CHAPTER III

RESULTS

1. Electroscopic study

Photomicrograph of aspirin powder at 200 x magnification is shown in Figure 6, it appears elongated crystal. Aspirin tablet, photographed at 1100 x magnification is demonstrated in Figure 7, it is apparent that the tablet has the complex stratum of crystals.

Photomicrograph of Methocel A - 15LV, Methocel A - 4C, Methocel A - 15C and Methocel A - 4M at 200 x magnification and 540 x magnification are shown in Figures 8 - 15 respectively. These figures appear that various grades of Methocel A are fibrous and clearly show the difference in physical appearance of fibers relate to molecular weight of Methocel A. The physical shape of Methocel A - 4M which has molecular weight of about 86,000 (viscosity range 3,500 - 5,000) appears to be the longest fiber, while Methocel A - 15LV which has the lowest molecular weight of about 13,000 (viscosity range 13 - 19) is the shortest. Therefore, the more increasing in molecular weight of Methocel A, the longer of the fiber.

P.V.P. - K30, photographed at 200 x magnification, is demonstrated in Figure 16, it is almost round crystal.

2. Weight variation of aspirin tablets

Table 10 shows average weights and standard deviations (S.D.) of aspirin tablets Formulations # 1 - 17. Formulation # 2 has the maximum weight variation, which the S.D. equals to 8.4 and the coefficient of variation (C.V.) is 1.21% Formulation # 6 has the minimum weight variation,

Figure 6 : Photomicrograph of aspirin powder at 200 x magnification.

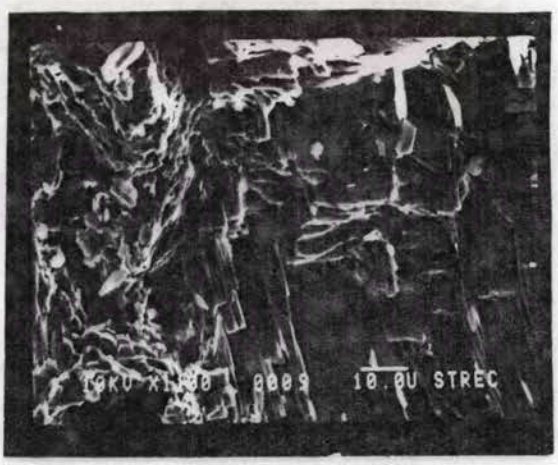

Figure 7 : Photomicrograph of aspirin tablet at 1100 x magnification.

Figure 8 : Photomicrograph of Methocel A - 15LV at 200 x magnification.

Figure 9 : Photomicrograph of Methocel A - 15LV at 540 x magnification.

Figure 10 : Photomicrograph of Methocel A - 4C at 200 x magnification.

Figure 11 : Photomicrograph of Methocel A - 4C at 540 x magnification.

Figure 12 : Photomicrograph of Methocel A - 15C at 200 x magnification.

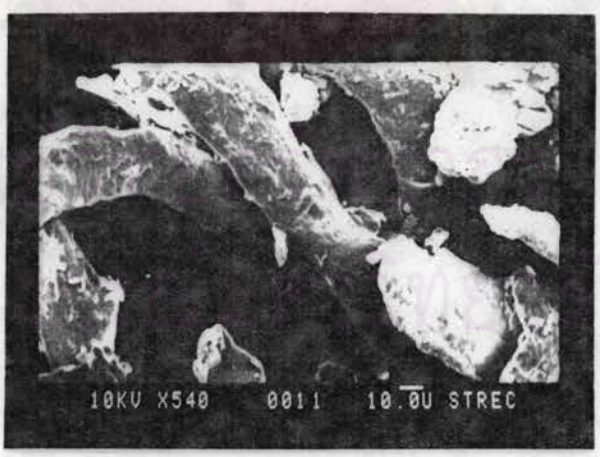

Figure 13 : Photomicrograph of Methocel A - 15C at 540 x magnification.

Figure 14 : Photomicrograph of Methocel A - 4M at 200 x magnification.

Figure 15 : Photomicrograph of Methocel A - 4M at 540 x magnification.

Figure 16 : Photomicrograph of P.V.P. - K30 at 200 x magnification.

which S.D. equals to 3.4 and C.V. is 0.46%. Nevertheless the S.D. and C.V. of each formulation are low, which show that these aspirin tablets are conformed in the limit of U.S.P. XX. in the title of weight variation. Each formulation has its individual weight within the range of theoretical weight ($\pm$ 5%)

3. Hardness of aspirin tablets

The average hardnesses and the standard deviations of aspirin tablets Formulations # 1 - 17 are shown in Table 11. The maximum average hardness is 14.6 K.P. in Formulations # 4 and 6. Formulation # 1 has the minimum average hardness which is 13.6 K.P. Nevertheless the S.D. and C.V. of each formulation are low which show that the hardnesses of aspirin tablets are relatively constant.

4. Thickness of aspirin tablets

Table 12 shows average thicknesses and standard deviations of aspirin tablets Formulations # 1 - 17. The average thickness of tablet is related to average weight of aspirin tablet (Table 10). Fromulation # 1 has the minimum average weight (679.7 $\pm$ 5.1 mg.) and also the minimum average thickness (3.59 $\pm$ 0.03 mm.). On the contrary, Formulations # 8, # 11, # 14 and # 17 have the maximum average weight. They also have the maximum average thickness.

5. Disintegration time of aspirin tablets

Disintegration times of aspirin tablets Formulation # 1 - 17 are shown in Table 13. All formulations have a disintegration time of more than 3 hours.

Table 10 : Weight variation of aspirin tablets

Formulation	Average weight (mg) ± S.D.
1	679.7 ± 5.1
2	691.6 ± 8.4
3	702.4 ± 6.0
4	715.8 ± 5.2
5	733.7 ± 7.3
6	735.6 ± 3.4
7	770.0 ± 4.8
8	803.1 ± 5.7
9	737.3 ± 6.9
10	771.3 ± 4.8
11	803.4 ± 7.9
12	737.3 ± 5.1
13	767.1 ± 7.4
14	803.5 ± 7.5
15	737.1 ± 4.9
16	766.9 ± 7.6
17	803.6 ± 6.4

Table 11 : Hardness of aspirin tablets

Formulation	Average hardness (K.P.) ± S.D.
1	13.6 ± 0.5
2	14.2 ± 0.5
3	14.1 ± 0.4
4	14.6 ± 0.5
5	14.3 ± 0.6
6	14.6 ± 0.4
7	14.4 ± 0.6
8	14.3 ± 0.5
9	14.1 ± 0.5
10	14.0 ± 0.6
11	14.4 ± 0.5
12	14.4 ± 0.5
13	14.4 ± 0.5
14	14.4 ± 0.5
15	14.2 ± 0.6
16	14.3 ± 0.6
17	14.1 ± 0.5

Table 12 : Thickness of aspirin tablets

Formulation	Average thickness (mm) ± S.D.
1	3.59 ± 0.03
2	3.70 ± 0.02
3	3.73 ± 0.04
4	3.72 ± 0.03
5	3.78 ± 0.04
6	3.80 ± 0.04
7	4.00 ± 0.02
8	4.38 ± 0.03
9	3.84 ± 0.04
10	4.00 ± 0.05
11	4.41 ± 0.05
12	3.84 ± 0.03
13	4.07 ± 0.02
14	4.38 ± 0.03
15	3.85 ± 0.01
16	4.04 ± 0.04
17	4.35 ± 0.04

Table13 : Disintegration time of aspirin tablets

Formulation	Disintegration time (hr.)
1	more than 3
2	" " 3
3	" " 3
4	" " 3
5	" " 3
6	" " 3
7	" " 3
8	" " 3
9	" " 3
10	" " 3
11	" " 3
12	" " 3
13	" " 3
14	" " 3
15	" " 3
16	" " 3
17	" " 3

6. Dissolution study

The absorbances of standard solution of aspirin in simulated gastric fluid and simulated intestinal fluid at 302 nm are demonstrated in Tables 14 and 15. Standard calibration curves of aspirin which dissolved in simulated gastric fluid and simulated intestinal fluid are shown in Figures 17 and 18 respectively. The slope of regression line is 0.0210 per mcg per ml in simulated gastric fluid and is 0.02003 per mcg per ml in simulated intestinal fluid.

Tables 16, 17, 18, 19 and 20 demonstrate dissolution rate of aspirin Formulations # 1, # 2, # 3, # 4 and # 5 which have content of P.V.P. - K30 1%, 3%, 5%, 7% and 10% respectively. The dissolution profiles of aspirin containing various concentration of P.V.P. - K30 are presented in Figure 19. It was found that P.V.P. - K30 could retard the dissolution of aspirin. About 97% of the drug was dissolved after 6 hours in dissolution medium using only as low as 1% of P.V.P.. It may be concluded from the results that different concentration of P.V.P. - K30 in five formulations exhibited no effect in dissolution rate. Formulations # 3 which containing 5% P.V.P. K-30, was selected as a control formulation (no Methocel A) because this concentration was the proper proportion to give the good granules for tableting.

Dissolution rate of aspirin Formulations # 6 - 17 are demonstrated in Tables 21 - 32. The influence of Methocel A - 15LV, Methocel A - 4C, Methocel A - 15C and Methocel A - 4M on dissolution rate of aspirin are showed in Figures 20, 21, 22 and 23 respectively. The dissolution rate of aspirin were lowered by the presence of various grades of Methocel A in the formulations. Aspirin tablets containing no Methocel A release 97% of the drug at the sixth hour

while tablets containing Methocel A released 5-20% less. An increase of concentration of various grades of Methocel A resulted in a reduction of dissolution rate. It appeared from the curves that concentration of Methocel A affected the dissolution rate of aspirin from tablets.

Effect of various grades of Methocel A in equal concentration on the dissolution rate are shown in Figures 24, 25 and 26 which containing different concentration of 5%, 10% and 15% of Methocel A respectively. The results indicated that Methocel A - 15C gave lowest dissolution rate and Methocel A - 4M gave lower dissolution rate than that of Methocel A - 4C and Methocel A - 15LV in three different concentrations. These figures also showed that the release rate in simulated gastric fluid was slower than that in simulated intestinal fluid. The slower release rate in simulated gastric fluid was expected due to the poor solubility of aspirin in and acidic medium. The dramatic increase in the release rate, when dissolution medium was changed to simulated intestinal fluid, was not surprising.

Table 14 : The absorbance of standard solution of aspirin in simulated gastric fluid at 302 nm.

Concentration (mcg/ml)	Absorbance
5.23	0.108
10.46	0.214
15.69	0.320
20.92	0.422
26.15	0.528
31.38	0.633
36.61	0.741
41.84	0.844

Table 15 : The absorbance of standard solution of aspirin in simulated intestinal fluid at 302 nm.

Concentration (mcg/ml)	Absorbance
5.50	0.119
11.00	0.233
16.50	0.342
22.00	0.451
27.50	0.563
33.00	0.672
38.50	0.781
44.00	0.892

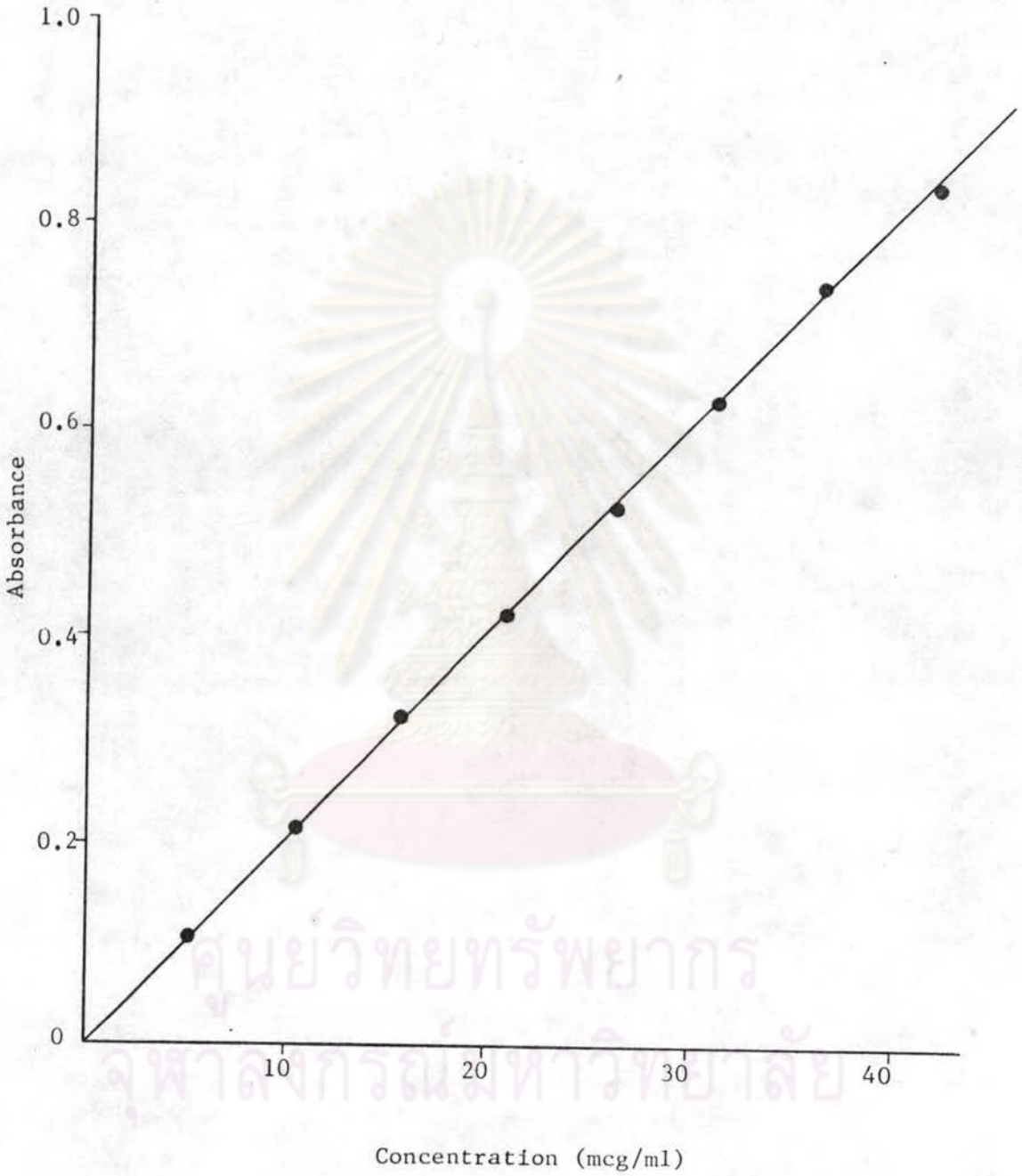

Figure 17 : Calibration curve of aspirin in simulated gastric fluid determinated by spectrophotometer at 302 nm.

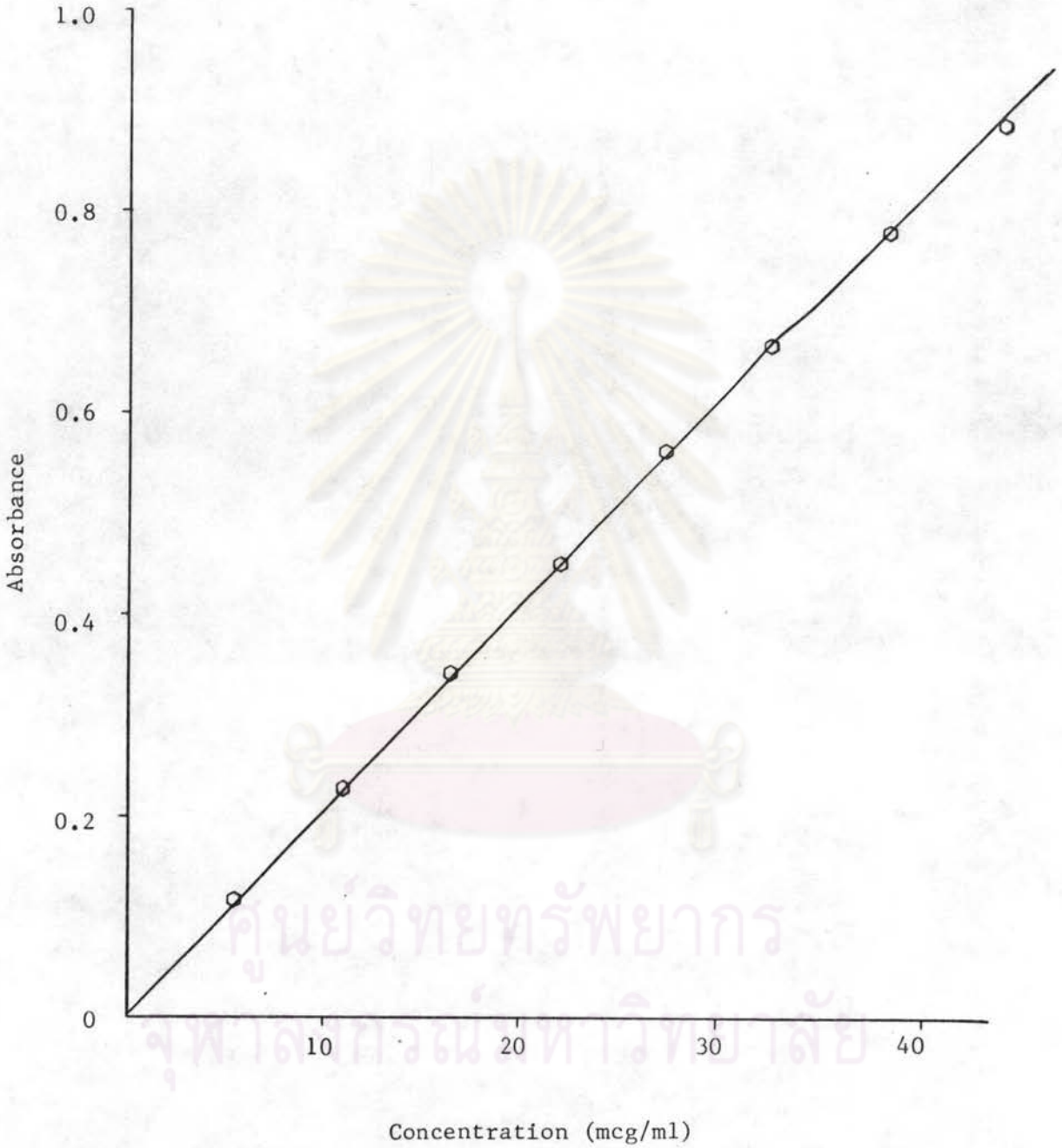

Figure 18 : Calibration curve of aspirin in simulated intestinal fluid determinated by spectrophotometer at 302 nm.

Table 16: Dissolution rate of aspirin tablet (formulation # 1) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time min	Absorbance I*	Absorbance II*	Absorbance average ± S.D.	Content of A.S.A.	% Release ± S.D.	% Release per hour
5	0.030	0.036	0.033 ± 0.003	14.7762	2.23 ± 0.20	26.76
15	0.027	0.029	0.028 ± 0.001	31.5068	4.76 ± 0.17	19.04
30	0.051	0.052	0.052 ± 0.001	58.5585	8.85 ± 0.17	17.70
60	0.087	0.089	0.088 ± 0.001	99.1530	14.98 ± 0.17	14.98
120	0.164	0.166	0.165 ± 0.001	185.6160	24.04 ± 0.17	12.05
180	0.212	0.216	0.214 ± 0.002	241.6032	36.50 ± 0.34	12.17
240	0.164	0.164	0.164 ± 0.000	184.2237	64.33 ± 0.00	16.08
300	0.248	0.252	0.250 ± 0.002	282.8768	79.24 ± 0.63	15.85
360	0.352	0.357	0.354 ± 0.002	400.7968	97.05 ± 0.55	16.18
420	0.360	0.363	0.362 ± 0.002	411.0586	98.60 ± 0.54	14.08
480	0.371	0.373	0.372 ± 0.001	422.3905	100.31 ± 0.27	12.54

* I. weight of tablet used = 690.0 mg.

* II. weight of tablet used = 687.2 mg.

Table 17: Dissolution rate of aspirin tablet (formulation # 2) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time min	Absorbance I*	Absorbance II*	Absorbance average ± S.D.	Content of A.S.A.	% Release ± S.D.	% Release per hour
5	0.029	0.032	0.030 ± 0.002	13.4328	2.00 ± 0.13	24.00
15	0.026	0.028	0.027 ± 0.001	30.3735	4.54 ± 0.17	18.16
30	0.052	0.052	0.052 ± 0.000	58.5456	8.74 ± 0.00	17.48
60	0.088	0.089	0.088 ± 0.001	99.1540	14.80 ± 0.17	14.80
120	0.164	0.165	0.164 ± 0.001	184.6765	27.57 ± 0.17	13.78
180	0.212	0.214	0.213 ± 0.001	240.4710	35.91 ± 0.17	11.97
240	0.163	0.164	0.164 ± 0.001	184.2232	63.42 ± 0.39	15.86
300	0.250	0.248	0.249 ± 0.001	281.7540	77.98 ± 0.31	15.60
360	0.350	0.356	0.353 ± 0.003	399.6388	95.58 ± 0.81	15.93
420	0.372	0.368	0.370 ± 0.002	420.0322	98.63 ± 0.53	14.09
480	0.380	0.376	0.378 ± 0.002	429.2302	100.00 ± 0.53	12.50

* I. weight of tablet used = 712.8 mg.

* II. weight of tablet used = 708.2 mg.

Table 18: Dissolution rate of aspirin tablet (formulation # 3) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.030	0.028	0.029 ± 0.001	12.9852	2.00 ± 0.07	24.00
15	0.026	0.024	0.025 ± 0.001	28.1298	4.34 ± 0.17	17.36
30	0.048	0.044	0.046 ± 0.002	51.8044	7.99 ± 0.35	15.98
60	0.084	0.076	0.080 ± 0.004	90.1244	13.90 ± 0.69	13.90
120	0.148	0.142	0.145 ± 0.003	163.3078	25.19 ± 0.52	12.60
180	0.203	0.205	0.204 ± 0.001	230.1605	35.50 ± 0.17	11.83
240	0.150	0.152	0.151 ± 0.001	172.1588	62.05 ± 0.41	15.51
300	0.241	0.240	0.240 ± 0.001	271.4797	77.37 ± 0.32	15.47
360	0.344	0.350	0.347 ± 0.002	392.7855	96.08 ± 0.55	16.01
420	0.359	0.358	0.358 ± 0.001	406.4780	98.19 ± 0.27	14.03
480	0.370	0.369	0.370 ± 0.001	420.0950	100.29 ± 0.27	12.54

* I. weight of tablet used = 702.0 mg.

* II. weight of tablet used = 707.5 mg.

Table 19: Dissolution rate of aspirin tablet (formulation # 4) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.024	0.026	0.025 ± 0.001	11.1940	1.72 ± 0.07	20.66
15	0.027	0.023	0.025 ± 0.002	28.1099	4.33 ± 0.35	17.32
30	0.045	0.045	0.045 ± 0.000	50.6839	7.81 ± 0.00	15.62
60	0.079	0.077	0.078 ± 0.001	87.8732	13.54 ± 0.17	13.54
120	0.140	0.142	0.141 ± 0.001	158.8054	24.46 ± 0.17	12.23
180	0.202	0.203	0.202 ± 0.001	227.8742	35.10 ± 0.17	11.70
240	0.148	0.144	0.146 ± 0.002	164.0040	60.37 ± 0.83	15.09
300	0.237	0.233	0.235 ± 0.002	265.8013	76.05 ± 0.65	15.21
360	0.351	0.337	0.344 ± 0.007	389.3526	95.08 ± 1.93	15.85
420	0.366	0.362	0.364 ± 0.002	413.1788	98.75 ± 0.54	14.11
480	0.374	0.368	0.371 ± 0.003	421.2922	100.00 ± 0.81	12.50

* I. weight of tablet used = 715.8 mg.

* II. weight of tablet used = 715.0 mg.

Table 20: Dissolution rate of aspirin tablet (formulation # 5) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.025	0.024	0.024 ± 0.001	10.7463	1.165 ± 0.07	19.80
15	0.026	0.022	0.024 ± 0.002	26.9844	4.15 ± 0.34	16.60
30	0.047	0.042	0.044 ± 0.002	49.5518	7.62 ± 0.35	15.25
60	0.078	0.076	0.077 ± 0.001	86.7398	13.33 ± 0.17	13.33
120	0.144	0.136	0.140 ± 0.004	157.6755	24.24 ± 0.69	12.12
180	0.202	0.198	0.200 ± 0.002	225.6208	34.68 ± 0.35	11.56
240	0.147	0.141	0.144 ± 0.003	161.7574	59.54 ± 1.24	14.88
300	0.236	0.230	0.233 ± 0.003	263.5312	75.19 ± 0.97	15.04
360	0.341	0.339	0.340 ± 0.001	384.8355	93.83 ± 0.28	15.64
420	0.369	0.367	0.368 ± 0.001	417.6225	98.87 ± 0.27	14.12
480	0.373	0.369	0.371 ± 0.002	421.3418	99.44 ± 0.54	12.43

* I. weight of tablet used = 735.1 mg.

* II. weight of tablet used = 736.5 mg.

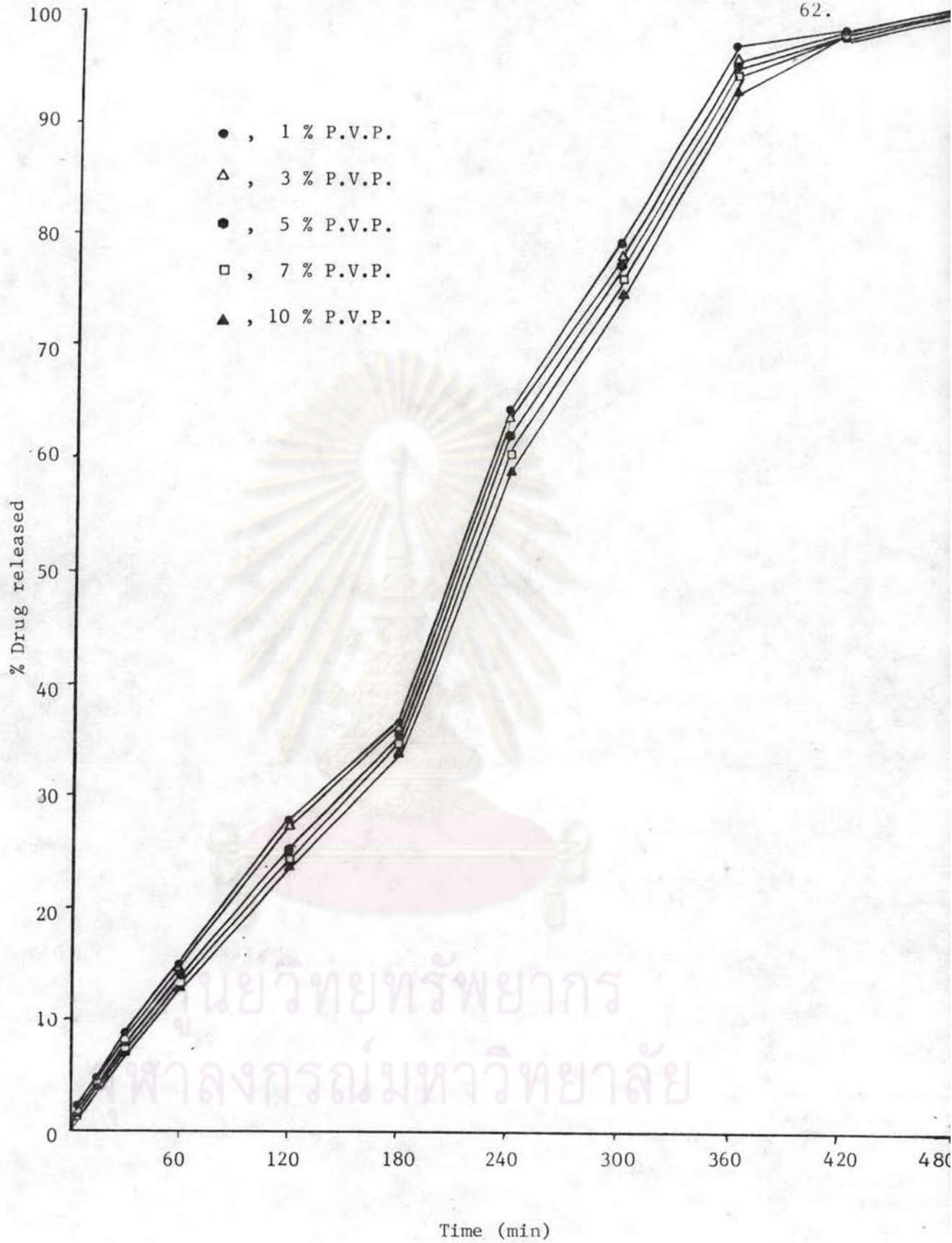

Figure 19 : Effect of concentration of P.V.P. on dissolution of aspirin tablets in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Table 21: Dissolution rate of aspirin tablet (formulation # 6) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.027	0.025	0.026 ± 0.001	11.6415	1.79 ± 0.07	21.48
15	0.025	0.021	0.023 ± 0.002	25.8750	3.98 ± 0.34	15.92
30	0.041	0.042	0.042 ± 0.001	47.3018	7.27 ± 0.17	14.54
60	0.076	0.074	0.075 ± 0.001	84.4762	12.99 ± 0.17	12.99
120	0.136	0.132	0.134 ± 0.002	150.9345	23.20 ± 0.35	11.60
180	0.200	0.201	0.200 ± 0.001	225.5468	34.67 ± 0.17	11.56
240	0.126	0.124	0.125 ± 0.001	140.4135	56.26 ± 0.45	14.06
300	0.221	0.220	0.220 ± 0.001	248.6880	72.90 ± 0.33	14.58
360	0.335	0.335	0.335 ± 0.000	379.0552	92.94 ± 0.00	15.49
420	0.373	0.367	0.370 ± 0.003	419.8072	99.21 ± 0.80	14.17
480	0.378	0.373	0.376 ± 0.002	426.9825	100.31 ± 0.29	12.54

* I. weight of tablet used = 739 mg.

* II. weight of tablet used = 735 mg.

Table 22: Dissolution rate of aspirin tablet (formulation # 7) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.025	0.021	0.023 ± 0.002	10.2987	1.58 ± 0.14	18.96
15	0.025	0.017	0.021 ± 0.004	23.6228	3.63 ± 0.69	14.52
30	0.042	0.033	0.038 ± 0.006	42.7972	6.58 ± 1.04	13.16
60	0.071	0.065	0.068 ± 0.003	76.5922	11.78 ± 0.52	11.78
120	0.128	0.126	0.127 ± 0.001	143.0100	22.00 ± 0.17	11.00
180	0.197	0.189	0.193 ± 0.004	217.6245	33.48 ± 0.69	11.16
240	0.118	0.114	0.116 ± 0.002	130.3042	53.53 ± 0.92	13.38
300	0.217	0.211	0.214 ± 0.003	241.8368	70.69 ± 0.99	14.14
360	0.332	0.326	0.329 ± 0.003	372.1748	90.74 ± 0.83	15.12
420	0.372	0.380	0.376 ± 0.004	426.4718	99.09 ± 1.05	14.16
480	0.380	0.384	0.382 ± 0.002	433.8000	100.22 ± 0.52	12.53

* I. weight of tablet used = 770.1 mg.

* II. weight of tablet used = 769.9 mg.

Table 23 : Dissolution rate of aspirin tablet (formulation # 8) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.021	0.023	0.022 ± 0.001	9.8505	1.52 ± 0.07	18.24
15	0.018	0.020	0.019 ± 0.001	21.5438	3.31 ± 0.17	13.24
30	0.032	0.036	0.034 ± 0.002	38.2950	5.89 ± 0.35	11.78
60	0.059	0.060	0.060 ± 0.001	67.5878	10.40 ± 0.17	10.40
120	0.118	0.123	0.120 ± 0.002	135.0742	20.78 ± 0.35	10.39
180	0.182	0.188	0.185 ± 0.003	208.5818	32.09 ± 0.52	10.70
240	0.104	0.108	0.106 ± 0.002	119.0722	50.41 ± 0.95	12.60
300	0.207	0.201	0.204 ± 0.003	229.1828	67.35 ± 0.99	13.47
360	0.324	0.316	0.320 ± 0.004	362.0070	87.78 ± 1.10	14.63
420	0.393	0.383	0.388 ± 0.005	439.8390	99.76 ± 1.28	14.25
480	0.395	0.389	0.392 ± 0.003	445.1805	100.58 ± 0.77	12.57

* I. weight of tablet used = 803.5 mg.

* II. weight of tablet used = 803.3 mg.

Table 24 : Dissolution rate of aspirin tablet (formulation # 9) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.024	0.022	0.023 ± 0.001	10.2987	1.58 ± 0.07	18.96
15	0.022	0.018	0.020 ± 0.002	22.5022	3.46 ± 0.35	13.84
30	0.039	0.036	0.038 ± 0.002	42.7860	6.58 ± 0.35	13.16
60	0.070	0.068	0.069 ± 0.001	77.7105	11.96 ± 0.17	11.96
120	0.130	0.126	0.128 ± 0.002	144.1418	22.18 ± 0.35	11.09
180	0.182	0.181	0.182 ± 0.001	205.3215	31.59 ± 0.17	10.53
240	0.123	0.197	0.120 ± 0.003	134.7975	52.33 ± 1.31	13.08
300	0.216	0.212	0.214 ± 0.002	241.8885	68.80 ± 0.64	13.76
360	0.332	0.324	0.328 ± 0.004	371.1172	88.69 ± 1.08	14.78
420	0.388	0.382	0.385 ± 0.003	436.5698	98.76 ± 0.77	14.11
480	0.402	0.400	0.401 ± 0.001	455.2560	101.63 ± 0.25	12.70

* I. weight of tablet used = 736.0 mg.

* II. weight of tablet used = 737.0 mg.

Table 25 : Dissolution rate of aspirin tablet (formulation # 10) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.018	0.018	0.018 ± 0.000	8.0597	1.24 ± 0.00	14.88
15	0.015	0.017	0.016 ± 0.001	18.0000	2.77 ± 0.17	11.08
30	0.033	0.035	0.034 ± 0.001	38.2568	5.88 ± 0.17	11.76
60	0.060	0.064	0.062 ± 0.002	69.8265	10.74 ± 0.35	10.74
120	0.118	0.120	0.119 ± 0.001	133.9808	20.31 ± 0.17	10.30
180	0.171	0.180	0.176 ± 0.004	198.4950	30.54 ± 0.69	10.18
240	0.106	0.112	0.109 ± 0.003	122.4405	49.37 ± 1.36	12.34
300	0.200	0.210	0.205 ± 0.005	231.6398	66.17 ± 1.61	13.23
360	0.318	0.322	0.320 ± 0.002	362.0182	86.23 ± 0.54	14.37
420	0.374	0.380	0.377 ± 0.003	427.4842	96.30 ± 0.77	13.76
480	0.398	0.402	0.400 ± 0.002	454.0298	100.39 ± 0.50	12.55

* I. weight of tablet used = 770.1 mg.

* II. weight of tablet used = 769.9 mg.

Table 26 : Dissolution rate of aspirin tablet (formulation # 11) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.014	0.018	0.016 ± 0.002	7.1640	1.10 ± 0.14	13.20
15	0.014	0.016	0.015 ± 0.001	16.8705	2.60 ± 0.17	10.40
30	0.028	0.032	0.030 ± 0.002	33.7680	5.20 ± 0.35	10.40
60	0.051	0.055	0.053 ± 0.002	59.7015	9.18 ± 0.35	9.18
120	0.106	0.112	0.109 ± 0.003	122.6745	18.87 ± 0.52	9.44
180	0.163	0.171	0.167 ± 0.004	188.2935	28.97 ± 0.69	9.66
240	0.095	0.097	0.096 ± 0.001	107.8380	45.56 ± 0.47	11.39
300	0.189	0.193	0.191 ± 0.002	215.7525	62.16 ± 0.65	12.43
360	0.307	0.309	0.308 ± 0.001	348.3630	82.56 ± 0.27	13.76
420	0.364	0.368	0.366 ± 0.002	414.9765	92.81 ± 0.51	13.26
480	0.400	0.406	0.403 ± 0.003	460.6335	99.83 ± 0.74	12.48

* I. weight of tablet used = 803.8 mg.

* II. weight of tablet used = 808.0 mg.

Table 27 : Dissolution rate of aspirin tablet (formulation # 12) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.020	0.018	0.019 ± 0.001	8.5077	1.31 ± 0.07	15.72
15	0.020	0.016	0.018 ± 0.002	20.1578	3.10 ± 0.34	12.40
30	0.035	0.033	0.034 ± 0.001	38.2815	5.89 ± 0.17	11.78
60	0.064	0.058	0.061 ± 0.003	68.7060	10.57 ± 0.52	10.57
120	0.111	0.105	0.108 ± 0.008	121.6530	18.72 ± 0.52	9.36
180	0.166	0.164	0.165 ± 0.001	186.0458	28.62 ± 0.17	9.54
240	0.122	0.118	0.120 ± 0.002	134.7975	49.36 ± 0.82	12.34
300	0.211	0.209	0.210 ± 0.001	237.3950	65.14 ± 0.31	13.03
360	0.326	0.322	0.324 ± 0.002	366.5745	85.02 ± 0.52	14.17
420	0.399	0.393	0.396 ± 0.003	448.8750	97.64 ± 0.74	13.95
480	0.414	0.406	0.410 ± 0.004	465.5025	100.24 ± 0.98	12.53

* I. weight of tablet used = 735.5 mg.

* II. weight of tablet used = 737.5 mg.

Table 28 : Dissolution rate of aspirin tablet (formulation # 13) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.018	0.014	0.016 ± 0.002	7.1640	1.10 ± 0.14	13.20
15	0.016	0.014	0.015 ± 0.001	16.8705	2.60 ± 0.17	10.40
30	0.031	0.027	0.029 ± 0.002	32.6498	5.02 ± 0.35	10.04
60	0.052	0.051	0.052 ± 0.001	58.5698	9.01 ± 0.17	9.01
120	0.101	0.099	0.100 ± 0.001	112.5855	17.32 ± 0.17	8.66
180	0.161	0.151	0.156 ± 0.005	175.8712	27.06 ± 0.87	9.02
240	0.110	0.102	0.106 ± 0.004	119.0722	45.38 ± 1.71	11.34
300	0.201	0.193	0.197 ± 0.004	222.6150	61.30 ± 1.24	12.26
360	0.314	0.310	0.312 ± 0.002	352.9328	81.35 ± 0.52	13.56
420	0.388	0.392	0.385 ± 0.003	436.3718	94.19 ± 0.73	13.46
480	0.420	0.412	0.416 ± 0.004	472.1040	99.69 ± 0.96	12.46

* I. weight of tablet used = 769.8 mg.

* II. weight of tablet used = 770.0 mg.

Table 29 : Dissolution rate of aspirin tablet (formulation # 14) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D,	per hour
5	0.011	0.015	0.013 ± 0.002	5.8212	0.90 ± 0.14	10.8
15	0.010	0.016	0.013 ± 0.003	14.6182	2.25 ± 0.52	9.00
30	0.022	0.024	0.023 ± 0.001	25.9088	3.98 ± 0.17	7.96
60	0.039	0.043	0.041 ± 0.002	46.1812	7.10 ± 0.35	7.10
120	0.087	0.093	0.090 ± 0.003	101.2568	15.56 ± 0.52	7.78
180	0.142	0.150	0.146 ± 0.004	164.5515	25.29 ± 0.69	8.43
240	0.092	0.096	0.094 ± 0.002	105.5925	41.52 ± 0.38	10.38
300	0.182	0.188	0.185 ± 0.003	208.9845	57.41 ± 0.93	11.48
360	0.295	0.305	0.300 ± 0.005	339.3022	77.44 ± 1.29	12.91
420	0.370	0.374	0.372 ± 0.002	421.6162	90.09 ± 0.48	12.87
480	0.427	0.429	0.428 ± 0.001	485.4196	99.90 ± 0.23	12.49

* I. weight of tablet used = 804.4 mg.

* II. weight of tablet used = 804.0 mg.

Table 30 : Dissolution rate of aspirin tablet (formulation # 15) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.024	0.018	0.021 ± 0.003	9.4032	1.45 ± 0.21	17.40
15	0.022	0.018	0.020 ± 0.002	22.4910	3.47 ± 0.35	13.88
30	0.038	0.034	0.036 ± 0.002	40.5450	6.25 ± 0.35	12.50
60	0.066	0.064	0.065 ± 0.001	73.2082	11.28 ± 0.17	11.28
120	0.123	0.121	0.122 ± 0.001	137.3490	21.17 ± 0.17	10.58
180	0.176	0.175	0.176 ± 0.001	198.5310	30.60 ± 0.17	10.20
240	0.123	0.117	0.120 ± 0.003	134.7975	51.37 ± 1.28	12.84
300	0.215	0.211	0.213 ± 0.002	240.7635	67.70 ± 0.64	13.54
360	0.330	0.322	0.326 ± 0.004	368.8605	87.45 ± 1.07	14.58
420	0.386	0.386	0.386 ± 0.000	437.8320	98.08 ± 0.00	14.01
480	0.403	0.395	0.399 ± 0.004	453.0195	100.42 ± 1.01	12.55

* I. weight of tablet used = 737.4 mg.

* II. weight of tablet used = 738.1 mg.

Table 31 : Dissolution rate of aspirin tablet (formulation # 16) in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.017	0.017	0.017 ± 0.000	7.6122	1.18 ± 0.00	14.16
15	0.014	0.015	0.014 ± 0.001	15.7545	2.43 ± 0.17	9.72
30	0.030	0.028	0.029 ± 0.001	32.6362	5.02 ± 0.17	10.04
60	0.061	0.057	0.059 ± 0.002	66.4042	10.25 ± 0.35	10.25
120	0.118	0.112	0.115 ± 0.003	129.4650	20.61 ± 0.52	10.30
180	0.173	0.165	0.169 ± 0.004	190.6110	29.32 ± 0.69	9.77
240	0.117	0.113	0.115 ± 0.002	129.1815	49.41 ± 0.86	12.35
300	0.212	0.206	0.209 ± 0.003	236.2072	65.95 ± 0.95	13.15
360	0.324	0.316	0.320 ± 0.004	362.0678	85.39 ± 1.07	14.23
420	0.382	0.378	0.380 ± 0.002	430.8524	95.61 ± 0.50	13.66
480	0.412	0.406	0.409 ± 0.003	464.1795	101.17 ± 0.74	12.65

* I. weight of tablet used = 768.0 mg.

* II. weight of tablet used = 765.2 mg.

Table 32 : Dissolution rate of aspirin tablet (formulation # 17) in simulated gastric fluid for 3 hours and in si simulated intestinal fluid for 5 hours at 37°C.

Time	Absorbance			Content	% Release	% Release
min	I*	II*	average ± S.D.	of A.S.A.	± S.D.	per hour
5	0.014	0.016	0.015 ± 0.001	6.7167	1.03 ± 0.07	12.36
15	0.012	0.016	0.014 ± 0.002	15.7455	2.42 ± 0.35	9.68
30	0.023	0.029	0.026 ± 0.003	29.2770	4.50 ± 0.52	9.00
60	0.042	0.050	0.046 ± 0.004	51.8175	7.97 ± 0.69	7.97
120	0.098	0.103	0.101 ± 0.002	113.6318	17.48 ± 0.35	8.74
180	0.153	0.159	0.156 ± 0.003	175.8825	27.05 ± 0.52	9.02
240	0.093	0.097	0.095 ± 0.002	106.7152	43.46 ± 0.91	10.86
300	0.183	0.191	0.187 ± 0.004	211.2458	59.54 ± 1.27	11.91
360	0.300	0.306	0.303 ± 0.003	342.6975	79.75 ± 0.79	13.29
420	0.367	0.369	0.368 ± 0.001	417.1612	91.20 ± 0.25	13.03
480	0.413	0.421	0.417 ± 0.004	473.0152	99.79 ± 0.96	12.47

* I. weight of tablet used = 804.5 mg.

* II. weight of tablet used = 802.9 mg.

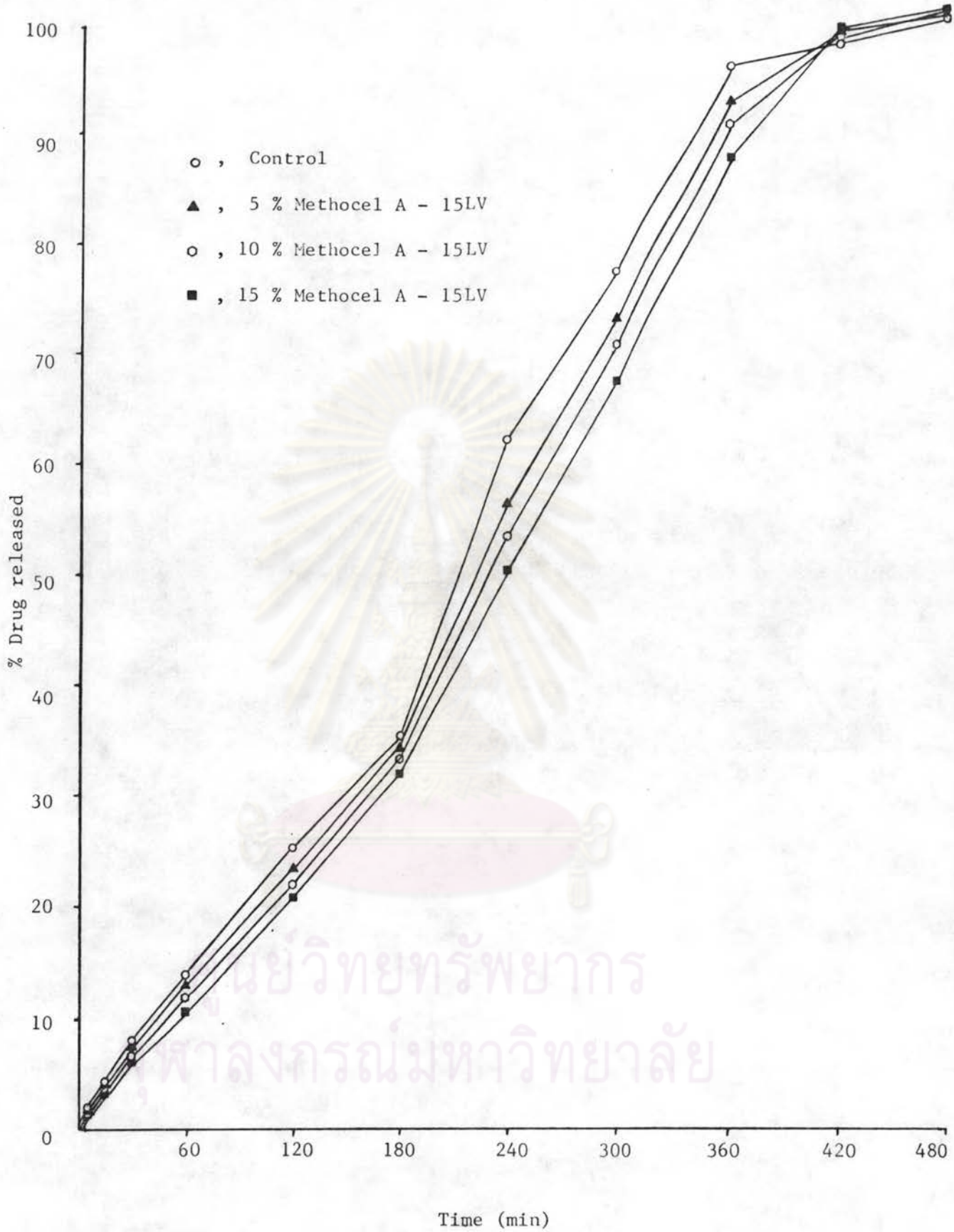

Figure 20 : Effect of concentration of Methocel A -15LV on dissolution rate of aspirin tablets in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

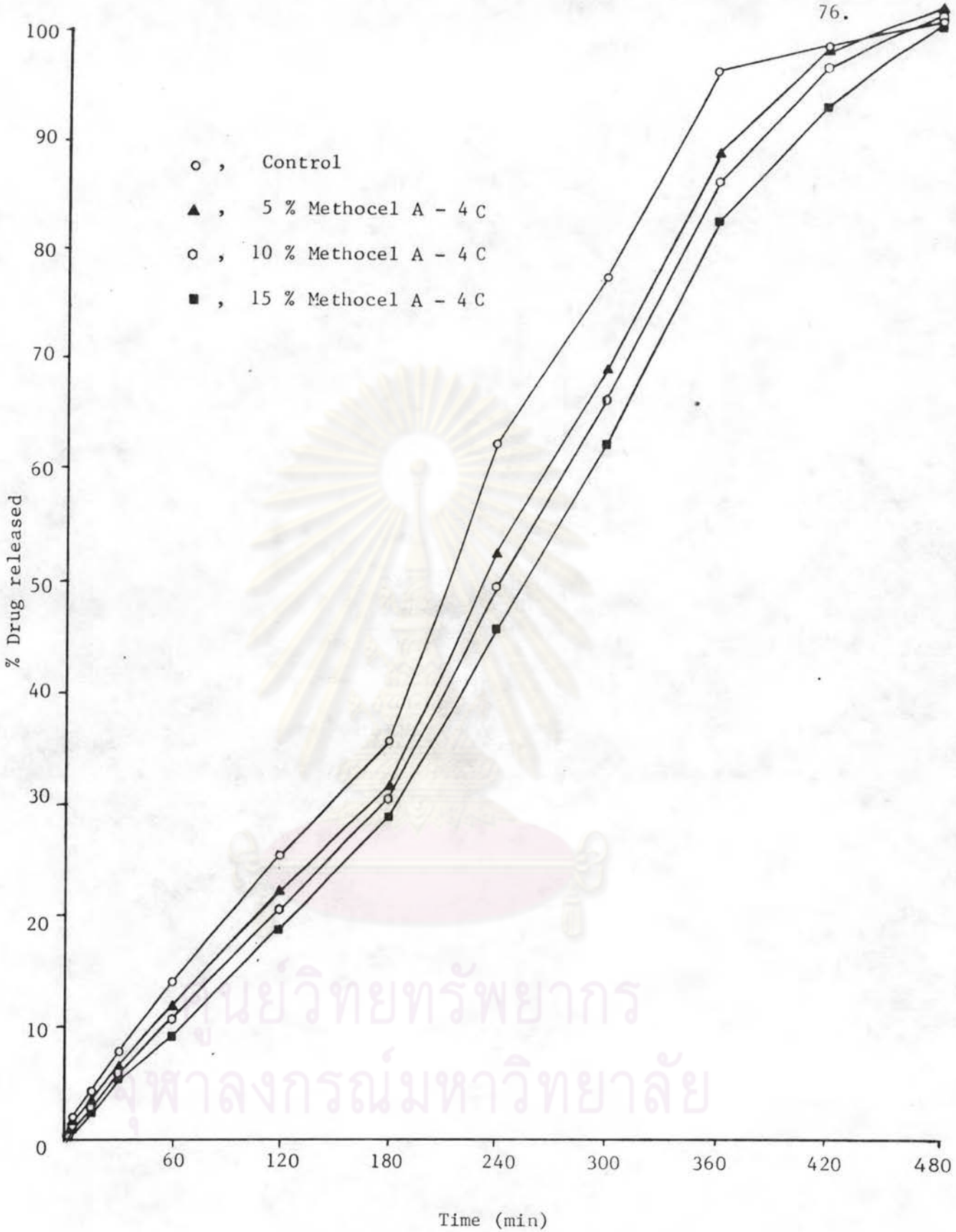

Figure 21 : Effect of concentration of Methocel A - 4C on dissolution of aspirin tablets in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

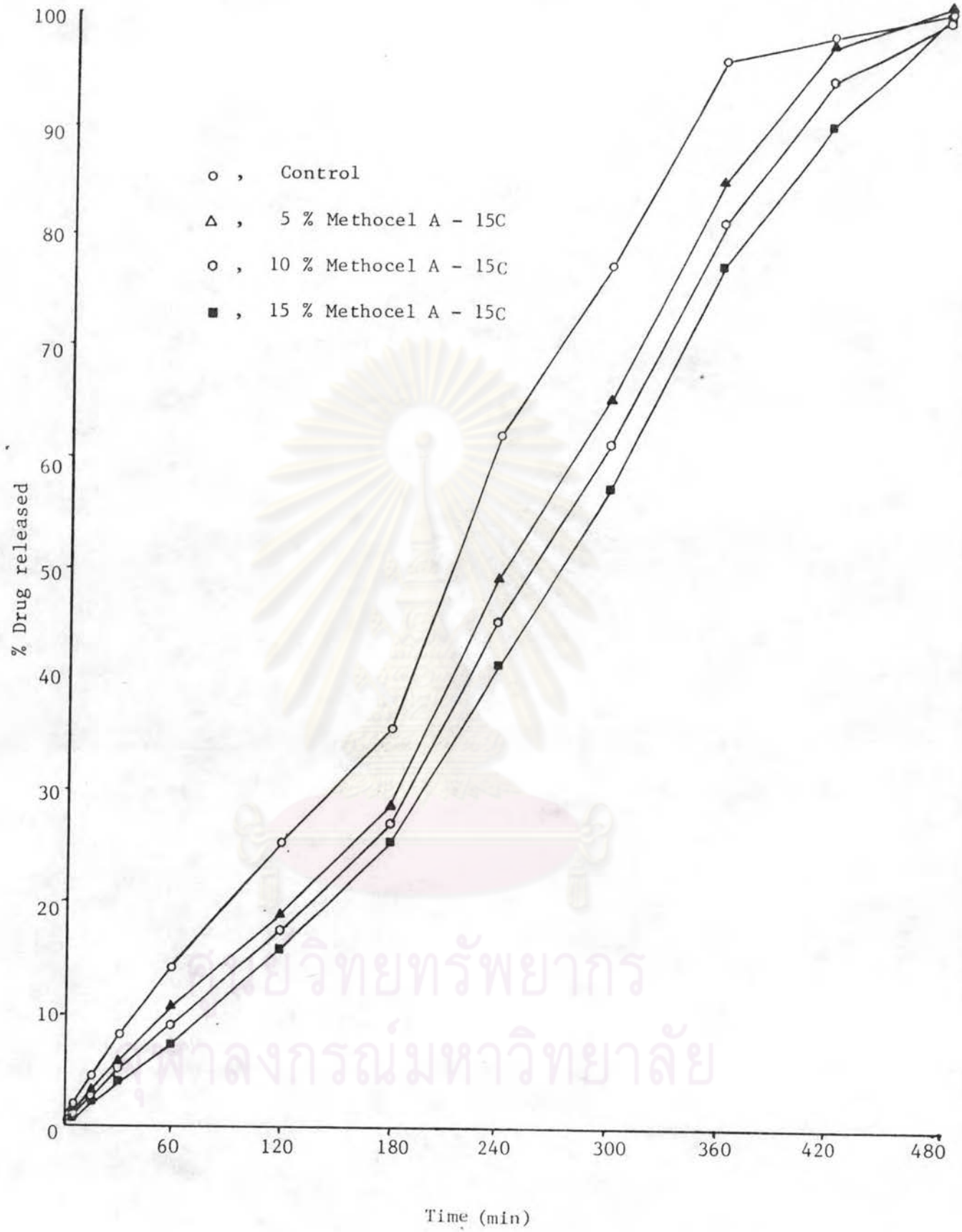

Figure 22 : Effect of concentration of Methocel A - 15C on dissolution of aspirin tablets in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

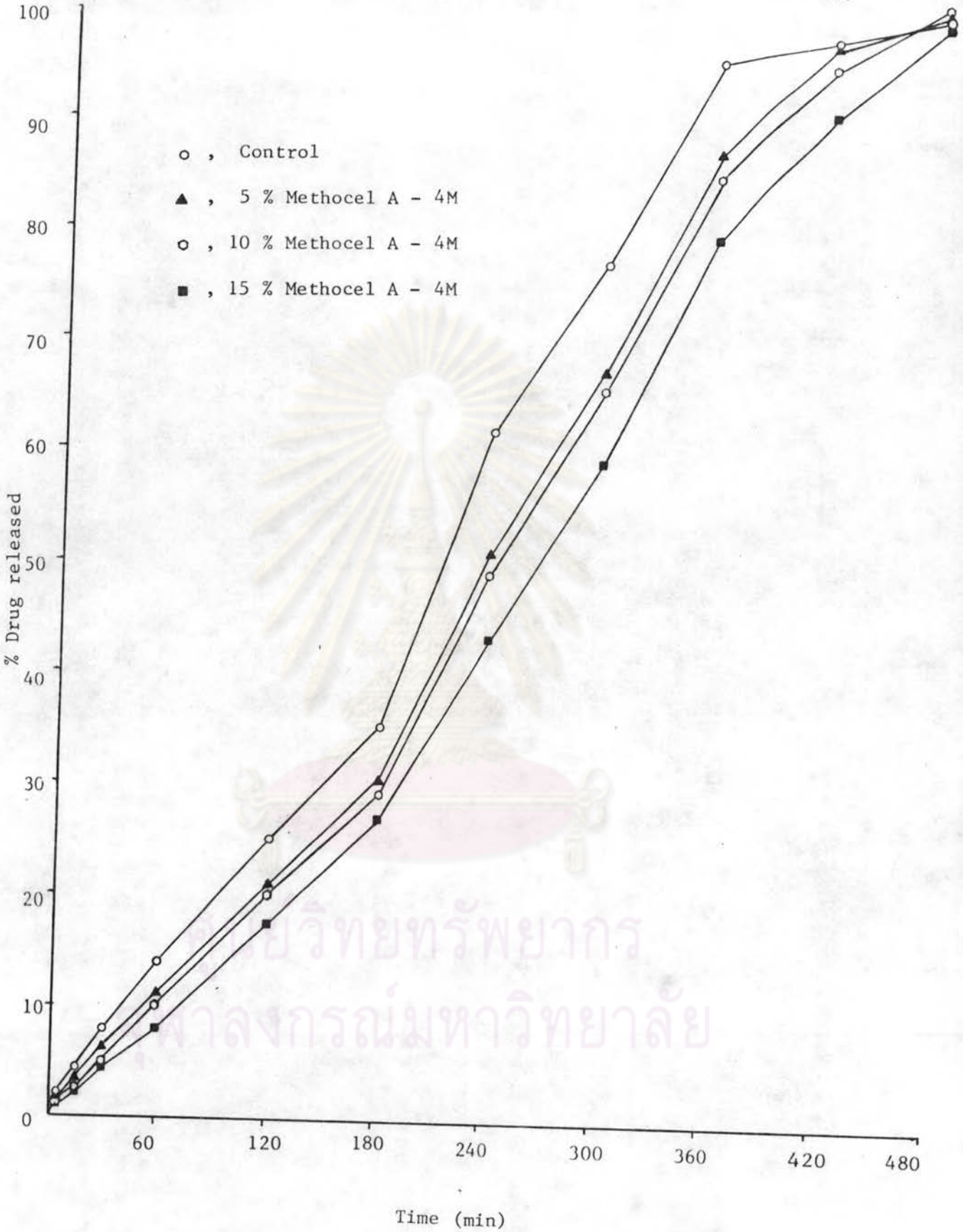

Figure 23 : Effect of concentration of Methocel A - 4M on dissolution rate of aspirin tablets in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours 37°C.

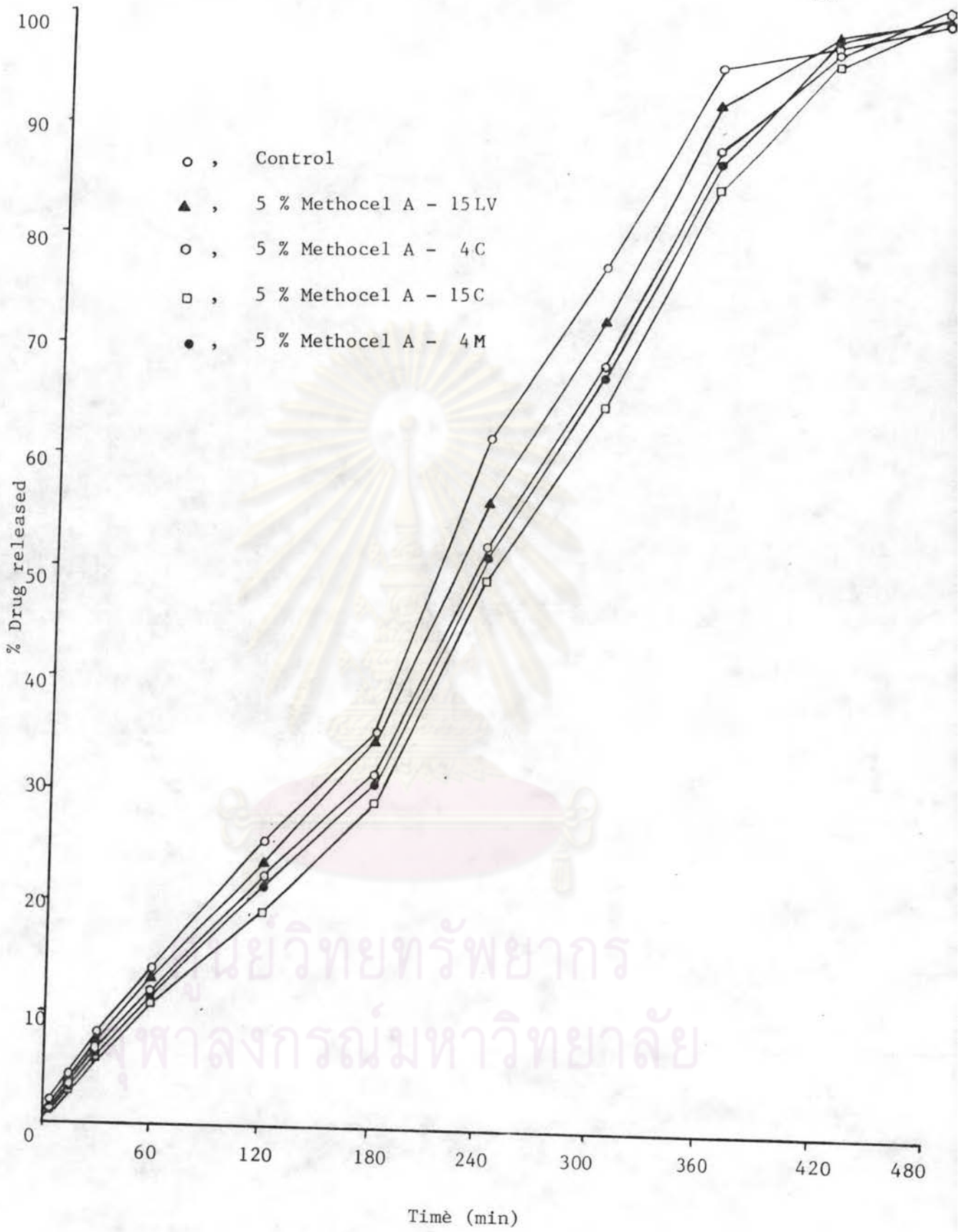

Figure 24 : Effect of various grades of 5% methylcellulose (Methocel A) on dissolution rate of aspirin tablets in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

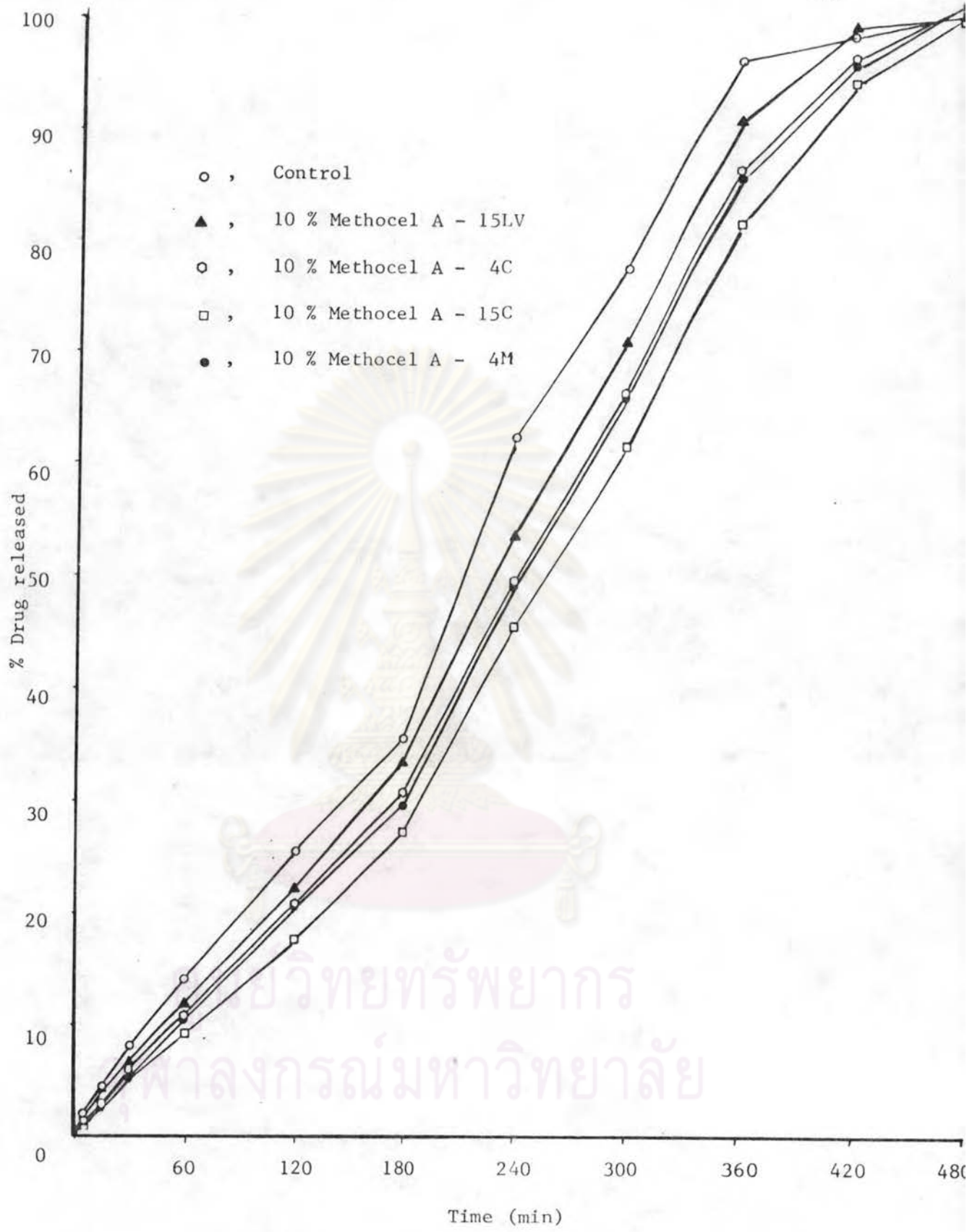

Figure 25 : Effect of various grades of 10% methylcellulose (Methocel A) on dissolution rate of aspirin tablets in simulated gastric flui for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.

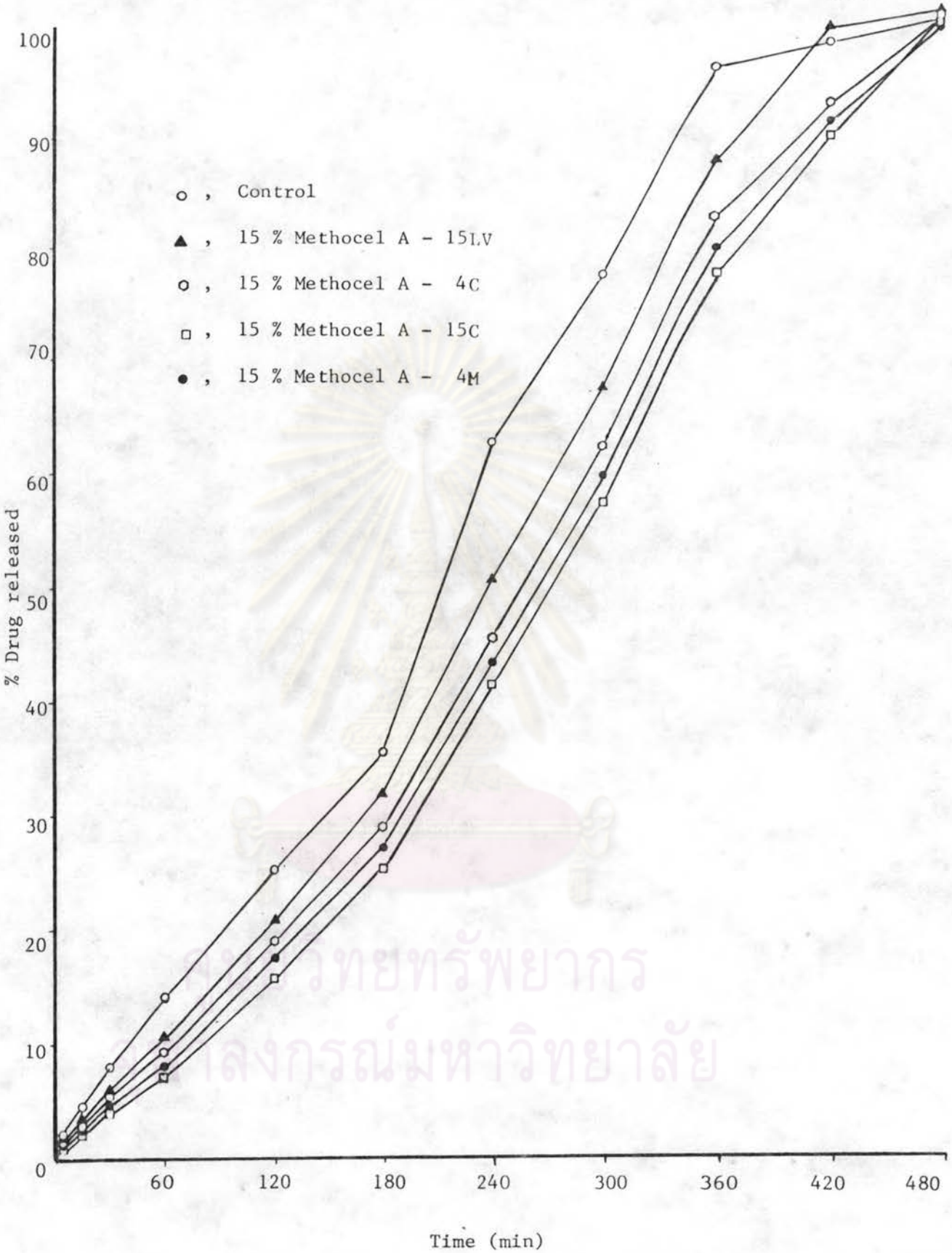

Figure 26 : Effect of various grades of 15% methylcellulose (Methocel A) on dissolution rate of aspirin tablets in simulated gastric fluid for 3 hours and in simulated intestinal fluid for 5 hours at 37°C.