273
45	1043.26	1005.36	1.1125	1.0358	1.1684	1.1245	729.743	722.011
46	1045.08	1008.90	1.0499	1.1148	1.1260	1.1218	662.911	1118.476
47	1048.17	1009.41	1.0755	1.0983	1.1395	1.1015	1089.975	842.530
48	1050.56	1010.47	1.0956	1.1413	1.1692	1.1248	549.682	1010.439
49	1052.05	1016.73	1.0941	1.0280	1.2805	1.1289	671.527	565.369
50	1053.34	1017.84	1.0795	1.0934	1.1199	1.1300	978.293	877.658
51	1054.43	1018.96	1.1500	1.0813	1.1329	1.1136		
52	1056.70	1019.98	1.1097	1.0271	1.1200	1.1184		
53	1059.48	1027.57	1.0079	1.0222	1.1818	1.1246		
54	1060.73	1027.68	1.0750	1.0717	1.1510	1.1319		
55	1064.95	1029.54	1.0491	1.0516	1.1592	1.1248		
56	1065.20	1032.37	1.0514	1.0634	1.1056	1.1041		
57	1067.50	1033.41	1.2156	1.0742	1.1243	1.1393		
58	1071.30	1033.62	1.1486	1.0618	1.1343	1.1186		
59	1072.75	1036.01	1.1531	1.0622	1.1186	1.1223		
60	1078.43	1037.54	1.0369	1.1651	1.1187	1.1406		
61	1080.12	1047.06	1.0842	1.0802	1.1150	1.1247		
62	1084.17	1049.28	1.1164	1.0175	1.1453	1.1160		
63	1084.93	1052.10	1.1305	1.1210	1.1170	1.1306		
64	1088.04	1057.06	1.1252	1.1850	1.1814	1.1211		
65	1089.01	1058.95	1.0962	1.1185	1.1236	1.1638		
66	1091.34	1059.20	1.0756	1.0907	1.1444	1.1176		
67	1094.13	1059.21	1.1043	1.0626	1.1299	1.1144		
68	1094.20	1060.14	1.1211	1.0923	1.1227	1.1236		
69	1097.42	1061.78	1.0255	1.2346	1.1593	1.1570		
70	1100.19	1062.20	1.1300	1.0405	1.1155	1.1021		
71	1101.03	1062.23	1.0860	1.0853	1.4000	1.1023		
72	1102.54	1063.09	1.0827	1.0396	1.1693	1.1242		
73	1103.41	1064.58	1.0772	1.0468	1.1212	1.1334		
74	1106.25	1064.69	1.0828	1.0955	1.1434	1.1304		
75	1109.08	1064.72	1.1347	1.0574	1.1195	1.1131		
76	1111.88	1065.79	1.0822	1.0796	1.1062	1.1165		
77	1113.33	1068.58	1.2325	1.0620	1.1459	1.1236		
78	1114.21	1071.69	1.1086	1.0798	1.1216	1.1156		
79	1115.88	1071.88	1.0765	1.1690	1.1226	1.4618		
80	1116.11	1072.45	1.0802	1.1961	1.3199	1.1226		
81	1117.99	1073.75	1.1368	1.0468	1.1281	1.1207		

82	1119.71	1076.51	1.0542	1.0353	1.1137	1.1049		
83	1120.01	1078.25	1.0436	1.1290	1.1248	1.1192		
84	1120.38	1078.65	1.1572	1.0959	1.2236	1.1223		
85	1120.62	1078.73	1.0323	1.0133	1.1243	1.1177		
86	1121.35	1079.67	1.1635	1.0555	1.1403	1.1184		
87	1122.04	1085.78	1.0371	1.1298	1.1088	1.1336		
88	1122.34	1086.81	1.0695	1.1755	1.1204	1.1186		
89	1123.41	1096.67	1.0098	1.0848	1.1116	1.1712		
90	1124.32	1102.58	1.0649	1.1076	1.1126	1.1426		
91	1127.25	1102.81	1.1341	1.0415	1.1285	1.1191		
92	1127.34	1115.73	1.0939	1.1402	1.1081	1.1373		
93	1127.45	1120.61	1.1703	1.1230	1.2811	1.1118		
94	1128.03	1120.77	1.0806	1.1247	1.1240	1.1209		
95	1130.01	1130.13	1.1317	1.0212	1.1190	1.1261		
96	1130.06	1135.14	1.1832	1.0342	1.1325	1.1224		
97	1135.83	1137.80	1.0889	1.0339	1.1248	1.1247		
98	1137.03	1141.17	1.0883	1.0625	1.1759	1.1137		
99	1139.97	1150.08	1.1510	1.0574	1.1672	1.1275		
100	1143.50	1154.97	1.1724	1.1216	1.1336	1.1448		
Mean (SD)	1057.97 (52.46)	1018.48 (65.45)	1.0995 (0.0527)	1.0898 (0.0504)	1.1462 (0.0476)	1.1283 (0.0360)	889.666 (240.050)	948.929 (192.179)

APPENDIX B

Validation of HPLC method

The HPLC method was used to determine the drug content of propranolol hydrochloride (PL) and diclofenac sodium (DS) pellets. The validation of HPLC methods used are presented as follows:

1. Specificity

From Figures 1B and 5B, PL and DS standard were eluted at 9-10 min. Figures 2B and 6B shows the chromatogram in presence of PL and DS with other excipients including MCC, HPMC, EC, PEG6000, TEC, Sunset yellow and 6-FAM. It indicated that the other ingredients did not interfere the peaks of drugs.

2. Accuracy

Tables 1B and 2B shows the percentage of analytical recovery of PL and DS respectively. The mean percentage of analytical recovery complied to the range of 95-105 % with low % RSD (<2.00 %) indicated the high accuracy of this method.

3. Precision

Tables 3B and 4B shows data of within run precision of PL and DS analyzed by HPLC method. Tables 5B and 6B shows data of between run precision of PL and DS analyzed by HPLC method. The percentage of coefficient of variation (%RSD) values of peak area both within run and between run were low (<2.00 %) which indicated that HPLC methods could determine the amount of the drugs over period of time studied.

4. Linearity

Figures 9B and 10B shows the relationship between peak area and drug concentrations is linear with the correlation of determination value closely to 1.0. This result indicated that HPLC method was acceptable for quantitative analysis of both drugs in the range studied.

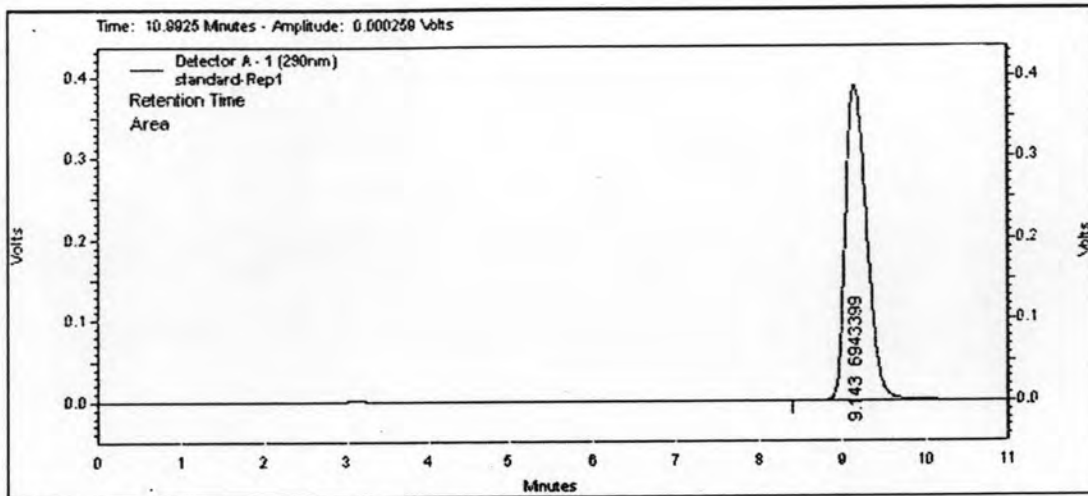


Figure 1B The chromatogram of standard of PL

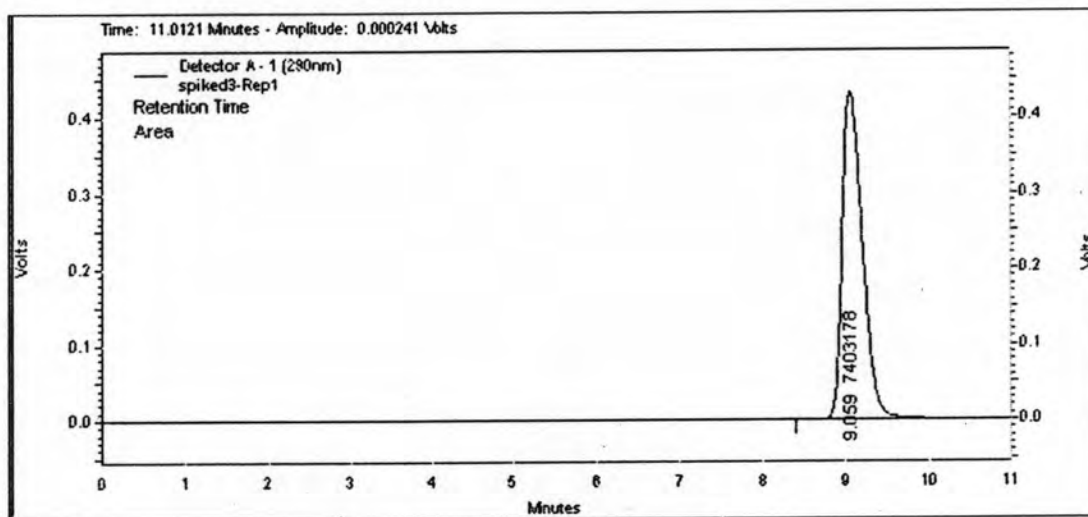


Figure 2B The chromatogram of specificity of PL

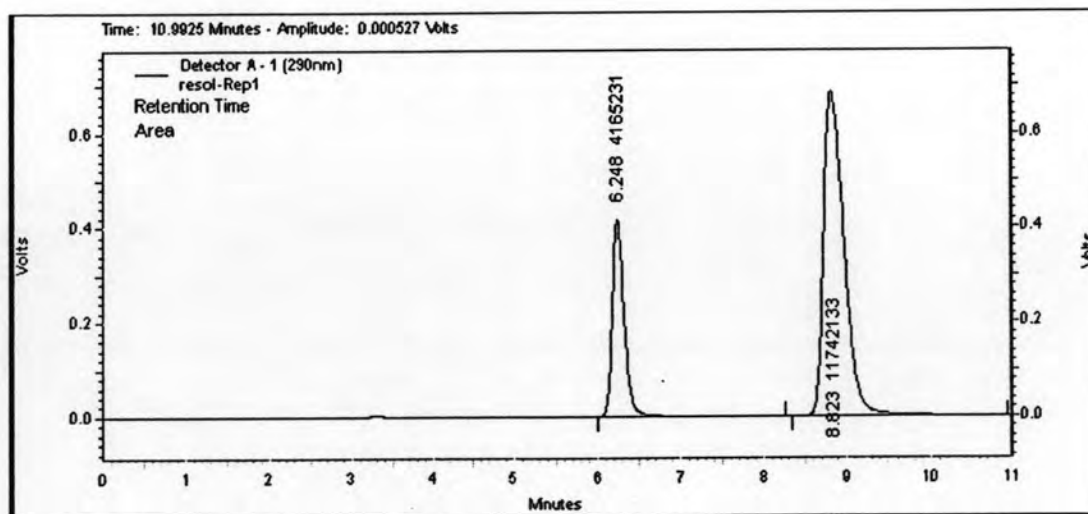


Figure 3B The chromatogram of resolution of PL

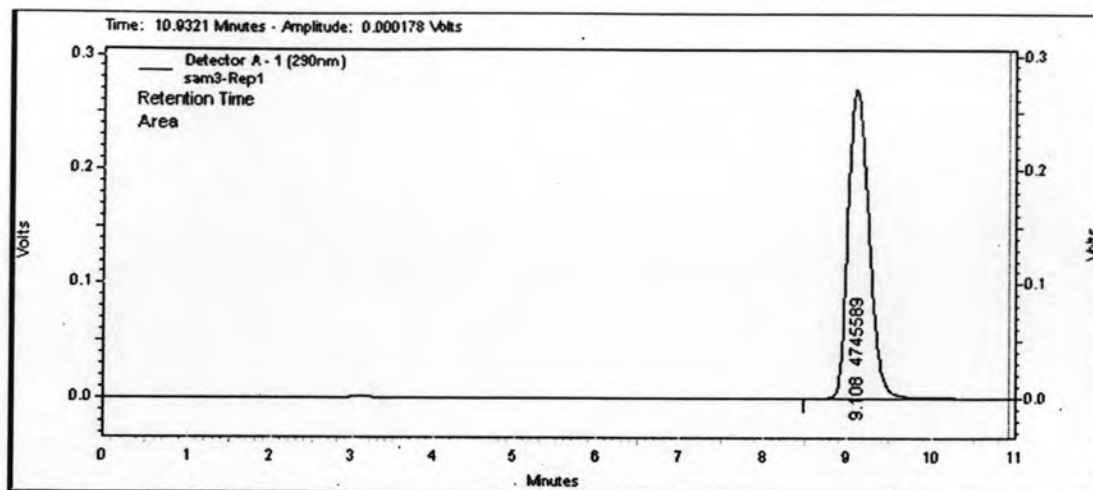


Figure 4B The chromatogram of sample of PL

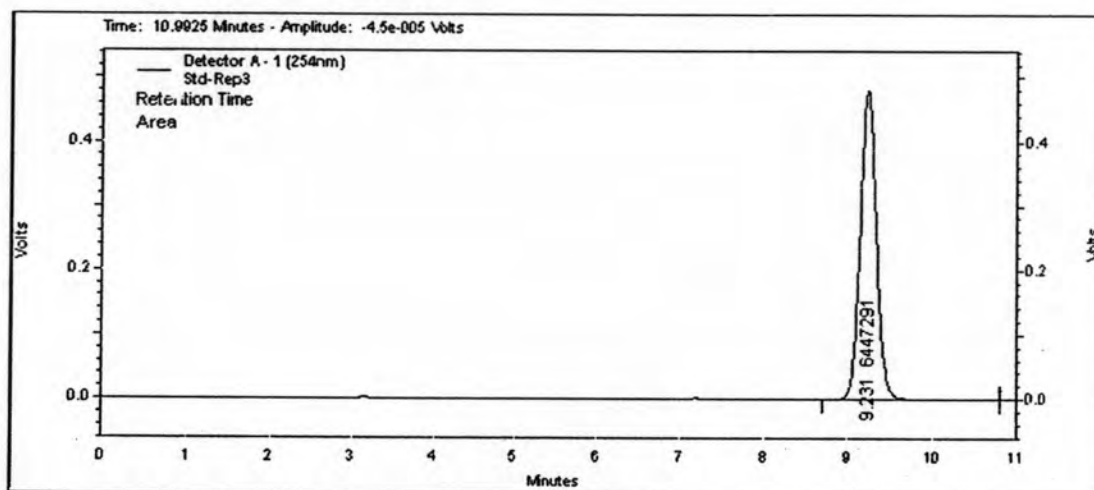


Figure 5B The chromatogram of standard of DS

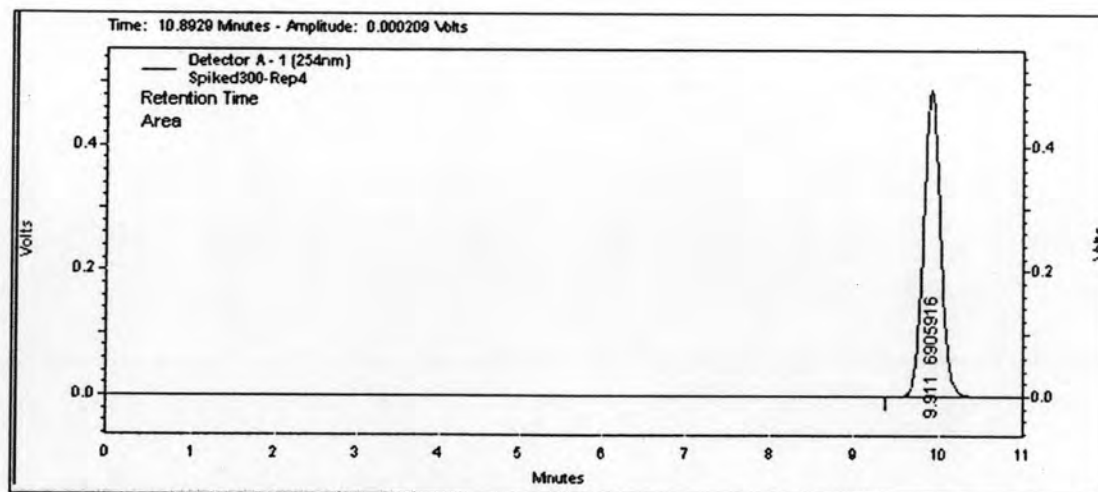


Figure. 6B The chromatogram of specificity of DS

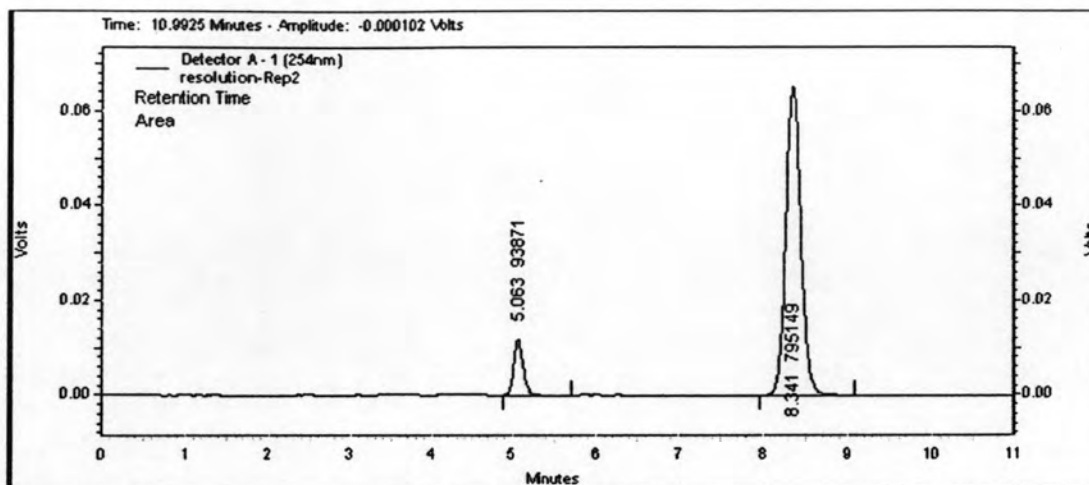


Figure 7B The chromatogram of resolution of DS

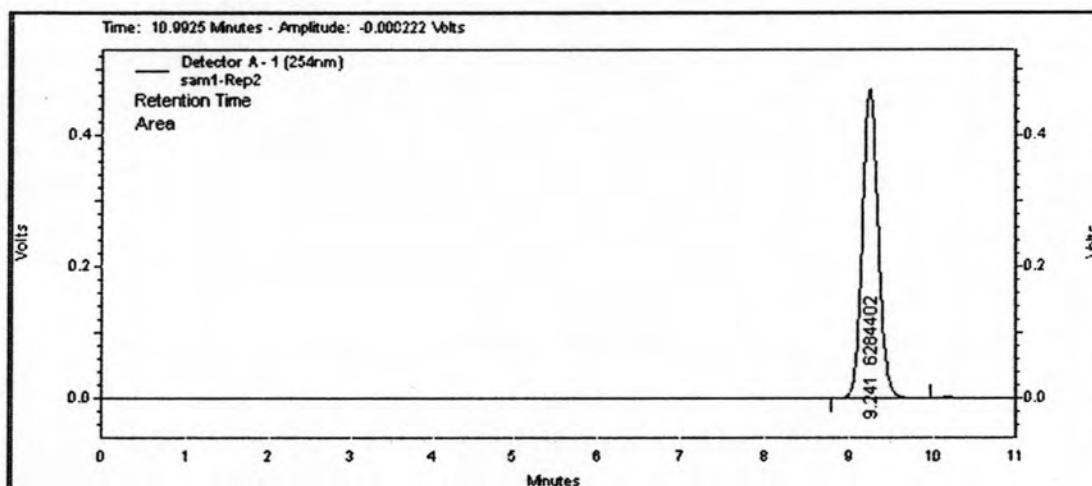


Figure 8B The chromatogram of sample of DS

Table 1B Accuracy data of percentage of analytical recovery of propranolol hydrochloride.

Actual concentration (µg/ml)	Peak area	Analytical concentration (µg/ml)	%Recovery	Average (SD)	%RSD
99.96	2502655	104.21	104.25	104.26 (0.13)	0.12
	2500133	104.10	104.14		
	2504682	104.29	104.33		
	2499919	104.09	104.14		
	2506986	104.39	104.43		
199.92	4846721	201.81	100.95	101.47 (0.37)	0.36
	4871354	202.84	101.46		
	4889543	203.60	101.84		
	4864181	202.54	101.31		
	4887755	203.52	101.80		
299.88	7403178	308.26	102.79	103.46 (0.48)	0.47
	7456561	310.48	103.54		
	7436096	309.63	103.25		
	7497440	312.19	104.10		
	7463726	310.78	103.64		
399.84	9716321	404.58	101.19	101.43 (0.28)	0.28
	9786552	407.50	101.92		
	9732927	405.27	101.36		
	9731080	405.19	101.34		
	9733723	405.30	101.37		
499.80	12157054	506.21	101.28	101.82 (0.31)	0.31
	12231185	509.29	101.90		
	12227015	509.12	101.86		
	12238706	509.61	101.96		
	12254912	510.28	102.10		

Table 2B Accuracy data of percentage of analytical recovery of diclofenac sodium.

Actual concentration (µg/ml)	Peak area	Analytical concentration (µg/ml)	%Recovery	Average (SD)	%RSD
100.34	2250671	101.15	100.81	100.75 (0.47)	0.47
	2250150	101.12	100.78		
	2256753	101.42	101.08		
	2231732	100.30	99.96		
	2257763	101.47	101.12		
200.68	4522498	203.25	101.28	103.05 (1.05)	1.02
	4620076	207.63	103.46		
	4595495	206.53	102.91		
	4634955	208.30	103.80		
	4635151	208.31	103.80		
301.01	6825780	306.76	102.25	103.49 (0.82)	0.79
	6904632	310.30	103.43		
	6910421	310.56	103.52		
	6979477	313.67	104.55		
	6920971	311.04	103.68		
401.35	8786246	394.87	98.38	98.47 (0.07)	0.07
	8804291	395.68	98.59		
	8793371	395.19	98.46		
	8793125	395.18	98.46		
	8793484	395.19	98.47		
501.69	11118547	499.68	99.60	99.60 (0.07)	0.07
	11122628	499.87	99.64		
	11121450	499.81	99.63		
	11122780	499.87	99.64		
	11104678	499.06	99.48		

Table 3B Within run precision data of propranolol hydrochloride.

Concentration ($\mu\text{g/ml}$)	Peak area				
	96.95	193.89	290.84	387.78	484.73
1	2402375	4823791	7089846	9393729	11565058
2	2394991	4801910	7116817	9406573	11580952
3	2399938	4764796	7058894	9411224	11607935
4	2393859	4773350	7004965	9355271	11652084
5	2407713	4785969	7142917	9416497	11647202
Average	2399775	4789963	7082688	9396659	11610646
SD	5649.87	23518.00	53503.68	24624.81	38796.90
%RSD	0.24	0.49	0.76	0.26	0.33

Table 4B Within run precision data of diclofenac sodium.

Concentration ($\mu\text{g/ml}$)	Peak area				
	99.70	199.40	299.10	398.80	498.50
1	2222590	4406832	6596527	8621328	10781968
2	2223804	4435018	6647217	8686527	10862825
3	2225405	4427811	6658830	8692763	10870723
4	2222065	4429867	6696955	8691326	10875358
5	2220071	4435772	6664561	8694425	10878095
Average	2222787	4427060	6652818	8677274	10853794
SD	1989.03	11798.77	36476.58	31412.97	40566.82
%RSD	0.09	0.27	0.55	0.36	0.37

Table 5B Between run precision data of propranolol hydrochloride.

Concentration ($\mu\text{g/ml}$)	Peak area									
	Day 1					Day 2				
	96.95	193.89	290.84	387.78	484.73	99.90	199.80	299.70	399.60	499.50
1	2402375	4823791	7089846	9393729	11565058	2433935	4722730	6921713	9160730	11675706
2	2394991	4801910	7116817	9406573	11580952	2425661	4699697	7024814	9290721	11814788
3	2399938	4764796	7058894	9411224	11607935	2419671	4716225	7041772	9304989	11833257
4	2393859	4773350	7004965	9355271	11652084	2418867	4725716	7038274	9308577	11833821
5	2407713	4785969	7142917	9416497	11647202	2421655	4723897	7037970	9316270	11856439
Average	2399775	4789963	7082688	9396659	11610646	2423958	4717653	7012909	9276257	11802802
SD	5649.87	23518.00	53503.68	24624.81	38796.90	6165.25	10656.37	51388.10	65243.48	72566.64
%RSD	0.24	0.49	0.76	0.26	0.33	0.25	0.23	0.73	0.70	0.61

Table 6B Between run precision data of diclofenac sodium.

Concentration (µg/ml)	Peak area									
	Day 1					Day 2				
	99.70	199.40	299.10	398.80	498.50	100.34	200.68	301.01	401.35	501.69
1	2222590	4406832	6596527	8621328	10781968	2227415	4294709	7019003	8737488	10916066
2	2223804	4435018	6647217	8686527	10862825	2227563	4323851	7024910	8709067	10919663
3	2225405	4427811	6658830	8692763	10870723	2228310	4310658	7015855	8752309	10901733
4	2222065	4429867	6696955	8691326	10875358	2224713	4340880	7027155	8740771	10918714
5	2220071	4435772	6664561	8694425	10878095	2225483	4309864	7023596	8776705	10920054
Average	2222787	4427060	6652818	8677274	10853794	2226697	4315992	7022104	8743268	10915246
SD	1989.03	11798.77	36476.58	31412.97	40566.82	1522.93	17321.56	4590.17	24541.42	7712.45
%RSD	0.09	0.27	0.55	0.36	0.37	0.07	0.40	0.07	0.28	0.07

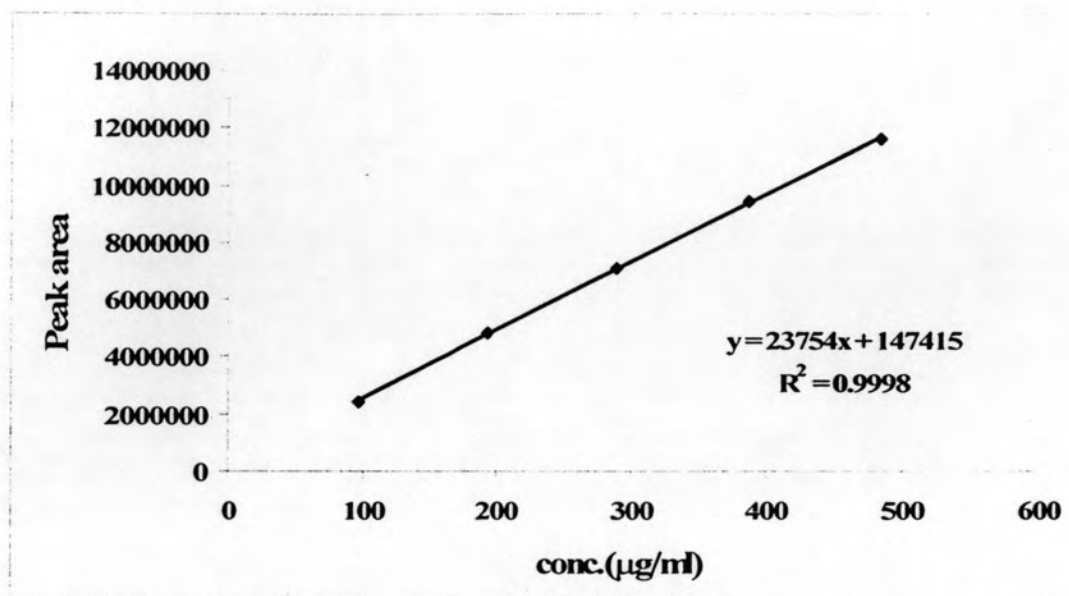


Figure 9B Calibration curve showing linearity between peak area and propranolol hydrochloride concentrations analyzed by HPLC method.

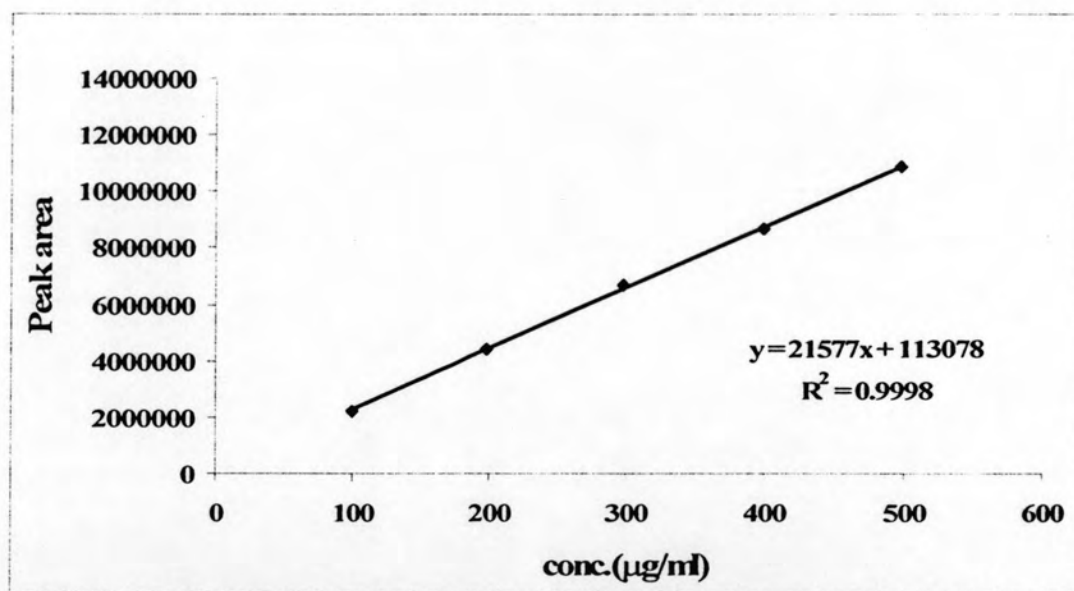


Figure 10B Calibration curve showing linearity between peak area and propranolol hydrochloride concentrations analyzed by HPLC method.

APPENDIX C

Calibration curve

1. Calibration curve of propranolol hydrochloride for dissolution studies

The relationship between propranolol hydrochloride concentration ($\mu\text{g/ml}$) versus absorbance in dilute hydrochloric acid at a maximum wavelength of 294 nm are presented in Table 1C. The calibration curve of propranolol hydrochloride obtained by regression analysis of these data are depicted in Figure 1C

Table 1C Absorbance of propranolol hydrochloride in dilute hydrochloric acid at maximum wavelength of 294 nm.

Concentration ($\mu\text{g/ml}$)	Absorbance			
	1	2	3	Average
10.30	0.2157	0.2158	0.2158	0.2158
20.60	0.4219	0.4219	0.4220	0.4219
30.90	0.6319	0.6322	0.6322	0.6321
41.21	0.8463	0.8460	0.8463	0.8462
51.51	1.0563	1.0565	1.0566	1.0564

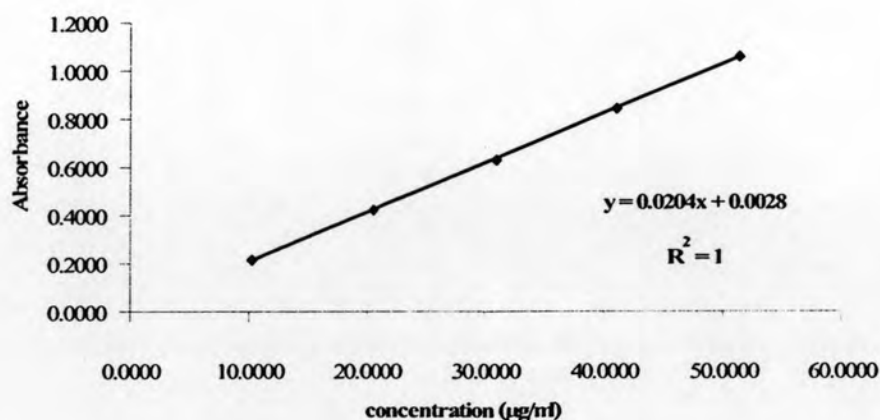


Figure 1C Calibration curve of propranolol hydrochloride in dilute HCl (1:100) at 294 nm.

2. Calibration curve of diclofenac sodium for dissolution studies

The concentration ($\mu\text{g/ml}$) versus absorbance of diclofenac sodium in phosphate buffer pH 6.8 at a maximum wavelength of 281 nm are presented in Table 2C. The calibration curve of diclofenac sodium obtained by regression analysis of these data are illustrated in Figure 2C .

Table 2C Absorbance of diclofenac sodium in phosphate buffer pH 6.8 at maximum wavelength of 281 nm.

Concentration ($\mu\text{g/ml}$)	Absorbance			
	1	2	3	Average
8.62	0.2950	0.2950	0.2951	0.2950
12.92	0.4388	0.4388	0.4388	0.4388
17.23	0.5826	0.5827	0.5825	0.5826
21.54	0.7260	0.7263	0.7263	0.7262
25.85	0.8784	0.8782	0.8783	0.8783

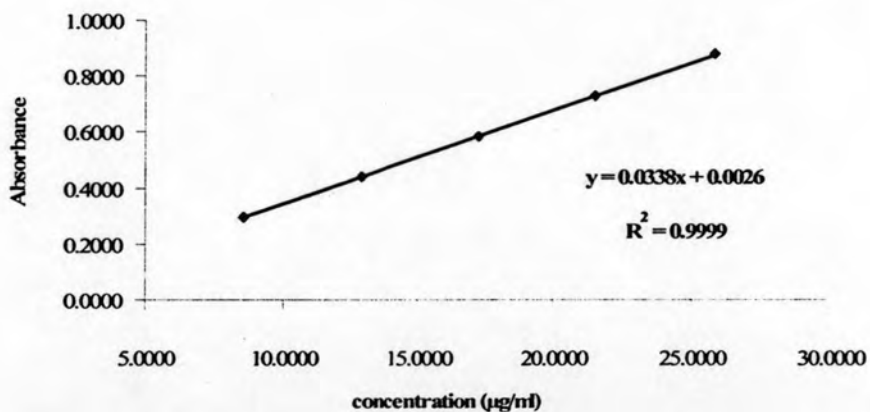


Figure 2C Calibration curve of diclofenac sodium in phosphate buffer pH 6.8 at 281 nm.

APPENDIX D

Dissolution study

Table 1D Percentage amount of propranolol hydrochloride (PL) release from HPMC coated pellets in dilute hydrochloric acid (1:100).

Conditions	Time (min)	% PL release			Mean (%)	SD
		n1	n2	n3		
PL-HPMC (+)	5	50.88	55.80	55.33	54.01	2.72
	10	78.98	81.40	81.00	80.46	1.30
	15	93.40	94.11	94.68	94.07	0.64
	25	105.13	106.13	104.08	105.11	1.02
	40	103.68	104.84	106.12	104.88	1.22
	70	106.67	95.14	105.39	102.40	6.32
	100	99.58	101.68	106.34	102.53	3.46
	180	105.04	106.93	107.11	106.36	1.14
PL-HPMC (non)	5	58.68	60.19	58.10	58.99	1.08
	10	81.40	83.13	85.16	83.23	1.88
	15	95.04	96.57	96.48	96.03	0.85
	25	105.84	106.02	97.91	103.25	4.63
	40	106.04	107.80	106.30	106.71	0.95
	70	101.60	103.38	104.21	103.06	1.33
	100	106.54	107.11	106.96	106.87	0.29
	180	108.42	110.79	107.62	108.94	1.65
PL-HPMC (-)	5	48.64	50.28	48.45	49.12	1.00
	10	78.98	80.69	79.40	79.69	0.89
	15	92.40	94.95	94.34	93.90	1.33
	25	101.24	102.88	103.15	102.42	1.03
	40	104.12	106.43	106.93	105.83	1.50
	70	100.23	105.70	105.00	103.64	2.98
	100	95.49	106.52	104.95	102.32	5.97
	180	103.41	107.84	103.54	104.93	2.52
PL-HPMC (swit)	5	51.15	51.11	50.67	50.98	0.26
	10	80.06	80.60	79.16	79.94	0.73
	15	94.22	94.45	92.61	93.76	1.00
	25	101.59	101.71	101.04	101.45	0.36
	40	103.92	102.88	102.11	102.97	0.91
	70	104.52	103.42	104.03	103.99	0.55
	100	104.54	110.59	103.54	106.22	3.81
	180	104.49	104.58	103.32	104.13	0.71
	180	104.24	106.52	102.67	104.48	1.94

Table 2D Percentage amount of propranolol hydrochloride (PL) release from EC coated pellets in dilute hydrochloric acid (1:100).

Conditions	Time (hours)	% PL release			Mean (%)	SD
		n1	n2	n3		
PL-EC (+)	0.25	0.37	2.12	0.20	0.90	1.07
	0.50	0.68	-0.36	-0.70	-0.13	0.72
	1	1.38	-0.14	-0.51	0.24	1.00
	2	1.64	0.60	0.15	0.80	0.76
	4	2.75	1.32	0.16	1.41	1.30
	8	3.85	2.69	1.39	2.65	1.23
	12	7.85	6.30	4.50	6.22	1.68
	24	16.81	15.22	13.11	15.05	1.85
PL-EC (non)	0.25	2.66	7.34	3.64	4.55	2.47
	0.50	4.69	10.36	5.05	6.70	3.17
	1	6.43	11.73	6.68	8.28	2.99
	2	7.55	12.47	8.39	9.47	2.63
	4	8.40	13.23	9.14	10.26	2.60
	8	9.49	14.84	10.02	11.45	2.95
	12	11.49	17.24	11.95	13.56	3.19
	24	22.51	27.48	21.91	23.97	3.06
PL-EC (-)	0.25	2.67	0.71	0.74	1.37	1.12
	0.50	3.60	1.62	1.64	2.28	1.14
	1	3.80	1.95	2.64	2.80	0.93
	2	4.39	3.20	4.37	3.99	0.68
	4	5.62	6.38	7.83	6.61	1.12
	8	5.75	8.69	9.55	8.00	2.00
	12	9.88	13.16	14.51	12.52	2.38
	24	19.96	22.38	24.92	22.42	2.48
PL-EC (swit)	0.25	1.23	0.36	0.68	0.76	0.44
	0.50	2.17	0.41	0.91	1.16	0.91
	1	2.06	0.48	0.61	1.05	0.88
	2	2.36	0.57	1.56	1.50	0.89
	4	4.07	1.50	2.63	2.73	1.28
	8	3.80	0.17	2.19	2.05	1.82
	12	8.12	3.26	6.02	5.80	2.44
	24	17.19	13.33	14.89	15.14	1.94

Table 3D Percentage amount of diclofenac sodium (DS) release from HPMC coated pellets in phosphate buffer pH 6.8.

Conditions	Time (min)	% PL release			Mean (%)	SD
		n1	n2	n3		
DS-HPMC (+)	5	26.14	24.34	22.49	24.32	1.83
	10	47.14	49.23	46.78	47.72	1.32
	15	59.45	61.95	59.21	60.20	1.52
	25	76.04	78.39	76.28	76.90	1.30
	40	90.15	92.29	90.67	91.04	1.12
	70	97.63	98.79	97.30	97.90	0.78
	100	100.75	100.83	98.75	100.11	1.18
	160	99.73	100.89	99.12	99.91	0.90
	180	99.55	101.07	99.28	99.97	0.96
DS-HPMC (non)	5	24.06	23.76	21.68	23.17	1.29
	10	51.36	51.33	48.83	50.51	1.45
	15	66.04	64.64	62.02	64.24	2.04
	25	83.33	80.79	79.65	81.26	1.89
	40	96.71	93.61	92.78	94.37	2.07
	70	101.97	101.14	100.09	101.06	0.94
	100	102.89	101.86	101.47	102.07	0.73
	160	103.30	101.03	101.71	102.31	0.86
	180	103.27	102.18	101.95	102.47	0.70
DS-HPMC (-)	5	18.55	19.19	20.16	19.30	0.81
	10	40.09	43.38	43.11	42.19	1.82
	15	61.19	63.06	63.50	62.58	1.23
	25	82.63	81.15	83.57	82.45	1.22
	40	94.14	93.93	95.33	94.47	0.76
	70	98.00	98.41	99.15	98.52	0.58
	100	98.52	98.70	99.83	99.02	0.71
	160	99.07	99.51	100.07	99.55	0.50
	180	98.50	99.59	100.41	99.50	0.96
DS-HPMC (swit)	5	18.99	20.66	20.40	20.02	0.90
	10	44.32	43.67	44.02	44.00	0.33
	15	62.62	63.21	63.78	63.21	0.58
	25	81.81	84.22	83.36	83.13	1.23
	40	94.06	94.28	94.13	94.16	0.11
	70	98.39	98.09	97.67	98.05	0.36
	100	98.81	99.10	99.03	98.98	0.15
	160	100.36	100.16	99.10	99.87	0.68
	180	100.92	99.74	99.57	100.08	0.73

Table 4D Percentage amount of diclofenac sodium (DS) release from EC coated pellets in phosphate buffer pH 6.8.

Conditions	Time (hours)	% PL release			Mean (%)	SD
		n1	n2	n3		
DS-EC (+)	0.25	1.60	0.31	0.51	0.81	0.69
	0.50	1.96	0.93	-0.09	0.93	1.02
	1	1.75	1.65	0.08	1.16	0.94
	2	4.29	3.42	-0.34	2.46	2.46
	4	8.56	6.15	2.80	5.84	2.89
	8	11.80	7.47	5.10	8.12	3.40
	12	14.32	9.13	6.90	10.12	3.81
	24	19.56	12.50	11.34	14.47	4.44
DS-EC (non)	0.25	-0.09	0.74	1.67	0.77	0.88
	0.50	-0.41	0.04	2.41	0.68	1.51
	1	1.53	0.48	3.80	1.94	1.70
	2	11.07	6.39	11.14	9.53	2.72
	4	25.33	16.34	24.17	21.95	4.89
	8	36.31	24.58	36.34	32.41	6.78
	12	42.21	29.78	43.70	38.56	7.65
	24	51.72	39.78	6.44	32.65	23.47
DS-EC (-)	0.25	2.26	0.09	-0.48	0.62	1.45
	0.50	4.46	0.18	1.12	1.92	2.25
	1	5.64	1.49	1.21	2.78	2.48
	2	17.32	7.82	8.41	11.18	5.33
	4	32.52	20.74	17.47	23.58	7.91
	8	38.04	27.95	23.14	29.71	7.60
	12	42.32	31.71	27.11	33.72	7.80
	24	48.33	37.17	34.22	39.90	7.44
DS-EC (swit)	0.25	0.20	-0.36	2.14	0.66	1.31
	0.50	-0.54	0.28	2.09	0.61	1.34
	1	-0.41	-0.28	3.14	0.82	2.01
	2	2.72	1.29	5.49	3.17	2.13
	4	8.05	6.10	12.36	8.84	3.21
	8	9.37	8.96	15.83	11.39	3.85
	12	11.63	12.35	18.33	14.11	3.68
	24	15.82	19.51	21.93	19.09	3.07

APPENDIX E

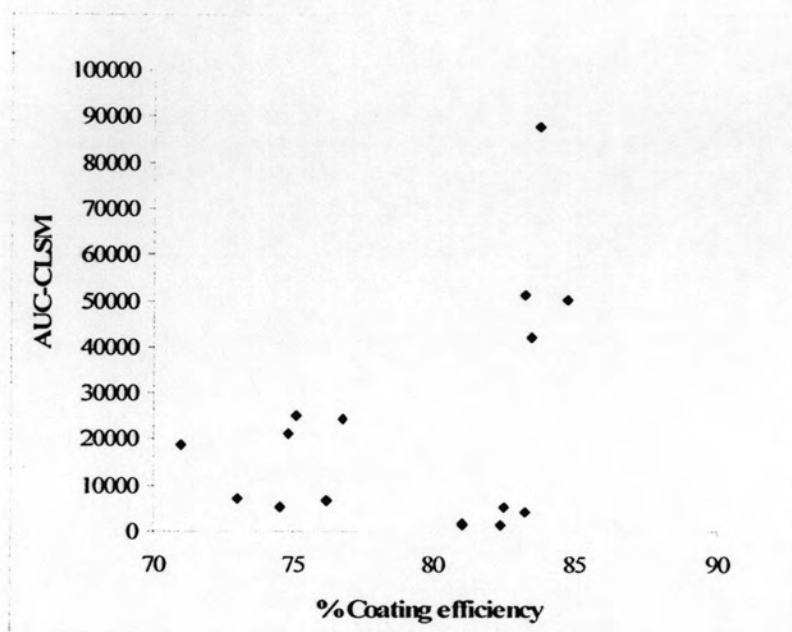
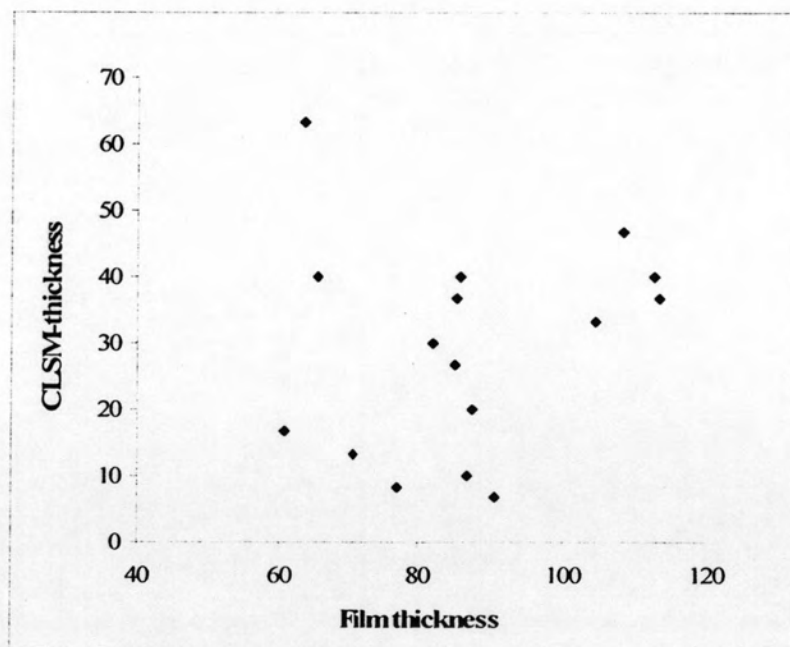
Figure 1E Correlation between %coating efficiency and AUC_{CLSM} 

Figure 2E Correlation between film thickness and CLSM-thickness

VITA

Miss Panicha Kittirungsi was born on October 19, 1980. She received her bachelor of Pharmacy degree in 2003 from Faculty of Pharmacy, Chiangmai University, Chiangmai, Thailand. After graduation, she worked at Government Pharmaceutical Organization for one year before entering the Master's degree program in manufacturing pharmacy at Chulalongkorn University.