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APPENDICES A

Particle size analysis

Table A1 Particle size measurement of 1:10:0 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
12.00	14.00	13.00	54	9.00	9.00
14.00	16.00	15.00	83	13.83	22.83
16.00	18.00	17.00	85	14.17	37.00
18.00	20.00	19.00	85	14.17	51.17
20.00	22.00	21.00	107	17.83	69.00
22.00	24.00	23.00	102	17.00	86.00
24.00	26.00	25.00	84	14.00	100.00

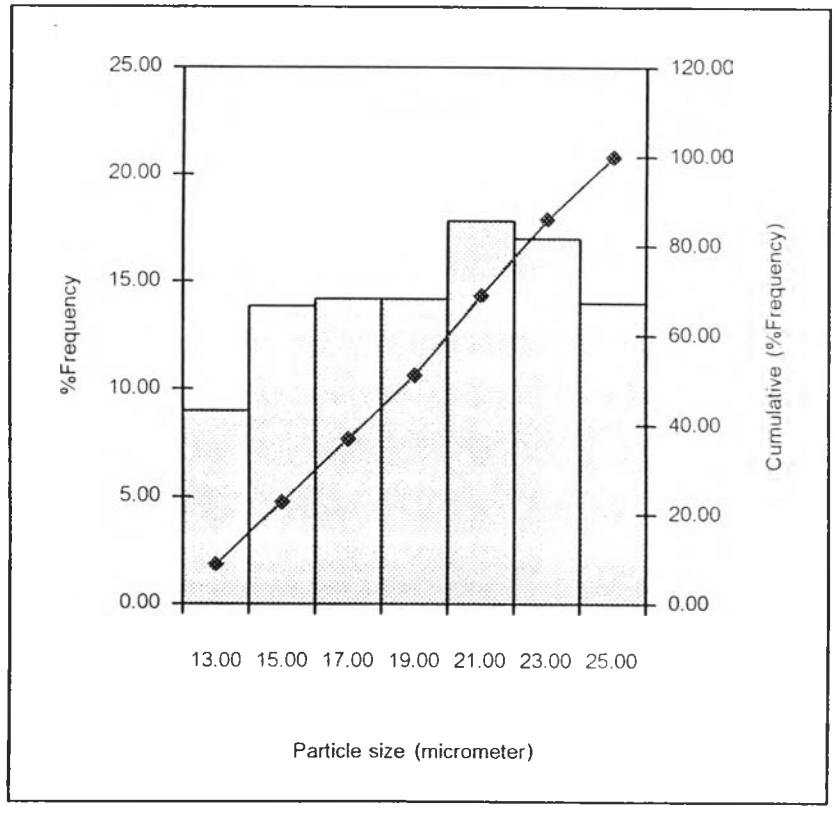

Figure A1 %Frequency distribution and cumulative %frequency plot of 1:0:10 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Table A2 Particle size measurement of 1:10:0 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
12.00	14.00	13.00	73.00	12.17	12.17
14.00	16.00	15.00	90.00	15.00	27.17
16.00	18.00	17.00	90.00	15.00	42.17
18.00	20.00	19.00	87.00	14.50	56.67
20.00	22.00	21.00	86.00	14.33	71.00
22.00	24.00	23.00	99.00	16.50	87.50
24.00	26.00	25.00	75.00	12.50	100.00

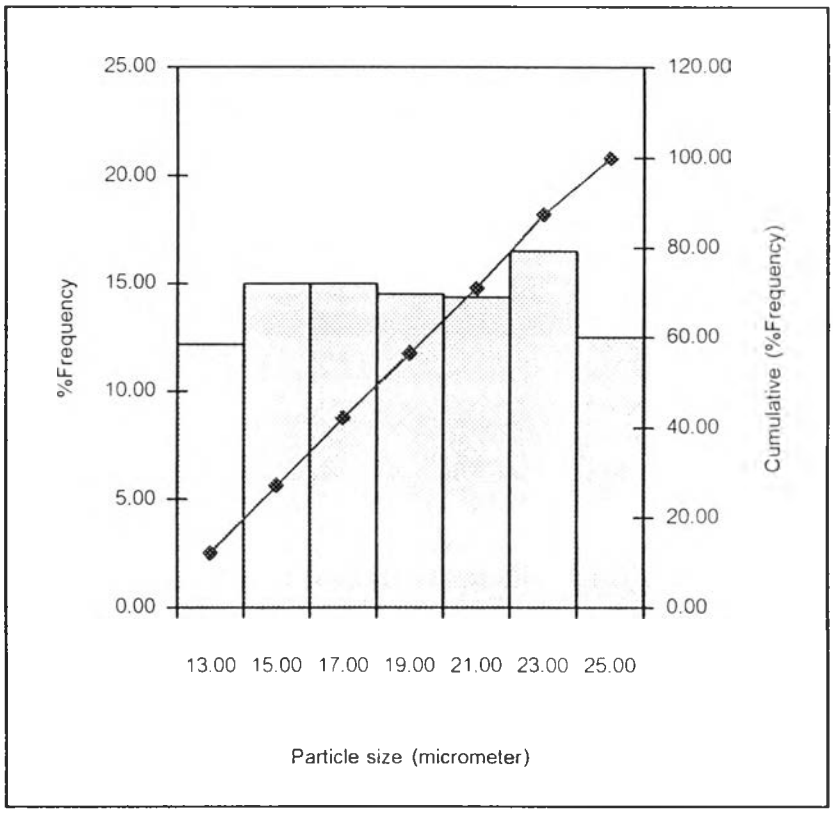

Figure A2 %Frequency distribution and cumulative %frequency plot of 1:0:10 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Table A3 Particle size measurement of 1:10:0 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
12.00	14.00	13.00	72	12.00	12.00
14.00	16.00	15.00	79	13.17	25.17
16.00	18.00	17.00	100	16.67	41.83
18.00	20.00	19.00	97	16.17	58.00
20.00	22.00	21.00	78	13.00	71.00
22.00	24.00	23.00	85	14.17	85.17
24.00	26.00	25.00	89	14.83	100.00

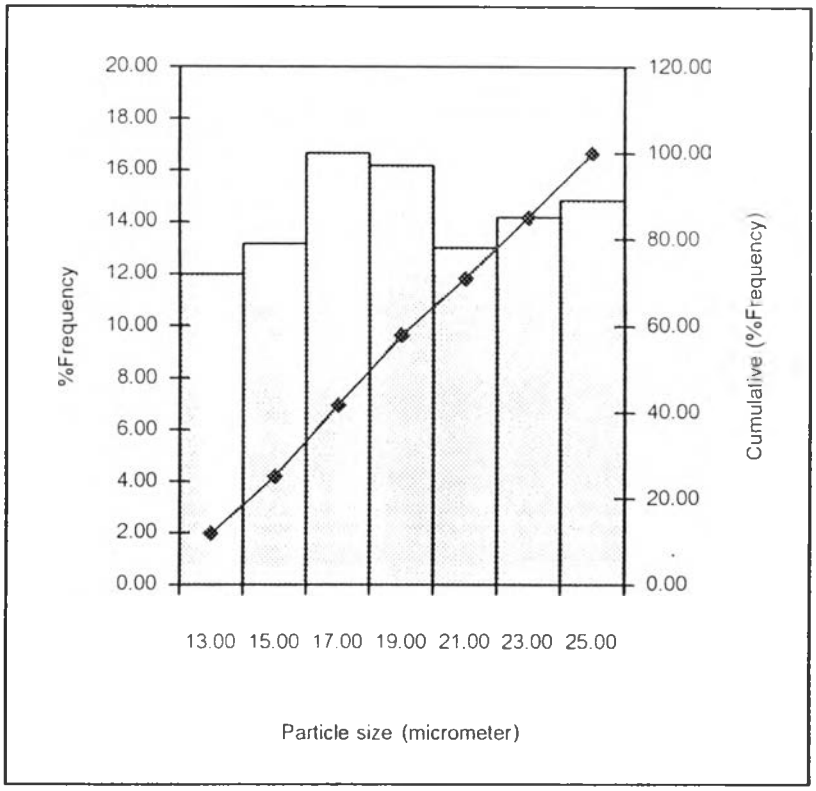

Figure A3 %Frequency distribution and cumulative %frequency plot of 1:0:10 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Table A4 Particle size measurement of 1:8:2 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
8.00	10.00	9.00	2	0.33	0.33
10.00	12.00	11.00	90	15.00	15.33
12.00	14.00	13.00	82	13.67	29.00
14.00	16.00	15.00	88	14.67	43.67
16.00	18.00	17.00	102	17.00	60.67
18.00	20.00	19.00	109	18.17	78.83
20.00	22.00	21.00	93	15.50	94.33
22.00	24.00	23.00	34	5.67	100.00

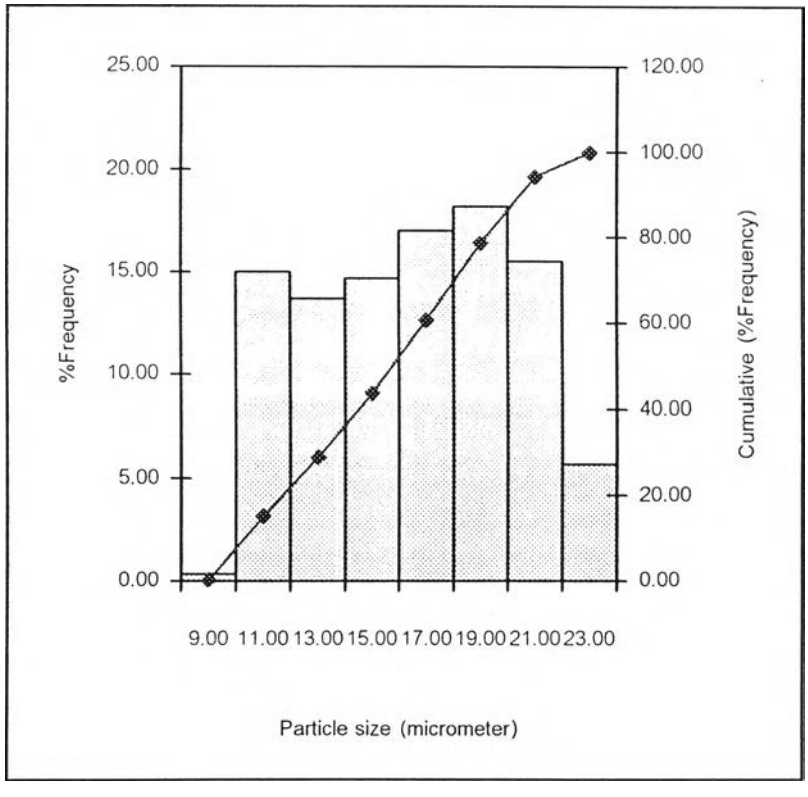

Figure A4 %Frequency distribution and cumulative %frequency plot of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Table A5 Particle size measurement of 1:8:2 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
4.00	6.00	5.00	1	0.17	0.17
6.00	8.00	7.00	0	0.00	0.17
8.00	10.00	9.00	0	0.00	0.17
10.00	12.00	11.00	13	2.17	2.33
12.00	14.00	13.00	128	21.33	23.67
14.00	16.00	15.00	204	34.00	57.67
16.00	18.00	17.00	193	32.17	89.83
18.00	20.00	19.00	49	8.17	98.00
20.00	22.00	21.00	10	1.67	99.67
22.00	24.00	23.00	2	0.33	100.00

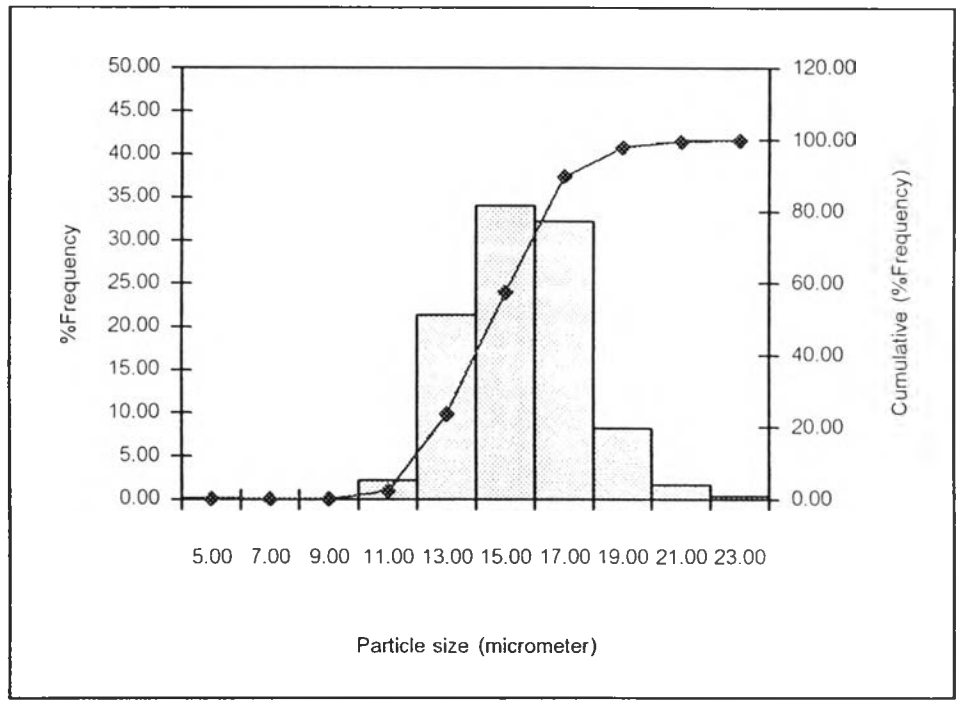

Figure A5 %Frequency distribution and cumulative %frequency plot of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Table A6 Particle size measurement of 1:8:2 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
8.00	10.00	9.00	11	1.83	1.83
10.00	12.00	11.00	124	20.67	22.50
12.00	14.00	13.00	119	19.83	42.33
14.00	16.00	15.00	120	20.00	62.33
16.00	18.00	17.00	106	17.67	80.00
18.00	20.00	19.00	112	18.67	98.67
20.00	22.00	21.00	8	1.33	100.00

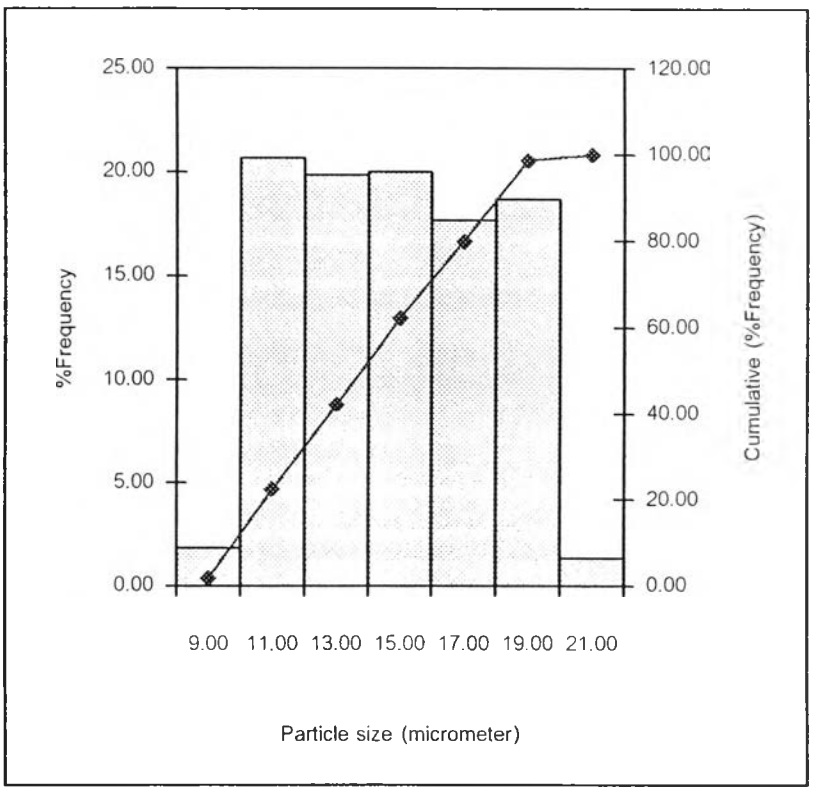

Figure A6 %Frequency distribution and cumulative %frequency plot of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Table A7 Particle size measurement of 1:5:5 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
12.00	14.00	13.00	69.00	11.50	11.50
14.00	16.00	15.00	96.00	16.00	27.50
16.00	18.00	17.00	83.00	13.83	41.33
18.00	20.00	19.00	95.00	15.83	57.17
20.00	22.00	21.00	85.00	14.17	71.33
22.00	24.00	23.00	85.00	14.17	85.50
24.00	26.00	25.00	87.00	14.50	100.00

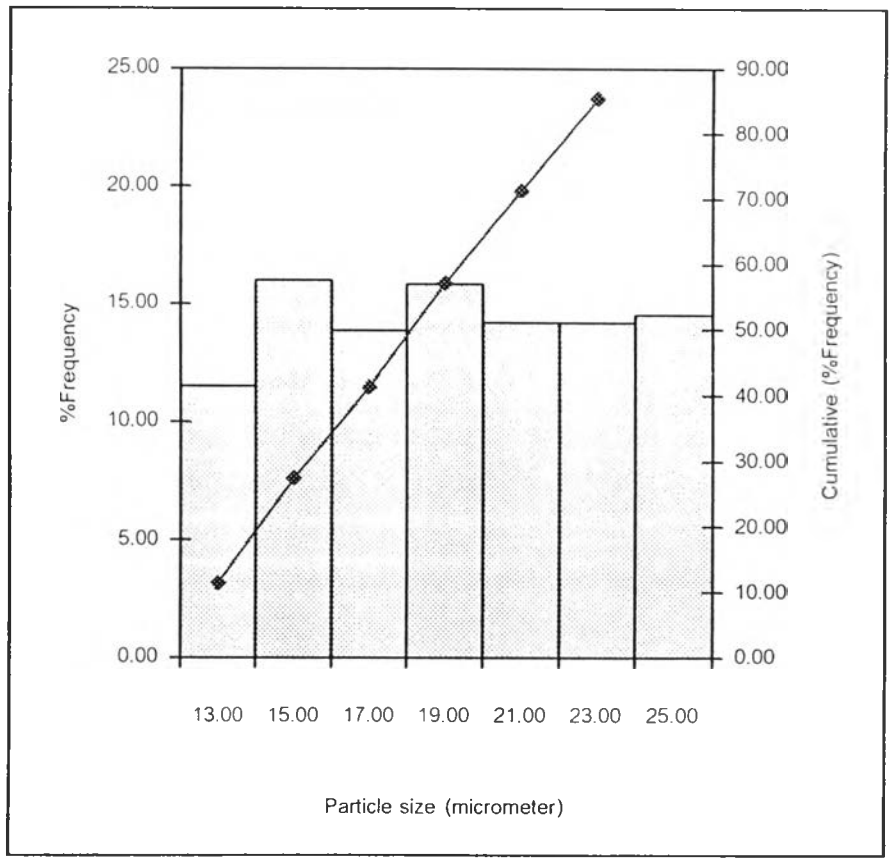

Figure A7 %Frequency distribution and cumulative %frequency plot of 1:5:5 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Table A8 Particle size measurement of 1:5:5 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
8.00	10.00	9.00	7	1.17	1.17
10.00	12.00	11.00	137	22.83	24.00
12.00	14.00	13.00	124	20.67	44.67
14.00	16.00	15.00	114	19.00	63.67
16.00	18.00	17.00	112	18.67	82.33
18.00	20.00	19.00	97	16.17	98.50
20.00	22.00	21.00	9	1.50	100.00

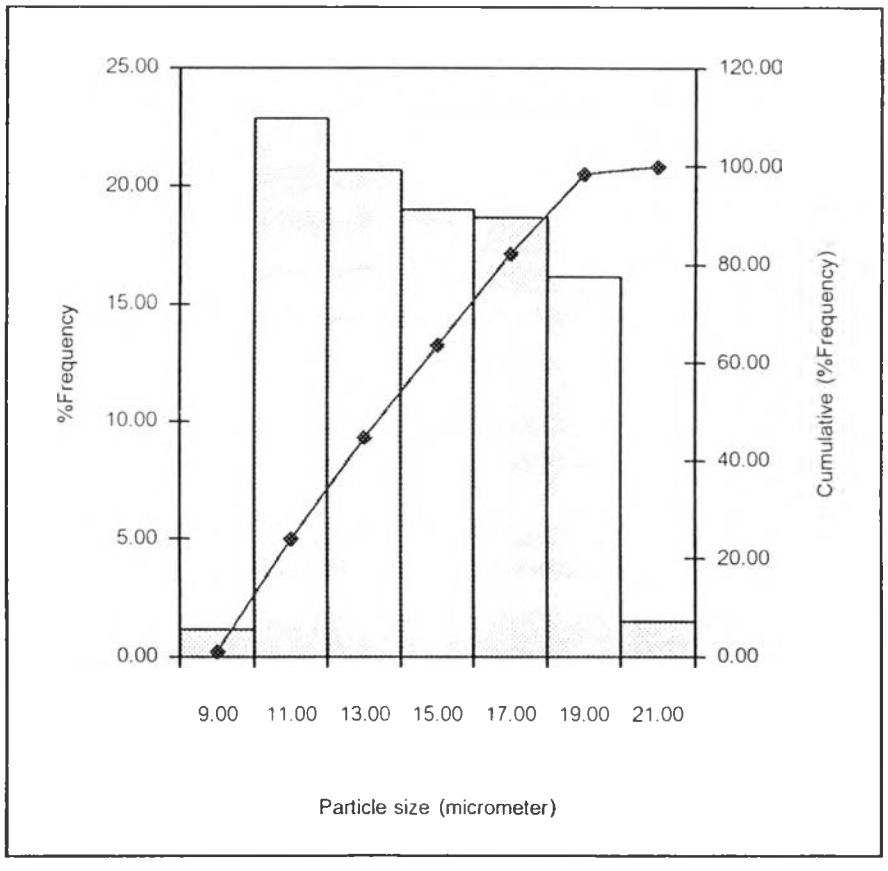

Figure A8 %Frequency distribution and cumulative %frequency plot of 1:5:5 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Table A9 Particle size measurement of 1:5:5 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
4.00	6.00	5.00	41	6.83	6.83
6.00	8.00	7.00	63	10.50	17.33
8.00	10.00	9.00	62	10.33	27.67
10.00	12.00	11.00	70	11.67	39.33
12.00	14.00	13.00	69	11.50	50.83
14.00	16.00	15.00	63	10.50	61.33
16.00	18.00	17.00	68	11.33	72.67
18.00	20.00	19.00	70	11.67	84.33
20.00	22.00	21.00	68	11.33	95.67
22.00	24.00	23.00	26	4.33	100.00

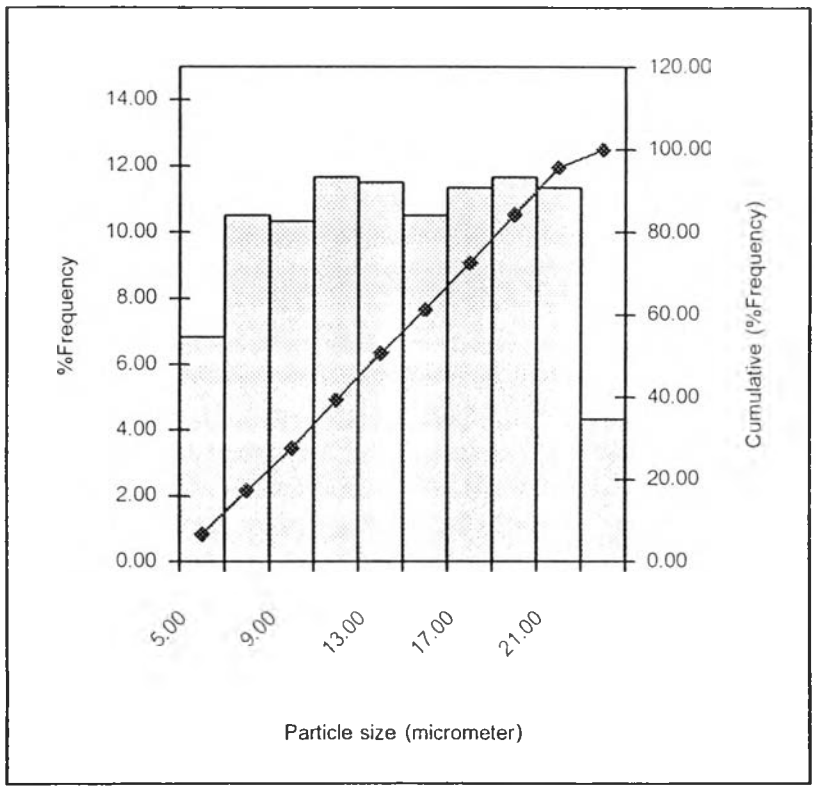

Figure A9 %Frequency distribution and cumulative %frequency plot of 1:5:5 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Table A10 Particle size measurement of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
8.00	10.00	9.00	4	0.67	0.67
10.00	12.00	11.00	62	10.33	11.00
12.00	14.00	13.00	75	12.50	23.50
14.00	16.00	15.00	70	11.67	35.17
16.00	18.00	17.00	102	17.00	52.17
18.00	20.00	19.00	91	15.17	67.33
20.00	22.00	21.00	72	12.00	79.33
22.00	24.00	23.00	80	13.33	92.67
24.00	26.00	25.00	44	7.33	100.00

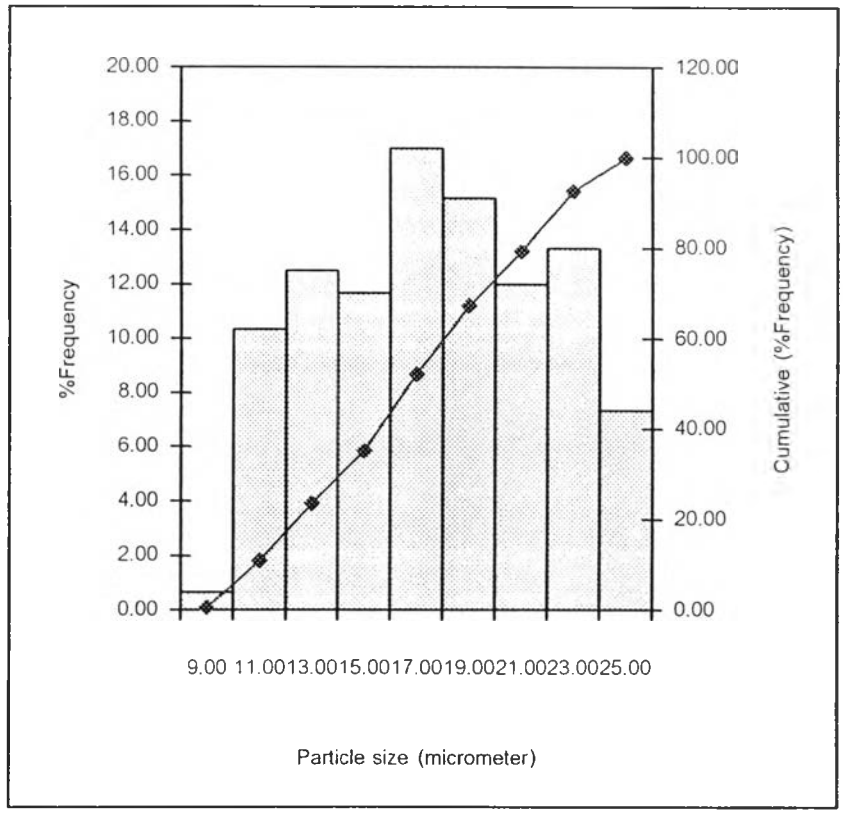

Figure A10 %Frequency distribution and cumulative %frequency plot of 1:8:2 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Table A11 Particle size measurement of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
8.00	10.00	9.00	51	8.50	8.50
10.00	12.00	11.00	81	13.50	22.00
12.00	14.00	13.00	95	15.83	37.83
14.00	16.00	15.00	90	15.00	52.83
16.00	18.00	17.00	105	17.50	70.33
18.00	20.00	19.00	93	15.50	85.83
20.00	22.00	21.00	85	14.17	100.00

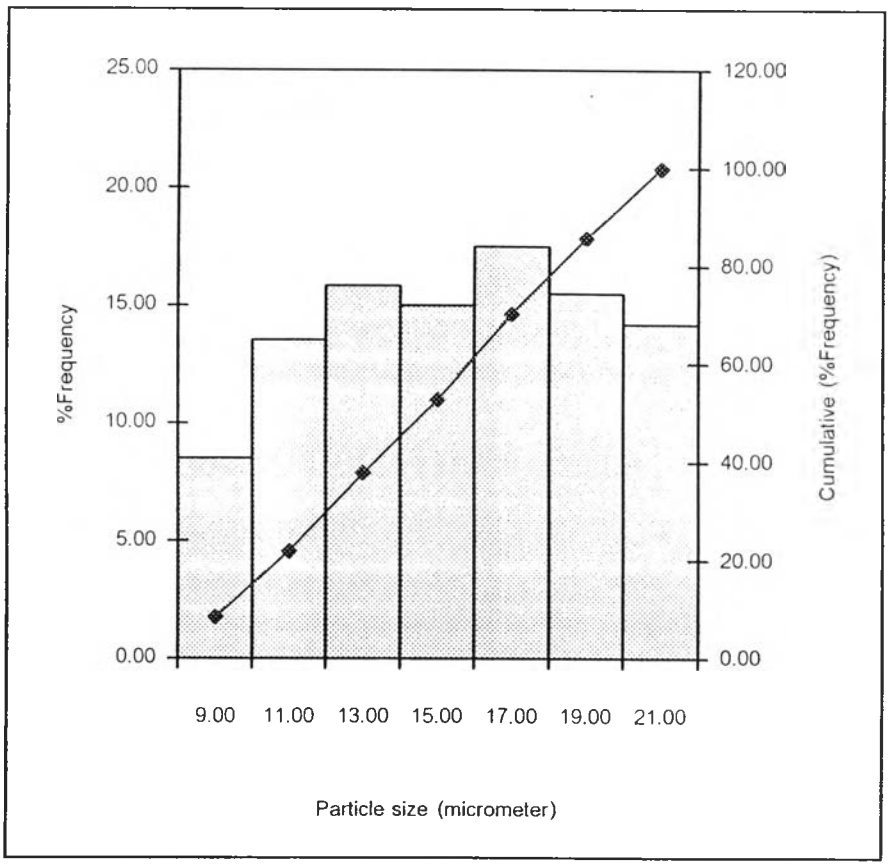

Figure A11 %Frequency distribution and cumulative %frequency plot of 1:8:2 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Table A12 Particle size measurement of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
4.00	6.00	5.00	40	6.67	6.67
6.00	8.00	7.00	57	9.50	16.17
8.00	10.00	9.00	54	9.00	25.17
10.00	12.00	11.00	71	11.83	37.00
12.00	14.00	13.00	72	12.00	49.00
14.00	16.00	15.00	54	9.00	58.00
16.00	18.00	17.00	79	13.17	71.17
18.00	20.00	19.00	76	12.67	83.83
20.00	22.00	21.00	75	12.50	96.33
22.00	24.00	23.00	22	3.67	100.00

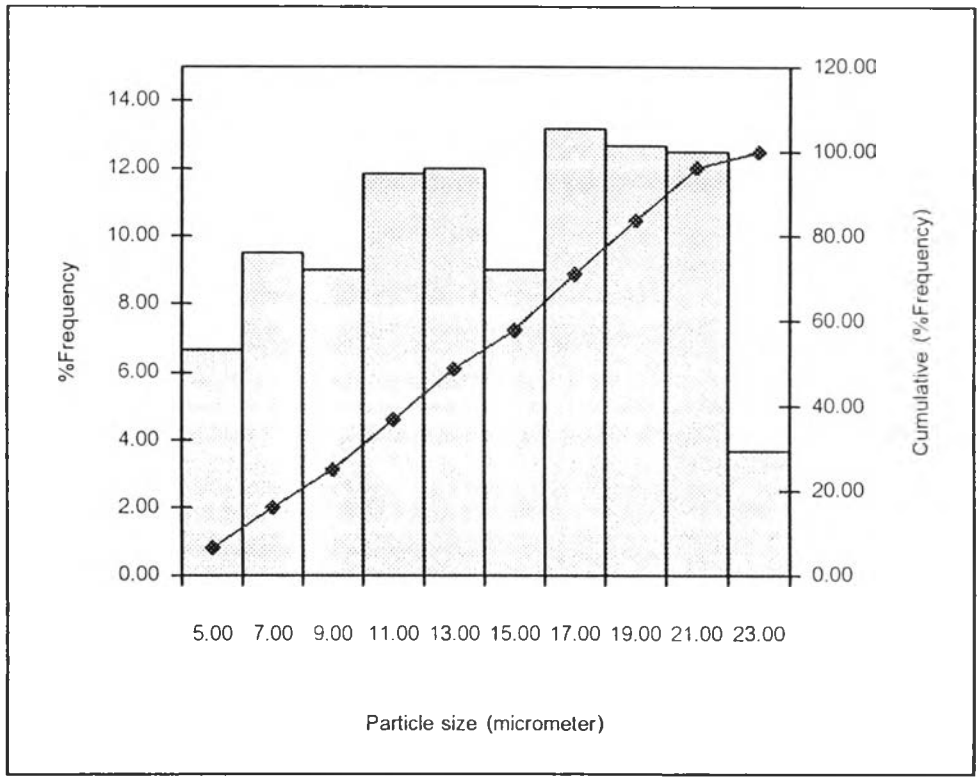

Figure A12 %Frequency distribution and cumulative %frequency plot of 1:8:2 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Table A13 Particle size measurement of 1:0:10 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
4.00	6.00	5.00	33	5.50	5.50
6.00	8.00	7.00	57	9.50	15.00
8.00	10.00	9.00	70	11.67	26.67
10.00	12.00	11.00	74	12.33	39.00
12.00	14.00	13.00	73	12.17	51.17
14.00	16.00	15.00	62	10.33	61.50
16.00	18.00	17.00	62	10.33	71.83
18.00	20.00	19.00	87	14.50	86.33
20.00	22.00	21.00	64	10.67	97.00
22.00	24.00	23.00	18	3.00	100.00

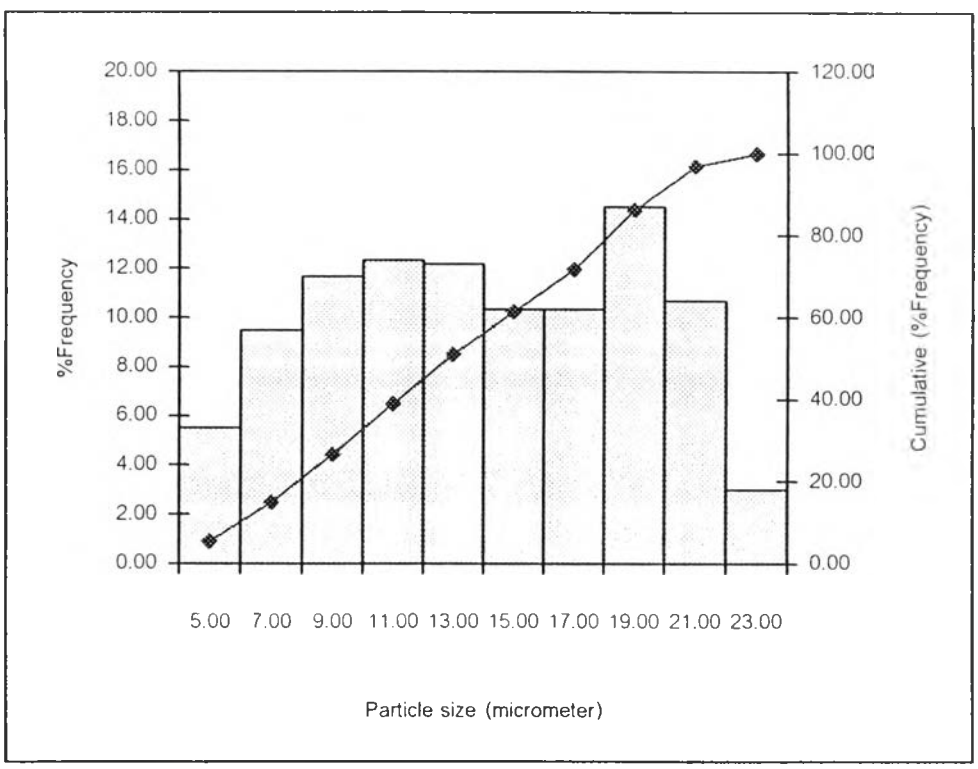

Figure A13 %Frequency distribution and cumulative %frequency plot of 1:10:0 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C.

Table A14 Particle size measurement of 1:0:10 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
4.00	6.00	5.00	37	6.17	6.17
6.00	8.00	7.00	65	10.83	17.00
8.00	10.00	9.00	72	12.00	29.00
10.00	12.00	11.00	79	13.17	42.17
12.00	14.00	13.00	71	11.83	54.00
14.00	16.00	15.00	65	10.83	64.83
16.00	18.00	17.00	75	12.50	77.33
18.00	20.00	19.00	63	10.50	87.83
20.00	22.00	21.00	60	10.00	97.83
22.00	24.00	23.00	13	2.17	100.00

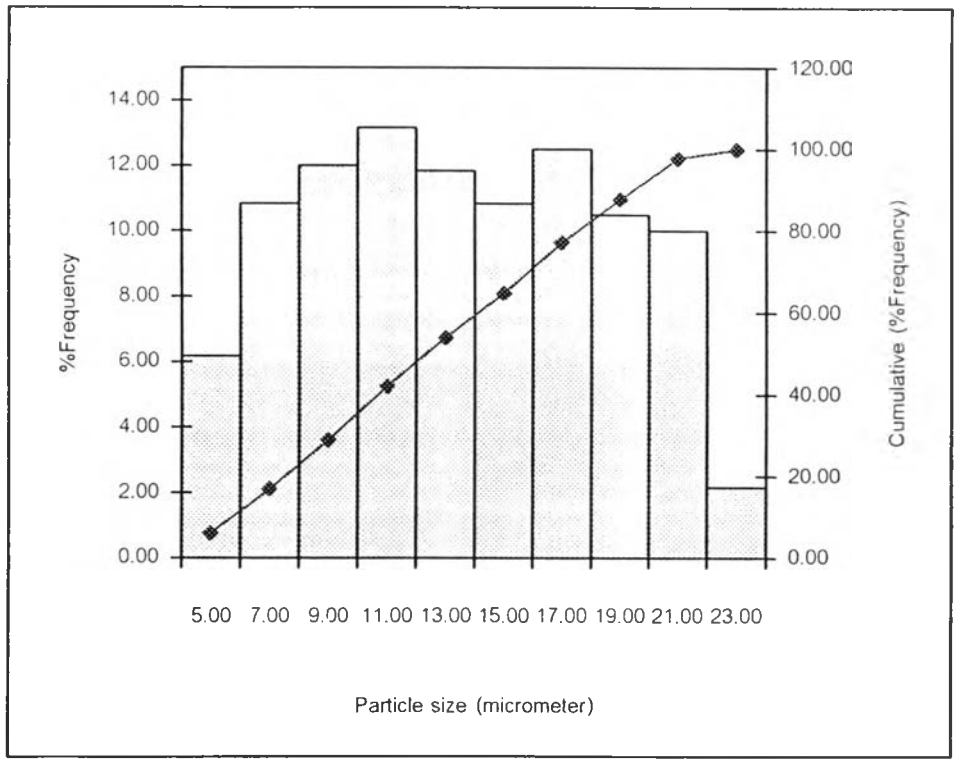

Figure A14 %Frequency distribution and cumulative %frequency plot of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Table A15 Particle size measurement of 1:0:10 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 75 °C.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
4.00	6.00	5.00	0	0.00	0.00
6.00	8.00	7.00	104	17.33	17.33
8.00	10.00	9.00	89	14.83	32.17
10.00	12.00	11.00	102	17.00	49.17
12.00	14.00	13.00	86	14.33	63.50
14.00	16.00	15.00	93	15.50	79.00
16.00	18.00	17.00	79	13.17	92.17
18.00	20.00	19.00	47	7.83	100.00

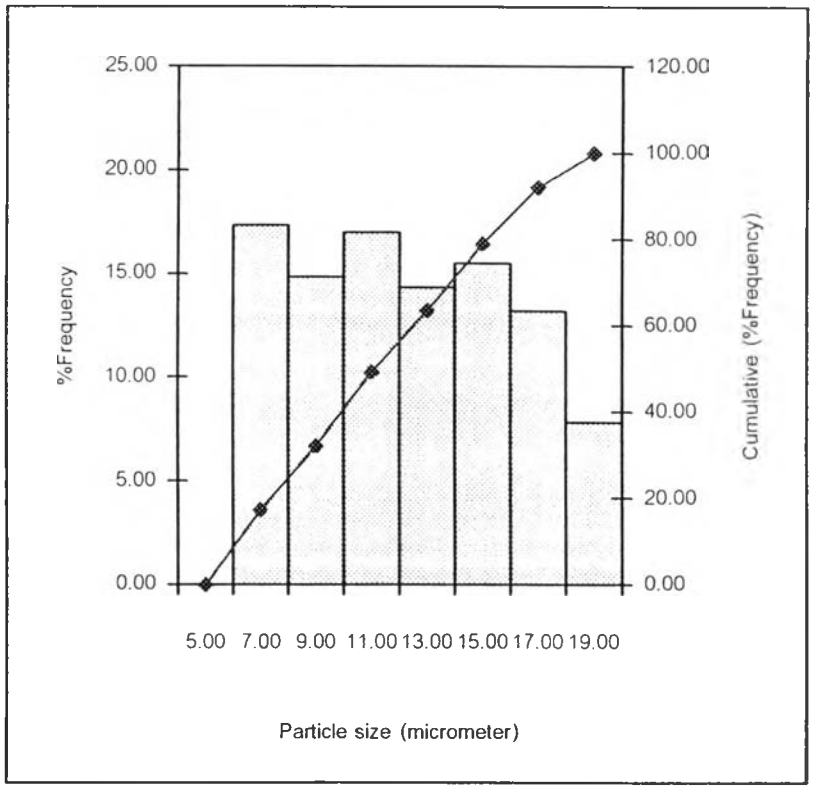

Figure A15 %Frequency distribution and cumulative %frequency plot of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C.

Table A16 Median diameter (μm) of nifedipine microspheres with varied mixing ratios and spray dried at varied inlet air temperature

	Median diameter (μm)		
	55 °C	65 °C	75 °C
1:10:0	18.54	18.10	18.17
1:8:2	15.50	14.44	13.87
1:5:5	18.14	13.76	12.88
1:2:8	16.70	14.50	13.13
1:0:10	12.92	12.50	11.31

Table A17 Particle size measurement of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 85 ^{o}C, pump setting 10 ml/min, spray flow 700 NL/h, solid content 1% w/v.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
4.00	6.00	5.00	152	25.33	25.33
6.00	8.00	7.00	221	36.83	62.17
8.00	10.00	9.00	217	36.17	98.33
10.00	12.00	11.00	7	1.17	99.50
12.00	14.00	13.00	3	0.50	100.00

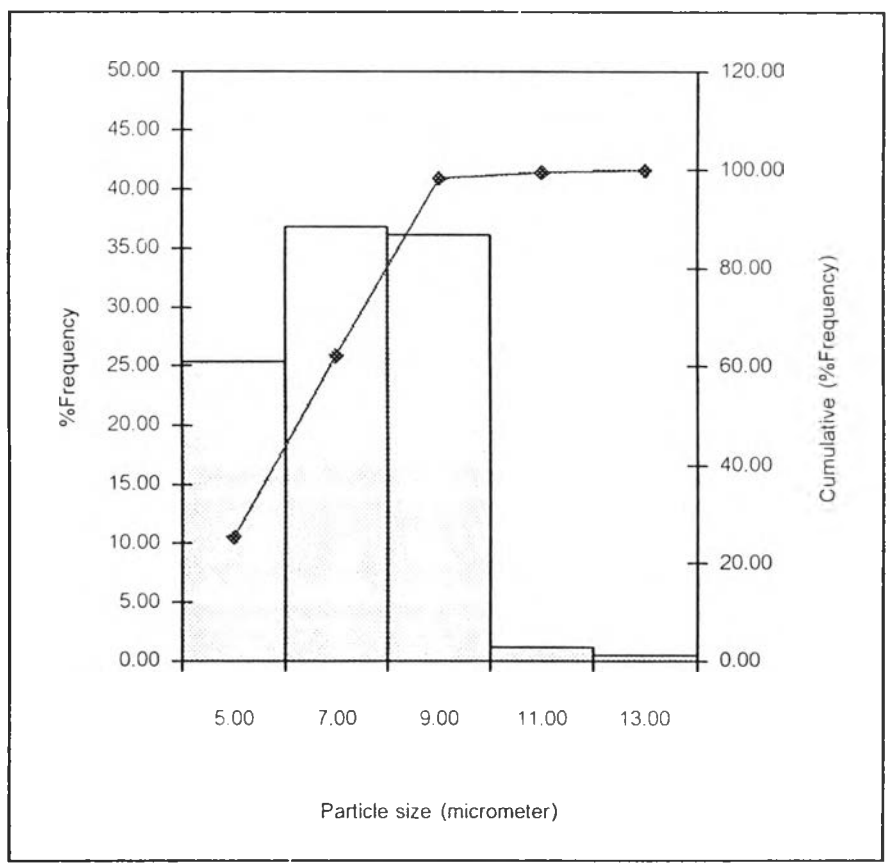

Figure A16 %Frequency distribution and cumulative %frequency plot of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 85 ^{o}C, pump setting 10 ml/min, spray flow 700 NL/h, solid content 1% w/v.

Table A18 Particle size measurement of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C, pump setting 5 ml/min, spray flow 700 NL/h, solid content 20% w/v.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
18.00	20.00	19.00	69	11.50	11.50
20.00	22.00	21.00	64	10.67	22.17
22.00	24.00	23.00	78	13.00	35.17
24.00	26.00	25.00	78	13.00	48.17
26.00	28.00	27.00	65	10.83	59.00
28.00	30.00	29.00	88	14.67	73.67
30.00	32.00	31.00	85	14.17	87.83
32.00	34.00	33.00	73	12.17	100.00

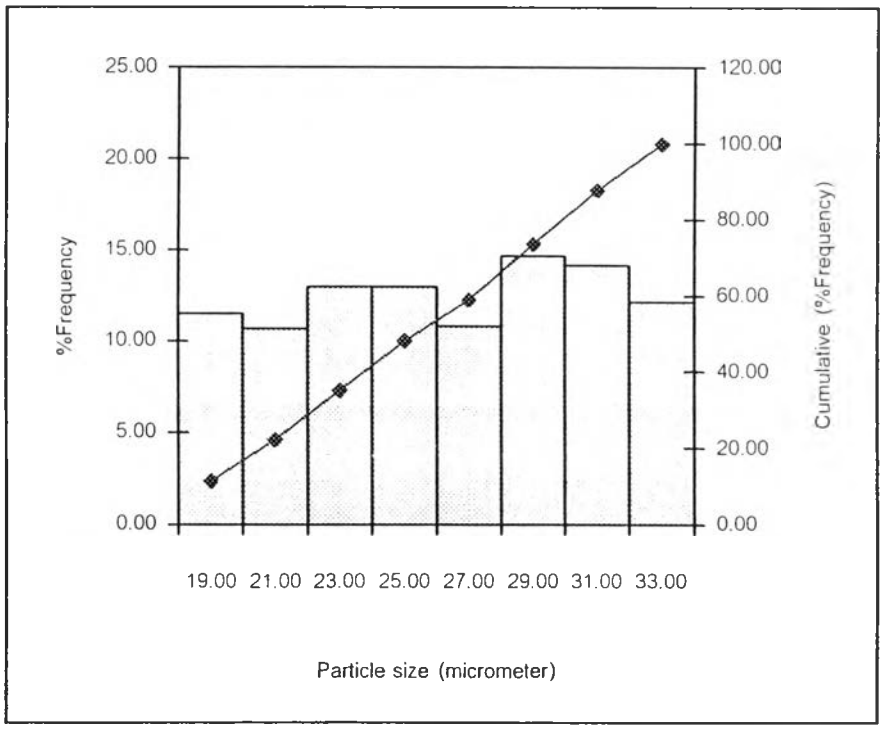

Figure A17 %Frequency distribution and cumulative %frequency plot of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 65 °C, pump setting 5 ml/min, spray flow 700 NL/h, solid content 20% w/v.

Table A19 Particle size measurement of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C, pump setting 5 ml/min, spray flow 300 NL/h, solid content 40% w/v.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
5.00	15.00	10.00	1	0.17	0.17
15.00	25.00	20.00	9	1.50	1.67
25.00	35.00	30.00	106	17.67	19.33
35.00	45.00	40.00	218	36.33	55.67
45.00	55.00	50.00	175	29.17	84.83
55.00	65.00	60.00	90	15.00	99.83
65.00	75.00	70.00	1	0.17	100.00

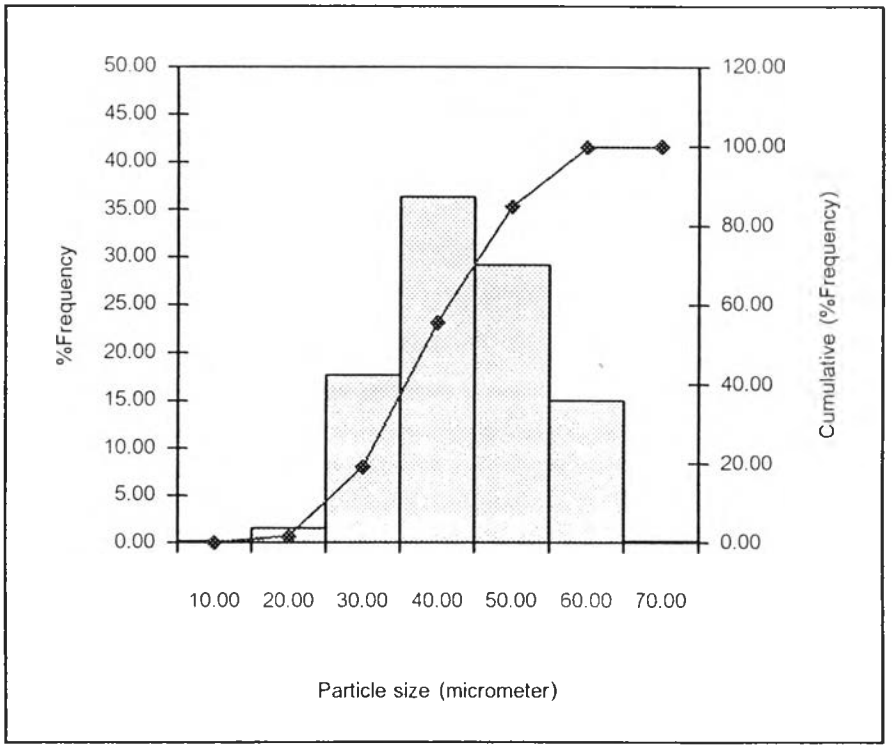

Figure A18 %Frequency distribution and cumulative %frequency plot of 1:2:8 nifedipine:Eudragit RS100:PVP K30, spray dried at inlet air temperature 55 °C, pump setting 5 ml/min, spray flow 300 NL/h, solid content 40% w/v.

Table A20 Median diameter (μm) of nifedipine microspheres with varied spray drying conditions

Formula	Median diameter (μm)
inlet air temperature 85 °C, pump setting 10 ml/min, spray flow 700 NL/h, solid content 1% w/v	6.35
inlet air temperature 65 °C, pump setting 5 ml/min, spray flow 600 NL/h, solid content 5% w/v	14.50
inlet air temperature 65 °C, pump setting 5 ml/min, spray flow 700 NL/h, solid content 20% w/v	25.57
inlet air temperature 55 °C, pump setting 5 ml/min, spray flow 300 NL/h, solid content 40% w/v.	38.31

Table A21 Particle size measurement of 1:1 nifedipine:Eudragit RS100

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
10.00	12.00	11.00	1	0.17	0.17
12.00	14.00	13.00	67	11.17	11.33
14.00	16.00	15.00	115	19.17	30.50
16.00	18.00	17.00	114	19.00	49.50
18.00	20.00	19.00	131	21.83	71.33
20.00	22.00	21.00	119	19.83	91.17
22.00	24.00	23.00	53	8.83	100.00

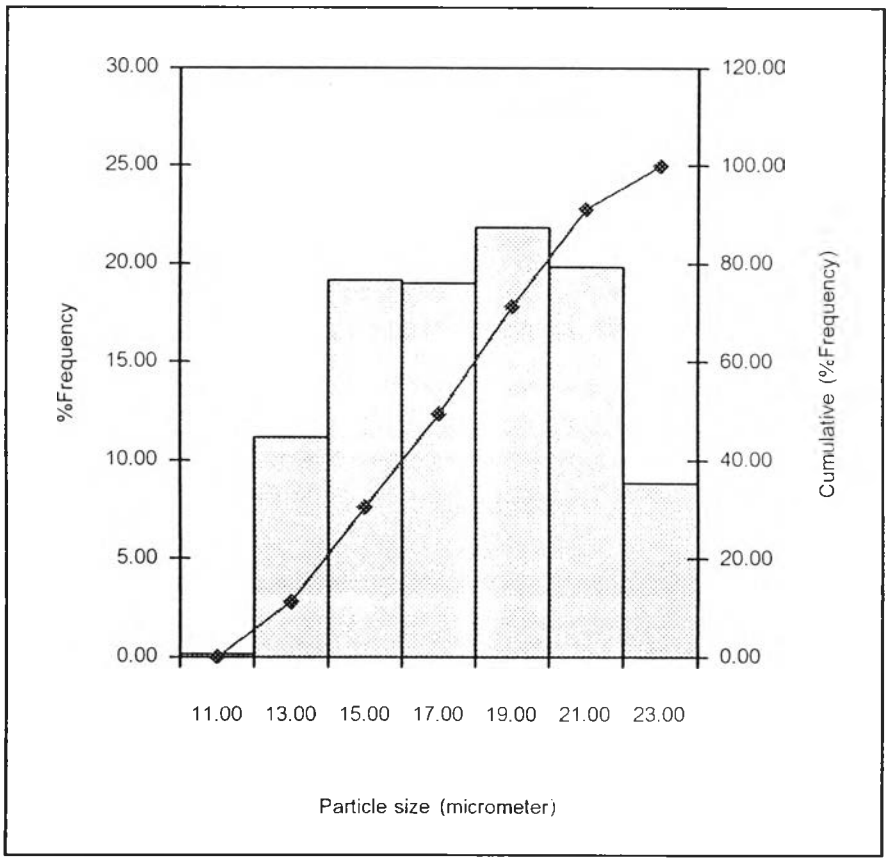

Figure A19 %Frequency distribution and cumulative %frequency plot of 1:1 nifedipine:Eudragit RS100.

Table A22 Particle size measurement of 1:3 nifedipine:Eudragit RS100

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
12.00	14.00	13.00	81	13.50	13.50
14.00	16.00	15.00	103	17.17	30.67
16.00	18.00	17.00	92	15.33	46.00
18.00	20.00	19.00	80	13.33	59.33
20.00	22.00	21.00	103	17.17	76.50
22.00	24.00	23.00	87	14.50	91.00

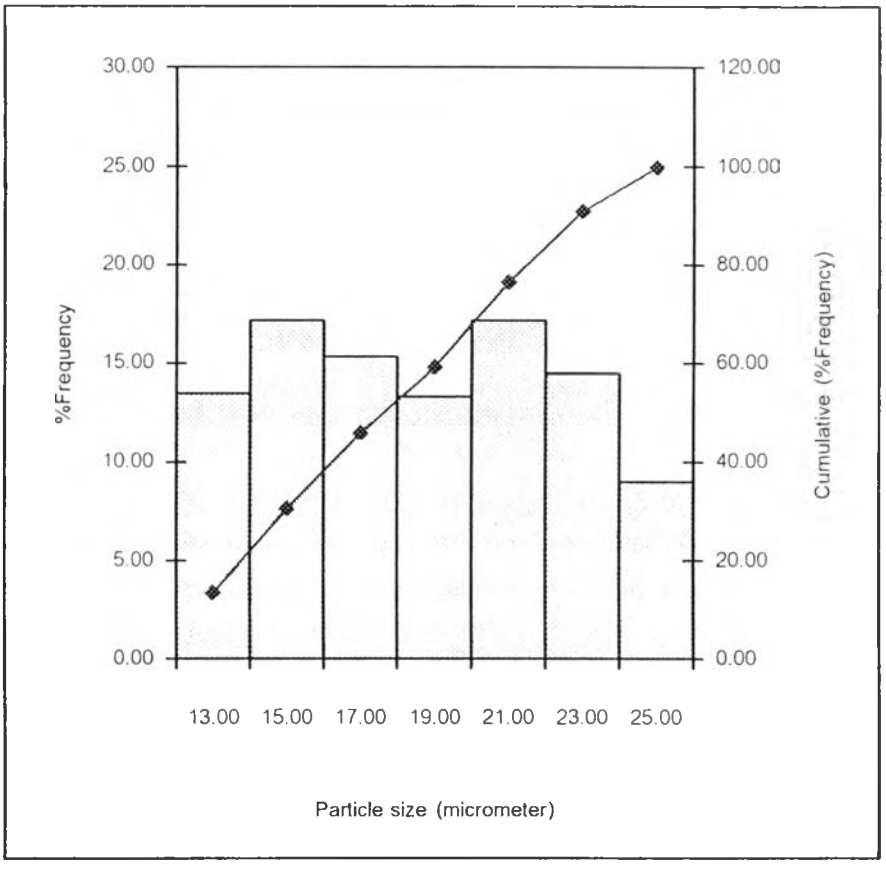

Figure A20 %Frequency distribution and cumulative %frequency plot of 1:3 nifedipine:Eudragit RS100.

Table A23 Particle size measurement of 1:5 nifedipine:Eudragit RS100

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
12.00	14.00	13.00	42	7.00	7.00
14.00	16.00	15.00	84	14.00	21.00
16.00	18.00	17.00	85	14.17	35.17
18.00	20.00	19.00	89	14.83	50.00
20.00	22.00	21.00	95	15.83	65.83
22.00	24.00	23.00	108	18.00	83.83
24.00	26.00	25.00	94	15.67	99.50
26.00	28.00	27.00	3	0.50	100.00

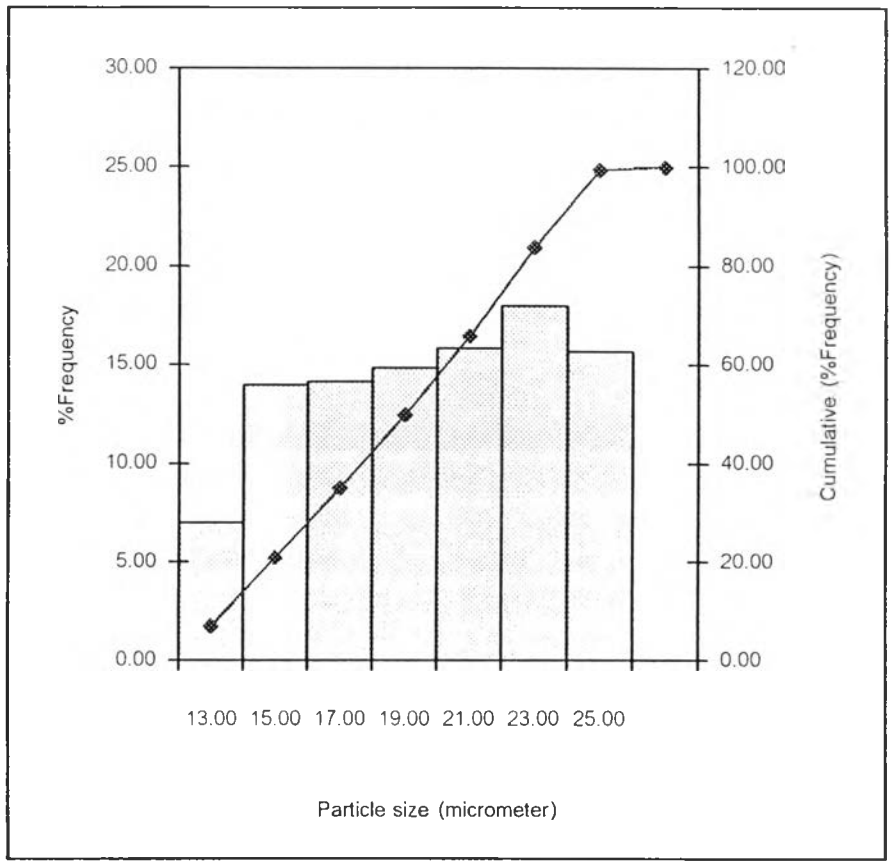

Figure A21 %Frequency distribution and cumulative %frequency plot of 1:5 nifedipine:Eudragit RS100.

Table A24 Particle size measurement of 1:1 nifedipine:PVP K30

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
8.00	10.00	9.00	87	14.50	14.50
10.00	12.00	11.00	110	18.33	32.83
12.00	14.00	13.00	139	23.17	56.00
14.00	16.00	15.00	119	19.83	75.83
16.00	18.00	17.00	99	16.50	92.33
18.00	20.00	19.00	46	7.67	100.00
20.00	22.00	21.00	0	0.00	100.00

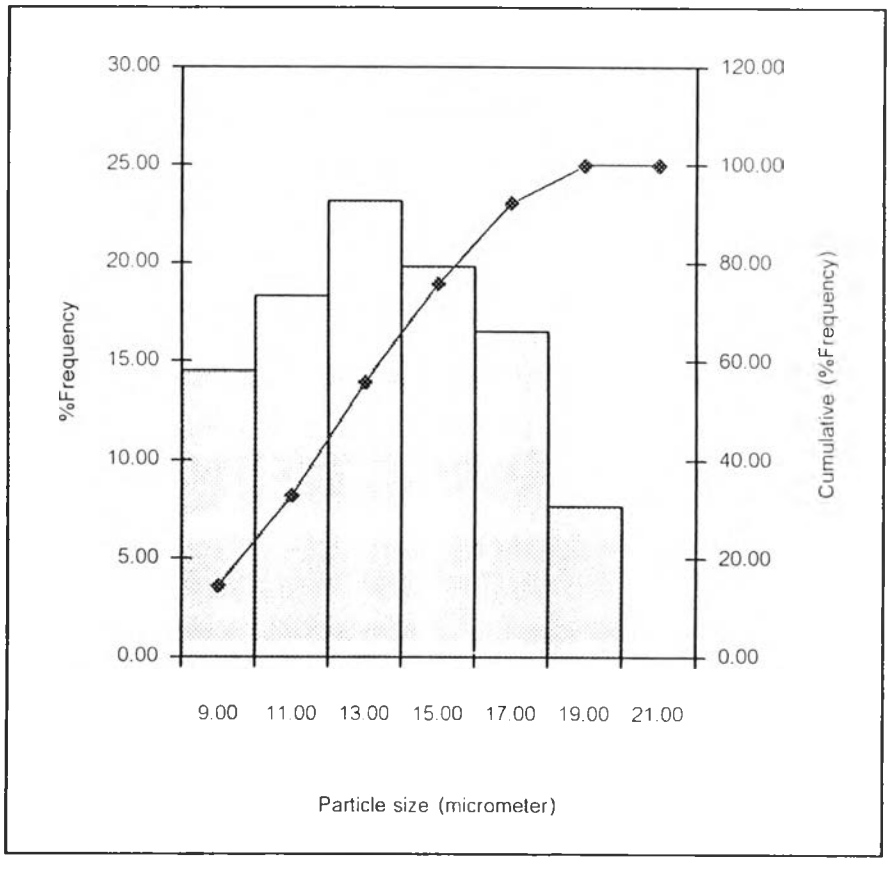

Figure A22 %Frequency distribution and cumulative %frequency plot of 1:1 nifedipine:PVP K30.

Table A25 Particle size measurement of 1:3 nifedipine:PVP K30

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
10.00	12.00	11.00	100	16.67	16.67
12.00	14.00	13.00	101	16.83	33.50
14.00	16.00	15.00	108	18.00	51.50
16.00	18.00	17.00	100	16.67	68.17
18.00	20.00	19.00	95	15.83	84.00
20.00	22.00	21.00	96	16.00	100.00

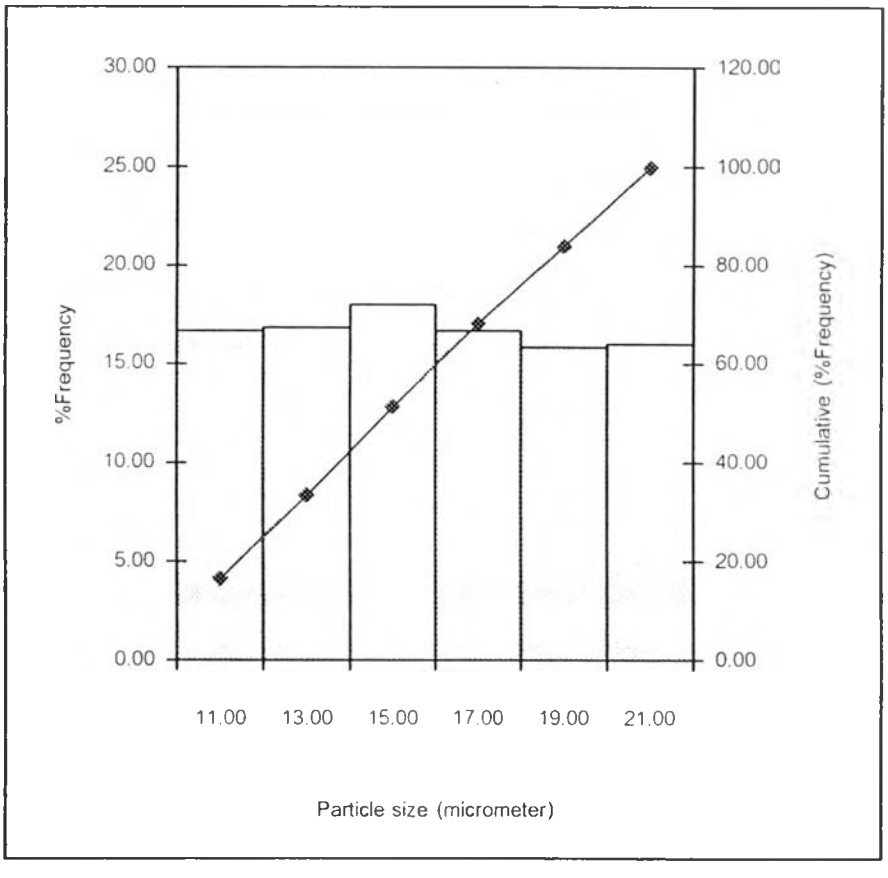

Figure A23 %Frequency distribution and cumulative %frequency plot of 1:3 nifedipine:PVP K30.

Table A26 Particle size measurement of 1:5 nifedipine:PVP K30

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
8.00	10.00	9.00	5	0.83	0.83
10.00	12.00	11.00	119	19.83	20.67
12.00	14.00	13.00	125	20.83	41.50
14.00	16.00	15.00	107	17.83	59.33
16.00	18.00	17.00	120	20.00	79.33
18.00	20.00	19.00	119	19.83	99.17
20.00	22.00	21.00	5	0.83	100.00

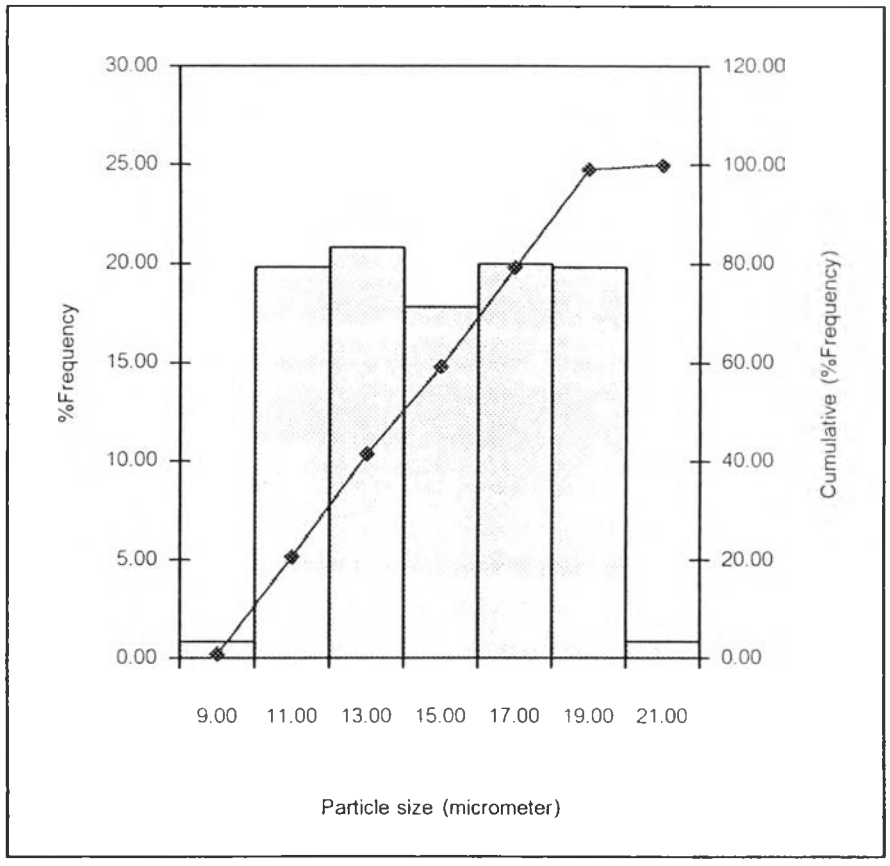

Figure A24 %Frequency distribution and cumulative %frequency plot of 1:5 nifedipine:PVP K30.

Table A27 Particle size measurement of 1:2:8:4 nifedipine:Eudragit RS100:PVP K30:curcumin.

Lower size (μm)	Upper size (μm)	Mean (μm)	Frequency (particle)	% Freq	Cum. %Freq
14.00	16.00	15.00	58	9.67	9.67
16.00	18.00	17.00	122	20.33	30.00
18.00	20.00	19.00	111	18.50	48.50
20.00	22.00	21.00	113	18.83	67.33
22.00	24.00	23.00	126	21.00	88.33
24.00	26.00	25.00	67	11.17	99.50
26.00	28.00	27.00	1	0.17	99.67
28.00	30.00	29.00	2	0.33	100.00

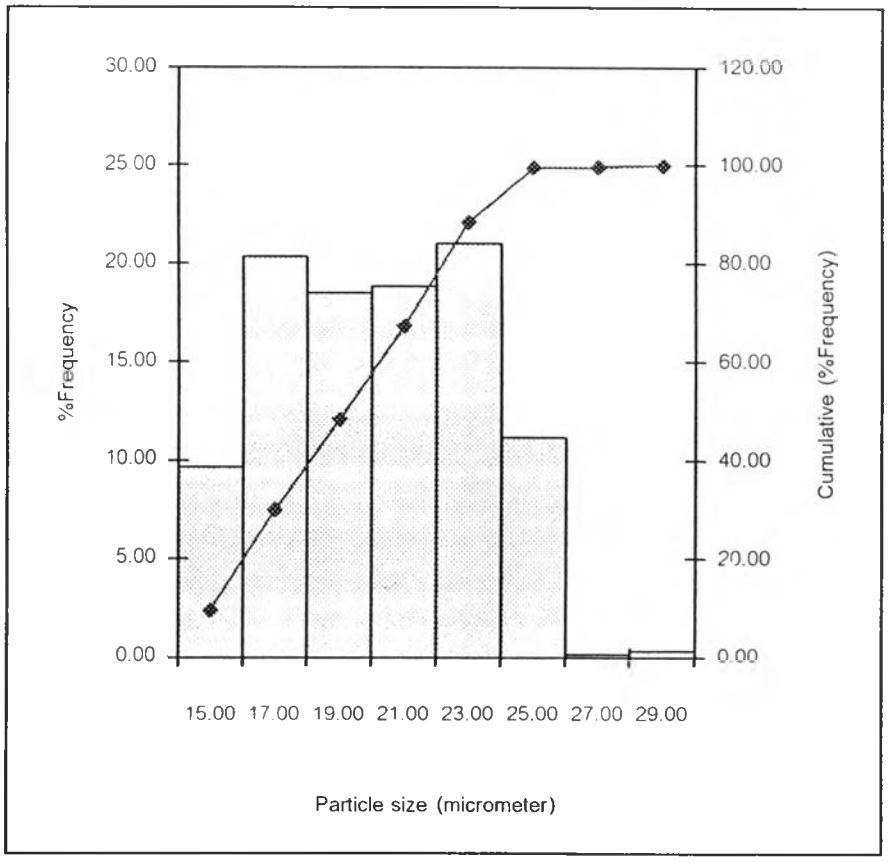

Figure A25 %Frequency distribution and cumulative %frequency plot of 1:2:8:4 nifedipine:Eudragit RS100:PVP K30:curcumin.

Table A28 Median diameter (μm) of nifedipine microspheres with varied polymer ratio

Drug-polymer ratio	Eudragit RS100	PVP K30
1:1	16.81	12.57
1:3	17.63	14.93
1:5	18.77	13.99
1:10	18.1	12.5

APPENDICES B

Photodegradation data

and summary of coefficient of determinations of zero-order, first-order, second-order and third-order kinetics.

Effects of PVP K30 content and inlet air temperature

Table B1 Photodegradation data of 1:0:10 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 55 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.34	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.32	100.48	100.48	100.48	4.51	4.54	4.54
1	8.46	90.97	93.39	93.94	4.48	4.48	4.48
2	8.38	88.15	88.45	88.11	4.36	4.34	4.35
4	8.41	78.28	77.04	77.13	4.15	4.13	4.14
6	8.50	63.71	61.89	62.82	3.91	3.92	3.93
8	8.48	49.76	50.44	51.02	3.62	3.64	3.66
10	8.44	37.37	37.97	38.95	3.37	3.37	3.40
12	8.41	29.17	29.08	29.87	3.27	3.29	3.28
14	8.34	26.20	26.89	26.64	2.92	2.93	2.94
16	8.45	18.59	18.68	18.92	2.68	2.68	2.68
20	8.37	14.63	14.56	14.57	2.17	2.20	2.20
24	8.36	8.78	8.99	9.04	2.08	2.08	2.13
30	8.43	8.47	8.06	8.09	2.14	2.09	2.09
36	8.44	7.99	7.28	9.11	2.08	1.98	2.21
48	8.43	8.48	8.46	8.30	2.14	2.13	2.12
72	8.46	8.10	8.48	7.67	2.09	2.14	2.04
96	8.39	7.93	8.04	8.55	2.07	2.08	2.15
120	8.49	7.19	8.97	8.19	1.97	2.19	2.10
144	8.51	7.23	8.55	8.39	1.98	2.15	2.13
168	8.45	8.87	9.51	7.54	2.18	2.25	2.02
192	8.51	7.89	8.74	8.03	2.07	2.17	2.08
216	8.33	8.93	8.96	7.97	2.19	2.19	2.08
264	8.43	7.87	7.55	7.79	2.06	2.02	2.05
312	8.43	8.26	7.75	8.11	2.11	2.05	2.09
360	8.44	8.37	8.33	8.03	2.12	2.12	2.08

First-order degradation rate constant = 0.1196 h^{-1}

Table B2 Photodegradation data of 1:0:10 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 65 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.34	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.47	93.30	93.34	88.94	4.54	4.54	4.49
1	8.40	88.61	89.91	88.84	4.48	4.50	4.49
2	8.34	79.05	80.29	80.18	4.37	4.39	4.38
4	8.44	64.29	64.09	61.95	4.16	4.16	4.13
6	8.37	49.41	49.55	47.79	3.90	3.90	3.87
8	8.47	37.87	37.96	36.21	3.63	3.64	3.59
10	8.49	28.14	28.56	28.39	3.34	3.35	3.35
12	8.33	24.53	24.20	23.42	3.20	3.19	3.15
14	8.43	19.55	19.41	19.51	2.97	2.97	2.97
16	8.40	14.68	14.99	14.53	2.69	2.71	2.68
20	8.45	9.22	9.05	9.00	2.22	2.20	2.20
24	8.51	6.92	6.88	6.79	1.93	1.93	1.92
30	8.34	7.10	8.00	8.16	1.96	2.08	2.10
36	8.41	6.57	7.42	6.71	1.88	2.00	1.90
48	8.44	8.40	7.30	7.56	2.13	1.99	2.02
72	8.33	6.34	5.98	7.04	1.85	1.79	1.95
96	8.40	7.18	7.41	8.22	1.97	2.00	2.11
120	8.43	7.37	10.64	6.99	2.00	2.36	1.94
144	8.44	7.44	6.97	6.32	2.01	1.94	1.84
168	8.41	8.50	7.93	8.17	2.14	2.07	2.10
192	8.46	7.41	8.79	6.11	2.00	2.17	1.81
216	8.46	6.92	9.54	6.86	1.93	2.26	1.93
264	8.45	6.96	7.42	7.22	1.94	2.00	1.98
312	8.50	7.38	7.74	7.42	2.00	2.05	2.00
360	8.34	8.49	6.81	7.37	2.14	1.92	2.00

First-order degradation rate constant = 0.1201 h^{-1}

Table B3 Photodegradation data of 1:0:10 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 75 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.37	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.46	84.93	86.77	88.39	4.44	4.46	4.48
1	8.49	80.59	79.80	80.68	4.39	4.38	4.39
2	8.45	73.25	75.72	74.37	4.29	4.33	4.31
4	8.47	62.64	62.71	61.19	4.14	4.14	4.11
6	8.36	44.84	46.11	45.86	3.80	3.83	3.83
8	8.37	36.56	35.82	36.34	3.60	3.58	3.59
10	8.39	29.63	29.84	31.35	3.39	3.40	3.45
12	8.51	23.56	23.76	24.83	3.16	3.17	3.21
14	8.46	17.27	17.20	17.39	2.85	2.85	2.86
16	8.34	14.48	14.26	14.58	2.67	2.66	2.68
20	8.37	8.74	8.68	9.12	2.17	2.16	2.21
24	8.41	5.98	6.02	6.34	1.79	1.80	1.85
30	8.42	8.28	7.14	6.77	2.11	1.97	1.91
36	8.41	6.78	6.65	7.21	1.91	1.89	1.98
48	8.35	7.12	8.04	7.55	1.96	2.08	2.02
72	8.51	7.30	7.68	6.77	1.99	2.04	1.91
96	8.37	7.27	7.36	6.74	1.98	2.00	1.91
120	8.47	8.17	8.58	6.66	2.10	2.15	1.90
144	8.41	6.79	6.43	7.89	1.92	1.86	2.07
168	8.46	8.46	6.58	7.77	2.14	1.88	2.05
192	8.45	7.78	6.84	8.37	2.05	1.92	2.12
216	8.39	6.92	7.59	7.91	1.93	2.03	2.07
264	8.50	6.98	8.23	6.87	1.94	2.11	1.93
312	8.51	7.65	7.65	8.42	2.03	2.03	2.13
360	8.39	6.71	8.11	6.72	1.90	2.09	1.90

First-order degradation rate constant = 0.1207 h^{-1}

Table B4 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 55 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.37	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.36	100.48	100.48	100.48	4.49	4.48	4.51
1	8.40	88.78	88.53	90.94	4.39	4.39	4.38
2	8.33	80.73	80.86	80.16	4.29	4.27	4.28
4	8.48	73.20	71.25	71.90	4.09	4.10	4.07
6	8.35	59.83	60.57	58.84	3.79	3.77	3.81
8	8.36	44.08	43.53	45.18	3.58	3.57	3.59
10	8.49	35.88	35.49	36.26	3.40	3.39	3.41
12	8.42	30.06	29.60	30.24	3.14	3.16	3.16
14	8.36	23.07	23.45	23.49	2.92	2.90	2.91
16	8.37	18.46	18.18	18.43	2.76	2.75	2.73
20	8.40	15.87	15.69	15.37	2.24	2.23	2.22
24	8.42	9.39	9.28	9.23	1.81	1.82	1.84
30	8.37	6.23	6.20	5.75	1.83	1.82	1.75
36	8.42	5.92	5.90	6.34	1.78	1.78	1.85
48	8.42	6.49	6.12	5.58	1.87	1.81	1.72
72	8.34	6.32	6.65	5.74	1.84	1.89	1.75
96	8.34	6.56	5.66	5.63	1.88	1.73	1.73
120	8.40	6.37	5.93	5.92	1.85	1.78	1.78
144	8.32	6.39	6.08	5.81	1.85	1.81	1.76
168	8.32	5.73	6.02	6.38	1.75	1.79	1.85
192	8.35	5.62	6.46	5.77	1.73	1.87	1.75
216	8.35	6.08	6.04	5.55	1.81	1.80	1.71
264	8.37	6.07	5.57	6.33	1.80	1.72	1.85
312	8.38	5.64	6.25	6.03	1.73	1.83	1.80
360	8.45	6.40	6.24	5.89	1.86	1.83	1.77

First-order degradation rate constant = 0.1193 h^{-1}

Table B5 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 65 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No 1	No 2	No. 3	No. 1	No 2	No. 3
0	8.37	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.43	100.74	97.39	97.38	4.61	4.58	4.58
1	8.49	90.51	90.95	91.31	4.51	4.51	4.51
2	8.35	80.13	80.88	80.91	4.38	4.39	4.39
4	8.51	64.64	63.45	64.13	4.17	4.15	4.16
6	8.35	52.40	52.46	50.96	3.96	3.96	3.93
8	8.37	39.78	40.31	38.87	3.68	3.70	3.66
10	8.40	29.58	29.89	28.66	3.39	3.40	3.36
12	8.44	23.72	23.96	23.75	3.17	3.18	3.17
14	8.39	18.41	18.79	18.43	2.91	2.93	2.91
16	8.36	14.82	14.58	14.79	2.70	2.68	2.69
20	8.45	8.88	9.01	8.91	2.18	2.20	2.19
24	8.43	7.81	7.85	8.01	2.06	2.06	2.08
30	8.38	7.13	6.34	7.27	1.96	1.85	1.98
36	8.41	6.94	6.75	7.01	1.94	1.91	1.95
48	8.32	6.63	7.46	7.18	1.89	2.01	1.97
72	8.47	6.90	6.76	6.05	1.93	1.91	1.80
96	8.38	7.61	7.24	6.20	2.03	1.98	1.82
120	8.51	6.99	6.56	6.39	1.94	1.88	1.85
144	8.48	6.11	6.70	7.36	1.81	1.90	2.00
168	8.43	7.09	6.69	6.32	1.96	1.90	1.84
192	8.48	6.36	6.92	7.03	1.85	1.93	1.95
216	8.38	5.96	7.47	7.13	1.78	2.01	1.96
264	8.49	6.36	7.74	6.69	1.85	2.05	1.90
312	8.42	6.98	7.41	7.23	1.94	2.00	1.98
360	8.40	7.05	6.70	6.26	1.95	1.90	1.83

First-order degradation rate constant = 0.1200 h^{-1}

Table B6 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 75 °C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.33	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.37	85.82	88.12	85.96	4.45	4.48	4.45
1	8.34	81.44	83.83	81.56	4.40	4.43	4.40
2	8.39	70.71	72.87	72.01	4.26	4.29	4.28
4	8.42	60.29	60.01	57.19	4.10	4.09	4.05
6	8.41	44.58	45.11	45.77	3.80	3.81	3.82
8	8.44	35.94	35.68	37.10	3.58	3.57	3.61
10	8.44	29.18	29.22	27.99	3.37	3.37	3.33
12	8.44	22.04	21.62	22.27	3.09	3.07	3.10
14	8.46	19.05	18.58	18.55	2.95	2.92	2.92
16	8.49	14.16	14.34	13.96	2.65	2.66	2.64
20	8.34	9.61	9.63	9.23	2.26	2.26	2.22
24	8.40	6.46	6.33	6.29	1.87	1.85	1.84
30	8.49	6.96	9.03	8.53	1.94	2.20	2.14
36	8.43	7.88	8.35	7.36	2.06	2.12	2.00
48	8.40	6.73	9.10	8.89	1.91	2.21	2.19
72	8.37	7.82	7.07	7.50	2.06	1.96	2.01
96	8.49	8.60	7.27	9.11	2.15	1.98	2.21
120	8.41	8.90	8.67	8.34	2.19	2.16	2.12
144	8.37	6.73	9.26	9.56	1.91	2.23	2.26
168	8.35	8.48	8.06	7.24	2.14	2.09	1.98
192	8.35	8.02	7.90	7.06	2.08	2.07	1.95
216	8.45	6.91	9.02	8.09	1.93	2.20	2.09
264	8.42	8.79	8.92	7.74	2.17	2.19	2.05
312	8.36	8.25	7.52	7.24	2.11	2.02	1.98
360	8.46	8.29	8.75	9.46	2.11	2.17	2.25

First-order degradation rate constant = 0.1199 h^{-1}

Table B7 Photodegradation data of 1:5:5 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 55 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.48	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.43	100.48	100.48	100.48	4.50	4.50	4.47
1	8.33	89.99	89.77	87.63	4.42	4.42	4.45
2	8.45	82.89	83.19	85.74	4.26	4.25	4.24
4	8.46	70.97	69.98	69.37	4.05	4.06	4.04
6	8.40	57.38	58.05	56.77	3.82	3.84	3.86
8	8.35	45.74	46.35	47.51	3.61	3.62	3.60
10	8.42	37.02	37.29	36.59	3.36	3.36	3.37
12	8.38	28.66	28.77	28.94	3.15	3.15	3.15
14	8.40	23.22	23.34	23.44	2.89	2.89	2.90
16	8.35	17.92	17.95	18.11	2.69	2.68	2.73
20	8.44	14.75	14.60	15.30	2.27	2.28	2.29
24	8.36	9.70	9.77	9.86	1.95	1.94	1.93
30	8.38	8.47	8.48	8.60	2.14	2.14	2.15
36	8.35	9.93	8.93	8.90	2.30	2.19	2.19
48	8.33	8.48	8.56	9.46	2.14	2.15	2.25
72	8.47	8.84	8.29	9.01	2.18	2.11	2.20
96	8.41	9.39	8.12	8.31	2.24	2.09	2.12
120	8.37	8.20	8.97	9.03	2.10	2.19	2.20
144	8.34	7.58	8.34	8.97	2.03	2.12	2.19
168	8.44	8.42	7.91	7.94	2.13	2.07	2.07
192	8.46	9.42	9.85	9.07	2.24	2.29	2.21
216	8.41	8.63	8.81	9.31	2.16	2.18	2.23
264	8.33	9.26	10.16	8.62	2.23	2.32	2.15
312	8.41	8.81	7.84	8.70	2.18	2.06	2.16
360	8.34	7.77	8.72	9.06	2.05	2.17	2.20

First-order degradation rate constant = 0.1178 h^{-1}

Table B8 Photodegradation data of 1:5:5 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 65 °C.

Time (h)	Control	% nifedipine Remaining			In (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.45	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.42	87.09	85.05	84.76	4.47	4.44	4.44
1	8.49	81.60	81.02	76.98	4.40	4.39	4.34
2	8.43	71.41	71.05	67.90	4.27	4.26	4.22
4	8.51	53.59	54.73	53.85	3.98	4.00	3.99
6	8.39	44.96	44.95	42.89	3.81	3.81	3.76
8	8.43	35.69	35.61	35.25	3.57	3.57	3.56
10	8.49	27.65	27.45	27.06	3.32	3.31	3.30
12	8.47	23.09	22.63	22.23	3.14	3.12	3.10
14	8.46	17.98	18.18	17.30	2.89	2.90	2.85
16	8.39	14.58	14.27	14.47	2.68	2.66	2.67
20	8.49	8.94	8.94	8.40	2.19	2.19	2.13
24	8.47	5.39	5.30	5.41	1.68	1.67	1.69
30	8.47	3.42	3.40	3.34	1.23	1.22	1.21
36	8.45	4.48	4.94	4.56	1.50	1.60	1.52
48	8.40	4.96	4.81	4.97	1.60	1.57	1.60
72	8.32	4.43	5.05	4.35	1.49	1.62	1.47
96	8.48	4.67	4.96	4.97	1.54	1.60	1.60
120	8.32	4.79	4.86	4.71	1.57	1.58	1.55
144	8.42	4.86	4.68	4.94	1.58	1.54	1.60
168	8.46	4.57	4.81	4.74	1.52	1.57	1.56
192	8.41	4.95	4.41	4.36	1.60	1.48	1.47
216	8.42	5.00	4.32	4.69	1.61	1.46	1.55
264	8.34	4.46	4.78	4.45	1.49	1.56	1.49
312	8.35	4.50	4.37	4.46	1.50	1.48	1.50
360	8.41	4.94	4.48	4.36	1.60	1.50	1.47

First-order degradation rate constant = 0.1202 h^{-1}

Table B9 Photodegradation data of 1:5:5 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 75 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.37	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.34	89.22	87.88	87.61	4.49	4.48	4.47
1	8.43	80.61	80.70	80.61	4.39	4.39	4.39
2	8.44	72.57	73.22	74.73	4.28	4.29	4.31
4	8.33	58.00	60.26	59.20	4.06	4.10	4.08
6	8.35	46.46	47.82	46.71	3.84	3.87	3.84
8	8.36	38.66	38.90	37.88	3.65	3.66	3.63
10	8.42	29.59	28.45	29.21	3.39	3.35	3.37
12	8.47	22.18	22.40	23.38	3.10	3.11	3.15
14	8.47	17.31	17.26	17.82	2.85	2.85	2.88
16	8.34	12.97	12.78	12.67	2.56	2.55	2.54
20	8.39	9.25	9.02	9.07	2.22	2.20	2.21
24	8.39	6.55	6.63	6.48	1.88	1.89	1.87
30	8.39	6.78	7.61	6.53	1.91	2.03	1.88
36	8.44	7.51	7.32	7.98	2.02	1.99	2.08
48	8.42	6.41	7.82	7.15	1.86	2.06	1.97
72	8.33	7.02	7.24	7.41	1.95	1.98	2.00
96	8.47	7.11	7.06	6.15	1.96	1.95	1.82
120	8.38	7.66	6.73	6.14	2.04	1.91	1.81
144	8.49	7.99	6.70	7.14	2.08	1.90	1.97
168	8.40	6.65	7.32	7.80	1.89	1.99	2.05
192	8.42	7.41	7.61	7.54	2.00	2.03	2.02
216	8.44	7.14	7.14	7.96	1.97	1.97	2.07
264	8.40	6.74	8.02	7.83	1.91	2.08	2.06
312	8.44	7.49	7.39	6.50	2.01	2.00	1.87
360	8.50	6.93	6.70	6.81	1.94	1.90	1.92

First-order degradation rate constant = 0.1207 h^{-1}

Table B10 Photodegradation data of 1:8:2 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 55 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.50	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.47	100.48	100.48	100.48	4.49	4.50	4.54
1	8.33	89.36	89.88	93.85	4.45	4.44	4.49
2	8.43	85.47	84.54	88.73	4.29	4.30	4.32
4	8.46	73.04	73.94	75.06	4.10	4.09	4.11
6	8.49	60.26	59.82	60.95	3.85	3.88	3.87
8	8.44	47.19	48.53	48.12	3.60	3.61	3.62
10	8.37	36.65	36.80	37.46	3.37	3.37	3.37
12	8.50	28.97	29.20	29.06	3.19	3.19	3.22
14	8.37	24.29	24.20	25.12	2.86	2.86	2.92
16	8.48	17.49	17.48	18.50	2.72	2.72	2.73
20	8.37	15.13	15.15	15.41	2.22	2.24	2.23
24	8.32	9.21	9.40	9.29	1.84	1.83	1.82
30	8.47	7.87	7.01	7.38	2.06	1.95	2.00
36	8.34	7.07	6.55	7.43	1.96	1.88	2.01
48	8.37	6.59	7.46	7.86	1.89	2.01	2.06
72	8.50	6.72	6.44	8.01	1.90	1.86	2.08
96	8.37	7.46	6.69	6.78	2.01	1.90	1.91
120	8.44	6.79	6.72	6.99	1.92	1.91	1.94
144	8.33	7.76	6.63	6.63	2.05	1.89	1.89
168	8.45	6.70	7.18	6.37	1.90	1.97	1.85
192	8.44	6.97	6.61	7.88	1.94	1.89	2.06
216	8.49	6.98	7.53	6.25	1.94	2.02	1.83
264	8.40	7.73	6.69	6.76	2.05	1.90	1.91
312	8.43	7.19	6.53	6.71	1.97	1.88	1.90
360	8.42	6.17	7.70	7.11	1.82	2.04	1.96

First-order degradation rate constant = 0.1190 h^{-1}

Table B11 Photodegradation data of 1:8:2 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 65 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.36	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.45	96.33	93.34	93.81	4.57	4.54	4.54
1	8.48	82.99	80.71	84.09	4.42	4.39	4.43
2	8.44	77.46	82.42	76.02	4.35	4.41	4.33
4	8.38	66.26	62.10	63.92	4.19	4.13	4.16
6	8.36	55.78	50.58	48.45	4.02	3.92	3.88
8	8.46	41.77	40.24	41.13	3.73	3.69	3.72
10	8.40	32.46	33.30	31.83	3.48	3.51	3.46
12	8.35	22.75	25.52	24.53	3.12	3.24	3.20
14	8.33	16.18	17.32	16.27	2.78	2.85	2.79
16	8.35	14.12	15.13	15.15	2.65	2.72	2.72
20	8.39	8.54	9.27	9.12	2.15	2.23	2.21
24	8.37	5.68	5.44	6.00	1.74	1.69	1.79
30	8.46	5.30	5.01	5.51	1.67	1.61	1.71
36	8.50	5.59	4.89	5.53	1.72	1.59	1.71
48	8.36	5.44	5.78	5.41	1.69	1.76	1.69
72	8.37	5.34	5.62	5.33	1.68	1.73	1.67
96	8.38	5.23	6.17	5.53	1.65	1.82	1.71
120	8.46	5.43	5.62	5.25	1.69	1.73	1.66
144	8.37	5.58	5.44	5.56	1.72	1.69	1.72
168	8.33	5.43	5.21	5.27	1.69	1.65	1.66
192	8.48	5.66	5.79	5.70	1.73	1.76	1.74
216	8.39	5.79	5.83	5.35	1.76	1.76	1.68
264	8.41	5.25	5.43	5.55	1.66	1.69	1.71
312	8.37	5.88	5.27	5.19	1.77	1.66	1.65
360	8.37	5.03	5.16	5.65	1.62	1.64	1.73

First-order degradation rate constant = 0.1199 h^{-1}

Table B12 Photodegradation data of 1:8:2 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 75 °C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.51	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.34	88.82	88.63	92.65	4.49	4.48	4.53
1	8.42	83.27	84.21	81.83	4.42	4.43	4.40
2	8.37	79.03	77.22	76.20	4.37	4.35	4.33
4	8.47	60.59	60.85	59.59	4.10	4.11	4.09
6	8.39	45.70	45.58	45.53	3.82	3.82	3.82
8	8.38	36.16	36.61	38.16	3.59	3.60	3.64
10	8.34	28.52	28.72	29.13	3.35	3.36	3.37
12	8.34	22.66	22.99	22.29	3.12	3.14	3.10
14	8.39	18.07	18.08	18.93	2.89	2.90	2.94
16	8.37	14.26	14.11	14.09	2.66	2.65	2.65
20	8.33	9.43	9.67	9.36	2.24	2.27	2.24
24	8.47	6.12	6.07	5.96	1.81	1.80	1.79
30	8.39	6.57	6.51	7.83	1.88	1.87	2.06
36	8.38	8.19	8.41	6.88	2.10	2.13	1.93
48	8.45	6.84	6.97	6.72	1.92	1.94	1.90
72	8.39	7.67	7.80	8.50	2.04	2.05	2.14
96	8.37	6.90	7.80	6.98	1.93	2.05	1.94
120	8.33	7.05	7.73	6.86	1.95	2.05	1.93
144	8.49	8.32	7.04	7.83	2.12	1.95	2.06
168	8.49	6.99	6.53	7.13	1.94	1.88	1.96
192	8.46	7.05	7.41	7.73	1.95	2.00	2.05
216	8.35	8.19	7.48	7.94	2.10	2.01	2.07
264	8.43	8.22	7.36	7.79	2.11	2.00	2.05
312	8.44	8.13	7.47	7.23	2.10	2.01	1.98
360	8.47	7.79	6.88	7.31	2.05	1.93	1.99

First-order degradation rate constant = 0.1203 h^{-1}

Table B13 Photodegradation data of 1:10:0 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 55 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.46	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.44	100.48	100.48	100.48	4.47	4.46	4.46
1	8.36	87.02	86.64	86.53	4.43	4.44	4.48
2	8.34	83.70	84.43	87.95	4.29	4.26	4.29
4	8.36	72.70	71.04	72.88	4.07	4.06	4.08
6	8.41	58.45	58.13	59.29	3.83	3.82	3.80
8	8.40	46.17	45.79	44.82	3.64	3.67	3.67
10	8.32	38.17	39.34	39.19	3.43	3.46	3.45
12	8.39	30.91	31.79	31.61	3.22	3.25	3.24
14	8.34	25.02	25.77	25.49	2.97	2.96	2.97
16	8.33	19.42	19.29	19.47	2.86	2.84	2.86
20	8.45	17.47	17.07	17.44	2.47	2.44	2.45
24	8.48	11.78	11.51	11.62	2.01	2.03	2.05
30	8.39	7.67	7.59	7.25	2.04	2.03	1.98
36	8.48	8.11	7.51	7.39	2.09	2.02	2.00
48	8.38	6.70	8.21	7.69	1.90	2.11	2.04
72	8.43	8.57	7.94	7.65	2.15	2.07	2.03
96	8.46	7.33	7.55	8.34	1.99	2.02	2.12
120	8.35	7.43	7.28	7.25	2.01	1.99	1.98
144	8.49	7.22	7.90	7.22	1.98	2.07	1.98
168	8.39	7.63	7.57	7.13	2.03	2.02	1.96
192	8.43	7.87	6.94	7.99	2.06	1.94	2.08
216	8.51	8.39	6.86	8.33	2.13	1.93	2.12
264	8.43	7.67	7.08	7.23	2.04	1.96	1.98
312	8.47	8.08	7.91	8.11	2.09	2.07	2.09
360	8.33	7.86	7.22	7.01	2.06	1.98	1.95

First-order degradation rate constant = 0.11137 h^{-1}

Table B14 Photodegradation data of 1:10:0 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 65 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.50	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.44	92.22	90.35	90.21	4.52	4.50	4.50
1	8.38	89.88	88.07	89.42	4.50	4.48	4.49
2	8.38	79.43	79.30	78.40	4.37	4.37	4.36
4	8.49	61.97	61.14	59.75	4.13	4.11	4.09
6	8.40	49.99	48.79	49.14	3.91	3.89	3.89
8	8.44	41.39	41.77	40.64	3.72	3.73	3.70
10	8.46	32.65	32.00	31.40	3.49	3.47	3.45
12	8.40	24.50	25.07	24.04	3.20	3.22	3.18
14	8.45	19.58	19.38	19.52	2.97	2.96	2.97
16	8.44	15.89	15.73	15.77	2.77	2.76	2.76
20	8.36	10.08	9.97	9.58	2.31	2.30	2.26
24	8.41	9.09	9.01	9.11	2.21	2.20	2.21
30	8.51	9.53	8.91	9.42	2.25	2.19	2.24
36	8.36	10.35	9.15	10.93	2.34	2.21	2.39
48	8.33	10.05	8.56	10.81	2.31	2.15	2.38
72	8.37	10.35	10.35	9.37	2.34	2.34	2.24
96	8.44	10.38	9.31	9.73	2.34	2.23	2.28
120	8.44	9.45	9.86	10.79	2.25	2.29	2.38
144	8.37	9.36	9.39	9.89	2.24	2.24	2.29
168	8.44	9.71	9.69	10.11	2.27	2.27	2.31
192	8.46	10.47	10.38	10.51	2.35	2.34	2.35
216	8.39	10.16	9.99	9.37	2.32	2.30	2.24
264	8.50	9.87	10.11	10.68	2.29	2.31	2.37
312	8.42	10.00	8.94	9.86	2.30	2.19	2.29
360	8.46	8.93	9.45	10.41	2.19	2.25	2.34

First-order degradation rate constant = 0.1161 h^{-1}

Table B15 Photodegradation data of 1:10:0 nifedipine:Eudragit RS100:PVP K30 microspheres, spray dried with inlet air temperature 75 ^{o}C.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.51	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.43	90.83	91.45	93.24	4.51	4.52	4.54
1	8.44	86.34	86.42	92.07	4.46	4.46	4.52
2	8.44	74.17	75.82	73.35	4.31	4.33	4.30
4	8.37	63.15	62.80	66.32	4.15	4.14	4.19
6	8.35	47.41	45.59	46.60	3.86	3.82	3.84
8	8.35	42.87	42.25	42.44	3.76	3.74	3.75
10	8.37	32.43	31.94	32.03	3.48	3.46	3.47
12	8.39	26.52	26.12	27.09	3.28	3.26	3.30
14	8.38	20.48	20.51	20.48	3.02	3.02	3.02
16	8.35	15.91	15.84	16.13	2.77	2.76	2.78
20	8.47	9.76	9.84	9.72	2.28	2.29	2.27
24	8.42	5.76	5.85	6.00	1.75	1.77	1.79
30	8.40	4.60	4.54	4.94	1.53	1.51	1.60
36	8.40	4.46	4.96	4.98	1.49	1.60	1.61
48	8.42	4.64	5.13	4.54	1.54	1.63	1.51
72	8.43	4.93	4.29	4.56	1.60	1.46	1.52
96	8.35	4.16	5.19	4.29	1.43	1.65	1.46
120	8.44	5.06	4.80	5.00	1.62	1.57	1.61
144	8.32	4.38	4.14	4.75	1.48	1.42	1.56
168	8.45	5.24	4.83	5.05	1.66	1.58	1.62
192	8.33	4.67	4.33	4.70	1.54	1.47	1.55
216	8.50	4.26	4.60	4.87	1.45	1.53	1.58
264	8.48	4.97	4.25	4.94	1.60	1.45	1.60
312	8.47	4.43	4.68	4.62	1.49	1.54	1.53
360	8.37	4.52	4.09	4.58	1.51	1.41	1.52

First-order degradation rate constant = 0.1159 h^{-1}

Table B16 Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation of nifedipine microspheres with varied mixing ratios and spray dried at varied inlet air temperature

Formula	Inlet air temp. (°C)		Zero-order	First-order	Second-order	Third-order
1:0:10	55	R^2	0.8731	0.9968	0.8934	0.6081
		SE	11.1730	4.809 E-02	1.150 E-02	2.697 E-03
		F	249.545	10470.068	308.082	78.496
	65	R^2	0.8798	0.9827	0.9253	0.8014
		SE	8.8006	2.435 E-02	8.928 E-03	16.21 E-03
		F	408.856	32659.795	281.784	74.415
	75	R^2	0.8900	0.9952	0.8257	0.5898
		SE	10.6441	4.652 E-02	1.922 E-02	5.064 E-03
		F	309.046	13500.934	173.513	54.918
1:2:8	55	R^2	0.9033	0.9960	0.8813	0.7017
		SE	11.5055	3.408 E-02	1.584 E-02	4.214 E-03
		F	206.321	25337.337	251.591	71.397
	65	R^2	0.8972	0.9968	0.8506	0.6320
		SE	10.7913	6.252 E-02	1.890 E-02	5.266 E-03
		F	313.356	8110.089	206.410	61.927
	75	R^2	0.8940	0.9930	0.8440	0.6159
		SE	11.6466	3.432 E-02	1.615 E-02	4.478 E-03
		F	252.609	25371.535	252.002	68.569
1:5:5	55	R^2	0.9210	0.9956	0.8785	0.6996
		SE	11.6949	5.048 E-02	1.242 E-02	3.167 E-03
		F	236.029	10724.168	346.674	89.881
	65	R^2	0.8149	0.9948	0.8516	0.6235
		SE	13.9090	6.235 E-02	3.216 E-02	1.434 E-02
		F	170.5730	11323.728	215.308	68.681
	75	R^2	0.9247	0.9894	0.8560	0.6772
		SE	11.2918	6.615 E-02	1.351 E-02	3.541 E-03
		F	258.979	7764.769	344.805	94.657

Table B16 (cont.) Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation of nifedipine microspheres with varied mixing ratios and spray dried at varied inlet air temperature

Formula	Inlet air temp. (°C)		Zero-order	First-order	Second-order	Third-order
1:8:2	55	R^2	0.8621	0.9954	0.8930	0.6941
		SE	11.4809	3.089 E-02	1.615 E-02	4.304 E-03
		F	245.022	19645.244	239.804	69.089
	65	R^2	0.8853	0.9878	0.9430	0.7753
		SE	9.3847	2.322 E-02	1.041 E-02	2.040 E-03
		F	401.985	40669.771	255.299	67.646
	75	R^2	0.9180	0.9938	0.8707	0.6871
		SE	11.5378	4.431 E-02	1.451 E-02	3.097 E-03
		F	242.424	14551.288	290.864	77.827
1:10:0	55	R^2	0.9245	0.9952	0.5649	0.6463
		SE	8.9558	3.808 E-02	1.084 E-02	2.075 E-03
		F	406.996	14409.295	229.292	64.586
	65	R^2	0.9092	0.9980	0.8987	0.6946
		SE	9.4353	2.959 E-02	1.002 E-02	1.965 E-03
		F	373.008	23952.075	262.883	68.045
	75	R^2	0.9124	0.9914	0.8823	0.7181
		SE	11.0750	4.505 E-02	1.612 E-02	4.318 E-03
		F	268.206	14620.970	258.397	75.675

Critical F value = 4.10

Effect of microsphere particle size

Table B17 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres, particle size 6.35 μm.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.47	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.32	92.66	92.13	90.72	4.53	4.52	4.51
1	8.33	83.41	83.59	84.79	4.42	4.43	4.44
2	8.42	73.62	74.89	74.82	4.30	4.32	4.32
4	8.35	58.08	58.18	55.96	4.06	4.06	4.02
6	8.36	43.88	43.60	42.66	3.78	3.78	3.75
8	8.49	33.49	33.63	34.24	3.51	3.52	3.53
10	8.49	27.86	27.20	27.10	3.33	3.30	3.30
12	8.38	22.65	22.68	22.61	3.12	3.12	3.12
14	8.46	17.78	18.16	18.05	2.88	2.90	2.89
16	8.43	15.48	15.40	15.58	2.74	2.73	2.75
20	8.35	8.98	9.14	8.96	2.20	2.21	2.19
24	8.47	5.79	5.86	5.62	1.76	1.77	1.73
30	8.43	5.99	5.91	5.98	1.79	1.78	1.79
36	8.37	5.94	5.93	5.80	1.78	1.78	1.76
48	8.40	6.02	6.02	6.01	1.79	1.79	1.79
72	8.50	5.70	5.63	5.68	1.74	1.73	1.74
96	8.42	5.86	5.83	5.92	1.77	1.76	1.78
120	8.42	6.05	6.05	5.91	1.80	1.80	1.78
144	8.45	6.01	6.00	6.09	1.79	1.79	1.81
168	8.44	5.81	5.81	5.79	1.76	1.76	1.76
192	8.42	5.90	5.83	5.72	1.77	1.76	1.74
216	8.42	5.99	5.94	5.95	1.79	1.78	1.78
264	8.45	5.99	5.96	5.92	1.79	1.79	1.78
312	8.50	5.69	5.63	5.73	1.74	1.73	1.75
360	8.36	5.88	5.97	5.93	1.77	1.79	1.78

First-order degradation rate constant = 0.1219 h^{-1}

Table B18 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres, particle size 14.50 μm.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.45	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.38	96.33	93.34	93.81	4.57	4.54	4.54
1	8.40	82.99	80.71	84.09	4.42	4.39	4.43
2	8.43	77.46	82.42	76.02	4.35	4.41	4.33
4	8.44	66.26	62.10	63.92	4.19	4.13	4.16
6	8.40	55.78	50.58	48.45	4.02	3.92	3.88
8	8.41	41.77	40.24	41.13	3.73	3.69	3.72
10	8.44	32.46	33.30	31.83	3.48	3.51	3.46
12	8.47	22.75	25.52	24.53	3.12	3.24	3.20
14	8.32	16.18	17.32	16.27	2.78	2.85	2.79
16	8.47	14.12	15.13	15.15	2.65	2.72	2.72
20	8.50	8.54	9.27	9.12	2.15	2.23	2.21
24	8.42	5.68	5.44	6.00	1.74	1.69	1.79
30	8.50	5.30	5.01	5.51	1.67	1.61	1.71
36	8.47	5.59	4.89	5.53	1.72	1.59	1.71
48	8.36	5.44	5.78	5.41	1.69	1.76	1.69
72	8.37	5.34	5.62	5.33	1.68	1.73	1.67
96	8.44	5.23	6.17	5.53	1.65	1.82	1.71
120	8.49	5.43	5.62	5.25	1.69	1.73	1.66
144	8.35	5.58	5.44	5.56	1.72	1.69	1.72
168	8.37	5.43	5.21	5.27	1.69	1.65	1.66
192	8.33	5.66	5.79	5.70	1.73	1.76	1.74
216	8.33	5.79	5.83	5.35	1.76	1.76	1.68
264	8.39	5.25	5.43	5.55	1.66	1.69	1.71
312	8.44	5.88	5.27	5.19	1.77	1.66	1.65
360	8.42	5.03	5.16	5.65	1.62	1.64	1.73

First-order degradation rate constant = 0.1199 h^{-1}

Table B19 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres, particle size 25.27 μm.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.51	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.49	92.14	92.75	93.38	4.52	4.53	4.54
1	8.46	87.54	87.99	86.55	4.47	4.48	4.46
2	8.49	79.00	80.41	77.74	4.37	4.39	4.35
4	8.46	64.13	63.01	63.16	4.16	4.14	4.15
6	8.35	49.83	50.26	51.11	3.91	3.92	3.93
8	8.46	41.58	41.77	41.69	3.73	3.73	3.73
10	8.42	33.89	33.40	34.07	3.52	3.51	3.53
12	8.46	28.46	28.57	27.64	3.35	3.35	3.32
14	8.44	23.52	23.24	23.24	3.16	3.15	3.15
16	8.50	19.86	19.45	19.18	2.99	2.97	2.95
20	8.50	12.67	12.57	12.42	2.54	2.53	2.52
24	8.38	9.01	9.16	9.18	2.20	2.21	2.22
30	8.35	9.07	9.29	9.40	2.21	2.23	2.24
36	8.35	9.68	9.63	9.21	2.27	2.27	2.22
48	8.46	9.22	9.17	9.33	2.22	2.22	2.23
72	8.38	9.09	9.01	10.64	2.21	2.20	2.36
96	8.40	9.33	9.36	8.68	2.23	2.24	2.16
120	8.39	9.22	9.32	9.30	2.22	2.23	2.23
144	8.49	9.41	9.17	9.99	2.24	2.22	2.30
168	8.33	9.44	9.58	7.96	2.25	2.26	2.07
192	8.42	9.38	9.44	8.94	2.24	2.24	2.19
216	8.39	9.67	9.60	7.55	2.27	2.26	2.02
264	8.35	9.28	9.46	9.03	2.23	2.25	2.20
312	8.35	9.54	9.58	8.75	2.26	2.26	2.17
360	8.34	8.97	8.94	10.02	2.19	2.19	2.30

First-order degradation rate constant = 0.1036 h^{-1}

Table B20 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres, particle size 38.31 μm.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.39	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.46	94.63	99.58	95.49	4.55	4.60	4.56
1	8.46	89.79	91.84	93.93	4.50	4.52	4.54
2	8.47	85.51	90.02	89.25	4.45	4.50	4.49
4	8.37	72.97	70.11	73.70	4.29	4.25	4.30
6	8.43	61.12	62.18	59.57	4.11	4.13	4.09
8	8.35	53.01	53.21	51.18	3.97	3.97	3.94
10	8.42	42.52	44.93	42.73	3.75	3.81	3.75
12	8.35	38.45	34.95	35.40	3.65	3.55	3.57
14	8.43	30.93	30.34	26.20	3.43	3.41	3.27
16	8.45	23.73	24.34	24.08	3.17	3.19	3.18
20	8.35	17.68	16.62	17.58	2.87	2.81	2.87
24	8.48	12.81	12.59	11.55	2.55	2.53	2.45
30	8.47	12.60	13.69	11.79	2.53	2.62	2.47
36	8.36	13.37	13.46	10.14	2.59	2.60	2.32
48	8.34	12.36	11.53	12.26	2.51	2.45	2.51
72	8.33	12.24	12.56	12.20	2.51	2.53	2.50
96	8.48	11.90	12.43	12.86	2.48	2.52	2.55
120	8.37	13.77	12.28	9.87	2.62	2.51	2.29
144	8.48	12.02	12.85	11.43	2.49	2.55	2.44
168	8.35	12.19	12.34	13.53	2.50	2.51	2.60
192	8.44	12.21	13.72	12.12	2.50	2.62	2.49
216	8.38	12.66	11.47	11.79	2.54	2.44	2.47
264	8.36	12.65	12.43	10.98	2.54	2.52	2.40
312	8.49	12.01	13.37	10.79	2.49	2.59	2.38
360	8.32	12.09	13.00	11.67	2.49	2.56	2.46

First-order degradation rate constant = 0.0872 h^{-1}

Table B21 Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation data of nifedipine microspheres (nifedipine:Eudragit RS100:PVP K30 of 1:2:8) of varied particle sizes

Median diameter (μm)		Zero-order	First-order	Second-order	Third-order
6.35	R^2	0.8564	0.9972	0.9262	0.8350
	SE	12.4516	4.915 E-02	1.779 E-02	5.061 E-03
	F	218.290	12428.812	221.825	62.902
14.50	R^2	0.8972	0.9968	0.9185	0.8306
	SE	10.7913	6.252 E-02	1.809 E-02	5.266 E-03
	F	313.356	8110.089	206.410	61.927
25.27	R^2	0.8925	0.9986	0.9649	0.9149
	SE	10.4142	3.164 E-02	9.139 E-03	1.814 E-03
	F	303.606	22034.138	355.279	93.960
38.31	R^2	0.9374	0.9988	0.9655	0.9268
	SE	7.9336	3.907 E-02	6.587 E-03	9.712 E-04
	F	533.521	11290.907	353.427	98.959

Critical F value = 4.10

Effect of drug-polymer ratio

Table B22 Photodegradation data of 1:1 nifedipine:Eudragit RS100 microspheres.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.36	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.38	95.32	93.15	94.87	4.56	4.53	4.55
1	8.36	88.17	88.12	86.98	4.48	4.48	4.47
2	8.42	79.64	79.98	75.51	4.38	4.38	4.32
4	8.49	63.69	63.03	60.76	4.15	4.14	4.11
6	8.38	47.71	47.16	46.13	3.87	3.85	3.83
8	8.39	38.05	38.62	37.61	3.64	3.65	3.63
10	8.33	29.39	29.50	28.35	3.38	3.38	3.34
12	8.40	23.02	22.63	22.29	3.14	3.12	3.10
14	8.44	17.49	17.99	17.43	2.86	2.89	2.86
16	8.46	13.52	13.41	13.87	2.60	2.60	2.63
20	8.32	9.25	9.14	8.96	2.22	2.21	2.19
24	8.36	6.12	6.10	5.76	1.81	1.81	1.75
30	8.49	6.71	6.32	6.66	1.90	1.84	1.90
36	8.47	6.32	6.57	6.70	1.84	1.88	1.90
48	8.49	6.57	6.39	6.16	1.88	1.86	1.82
72	8.37	6.93	6.71	6.97	1.94	1.90	1.94
96	8.50	6.53	6.89	6.11	1.88	1.93	1.81
120	8.34	6.17	6.90	6.79	1.82	1.93	1.92
144	8.45	6.26	6.43	6.06	1.83	1.86	1.80
168	8.41	6.99	6.80	6.34	1.94	1.92	1.85
192	8.47	6.24	6.44	6.78	1.83	1.86	1.91
216	8.33	6.68	6.33	6.12	1.90	1.85	1.81
264	8.38	6.64	6.42	6.63	1.89	1.86	1.89
312	8.41	6.26	6.33	6.86	1.83	1.85	1.93
360	8.50	6.26	6.85	6.00	1.83	1.92	1.79

First-order degradation rate constant = 0.1211 h^{-1}

Table B23 Photodegradation data of 1:3 nifedipine:Eudragit RS100 microspheres.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.47	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.37	97.49	97.16	92.20	4.58	4.58	4.52
1	8.47	91.42	90.07	91.28	4.52	4.50	4.51
2	8.35	79.53	80.33	79.66	4.38	4.39	4.38
4	8.45	60.94	62.13	61.62	4.11	4.13	4.12
6	8.45	48.83	49.38	48.53	3.89	3.90	3.88
8	8.34	36.86	37.03	37.01	3.61	3.61	3.61
10	8.45	29.28	29.71	30.01	3.38	3.39	3.40
12	8.50	24.15	24.39	23.61	3.18	3.19	3.16
14	8.37	17.74	17.72	17.45	2.88	2.87	2.86
16	8.32	14.45	14.38	13.65	2.67	2.67	2.61
20	8.45	8.70	8.67	8.39	2.16	2.16	2.13
24	8.50	6.18	6.02	6.13	1.82	1.80	1.81
30	8.36	7.15	6.98	7.03	1.97	1.94	1.95
36	8.49	6.95	6.77	6.79	1.94	1.91	1.92
48	8.44	6.92	6.80	6.68	1.93	1.92	1.90
72	8.39	7.08	7.00	7.09	1.96	1.95	1.96
96	8.36	6.48	6.69	6.59	1.87	1.90	1.88
120	8.41	7.06	6.88	7.13	1.95	1.93	1.96
144	8.45	6.63	6.60	6.84	1.89	1.89	1.92
168	8.34	7.21	7.12	7.33	1.98	1.96	1.99
192	8.49	7.49	7.39	7.04	2.01	2.00	1.95
216	8.41	7.10	7.26	7.24	1.96	1.98	1.98
264	8.40	6.59	6.60	6.95	1.89	1.89	1.94
312	8.51	6.76	6.75	6.29	1.91	1.91	1.84
360	8.38	6.95	7.11	6.81	1.94	1.96	1.92

First-order degradation rate constant = 0.1206 h^{-1}

Table B24 Photodegradation data of 1:5 nifedipine:Eudragit RS100 microspheres.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.45	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.36	91.75	92.32	91.44	4.52	4.53	4.52
1	8.45	84.34	84.78	85.21	4.43	4.44	4.45
2	8.45	73.83	75.09	72.21	4.30	4.32	4.28
4	8.42	62.26	60.57	60.02	4.13	4.10	4.09
6	8.43	46.34	47.66	46.98	3.84	3.86	3.85
8	8.36	36.48	35.43	35.73	3.60	3.57	3.58
10	8.34	29.10	28.85	27.58	3.37	3.36	3.32
12	8.36	22.82	22.25	22.20	3.13	3.10	3.10
14	8.41	18.46	18.17	18.44	2.92	2.90	2.91
16	8.46	14.61	14.77	14.37	2.68	2.69	2.67
20	8.37	9.49	9.42	9.55	2.25	2.24	2.26
24	8.34	6.46	6.61	6.58	1.87	1.89	1.88
30	8.35	7.85	7.98	7.50	2.06	2.08	2.01
36	8.37	7.97	7.53	7.39	2.08	2.02	2.00
48	8.39	7.66	7.59	7.43	2.04	2.03	2.00
72	8.40	8.00	7.43	7.89	2.08	2.00	2.07
96	8.49	7.60	7.22	8.21	2.03	1.98	2.11
120	8.34	8.70	7.21	7.78	2.16	1.98	2.05
144	8.34	7.24	8.03	7.63	1.98	2.08	2.03
168	8.46	7.17	8.09	8.39	1.97	2.09	2.13
192	8.40	7.30	7.22	8.81	1.99	1.98	2.18
216	8.47	7.23	7.26	8.85	1.98	1.98	2.18
264	8.37	7.97	7.94	7.87	2.08	2.07	2.06
312	8.47	8.47	7.71	7.05	2.14	2.04	1.95
360	8.36	8.34	7.17	7.80	2.12	1.97	2.05

First-order degradation rate constant = 0.1191 h^{-1}

Table B25 Photodegradation data of 1:10 nifedipine:Eudragit RS100 microspheres.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.50	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.39	92.22	90.35	90.21	4.52	4.50	4.50
1	8.34	89.88	88.07	89.42	4.50	4.48	4.49
2	8.47	79.43	79.30	78.40	4.37	4.37	4.36
4	8.39	61.97	61.14	59.75	4.13	4.11	4.09
6	8.49	49.99	48.79	49.14	3.91	3.89	3.89
8	8.51	41.39	41.77	40.64	3.72	3.73	3.70
10	8.48	32.65	32.00	31.40	3.49	3.47	3.45
12	8.38	24.50	25.07	24.04	3.20	3.22	3.18
14	8.45	19.58	19.38	19.52	2.97	2.96	2.97
16	8.32	15.89	15.73	15.77	2.77	2.76	2.76
20	8.41	10.08	9.97	9.58	2.31	2.30	2.26
24	8.45	9.09	9.01	9.11	2.21	2.20	2.21
30	8.36	9.53	8.91	9.42	2.25	2.19	2.24
36	8.41	10.35	9.15	10.93	2.34	2.21	2.39
48	8.35	10.05	8.56	10.81	2.31	2.15	2.38
72	8.37	10.35	10.35	9.37	2.34	2.34	2.24
96	8.45	10.38	9.31	9.73	2.34	2.23	2.28
120	8.39	9.45	9.86	10.79	2.25	2.29	2.38
144	8.40	9.36	9.39	9.89	2.24	2.24	2.29
168	8.32	9.71	9.69	10.11	2.27	2.27	2.31
192	8.46	10.47	10.38	10.51	2.35	2.34	2.35
216	8.46	10.16	9.99	9.37	2.32	2.30	2.24
264	8.42	9.87	10.11	10.68	2.29	2.31	2.37
312	8.38	10.00	8.94	9.86	2.30	2.19	2.29
360	8.43	8.93	9.45	10.41	2.19	2.25	2.34

First-order degradation rate constant = 0.1161 h^{-1}

Table B26 Photodegradation data of 1:1 nifedipine:PVP K30 microspheres.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.33	100.00	100.00	100.00	4.60	4.61	4.61
0.5	8.42	94.55	91.52	92.23	4.55	4.52	4.52
1	8.41	86.75	85.95	84.21	4.46	4.45	4.43
2	8.47	75.47	75.56	74.55	4.32	4.32	4.31
4	8.33	60.08	61.56	61.21	4.10	4.12	4.11
6	8.48	48.23	49.35	49.16	3.88	3.90	3.90
8	8.34	36.29	35.44	34.84	3.59	3.57	3.55
10	8.35	27.83	27.69	27.46	3.33	3.32	3.31
12	8.49	23.00	22.63	22.31	3.14	3.12	3.10
14	8.34	18.03	17.71	17.71	2.89	2.87	2.87
16	8.43	13.56	13.48	13.76	2.61	2.60	2.62
20	8.36	8.41	8.23	8.11	2.13	2.11	2.09
24	8.33	5.86	6.04	5.89	1.77	1.80	1.77
30	8.36	6.66	6.53	6.57	1.90	1.88	1.88
36	8.39	6.76	6.73	6.32	1.91	1.91	1.84
48	8.47	6.48	6.62	6.52	1.87	1.89	1.87
72	8.42	6.66	6.56	6.80	1.90	1.88	1.92
96	8.37	6.80	6.78	6.44	1.92	1.91	1.86
120	8.37	6.63	6.37	6.47	1.89	1.85	1.87
144	8.39	6.56	6.64	6.82	1.88	1.89	1.92
168	8.42	6.65	6.62	6.39	1.90	1.89	1.86
192	8.39	6.58	6.37	6.43	1.88	1.85	1.86
216	8.35	6.41	6.34	6.75	1.86	1.85	1.91
264	8.37	6.71	6.52	6.75	1.90	1.87	1.91
312	8.43	6.70	6.53	6.72	1.90	1.88	1.91
360	8.38	6.67	6.47	6.68	1.90	1.87	1.90

First-order degradation rate constant = 0.1229 h^{-1}

Table B27 Photodegradation data of 1:3 nifedipine:PVP K30 microspheres.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.35	100.00	100.00	100.00	4.63	4.61	4.61
0.5	8.50	95.57	96.69	91.70	4.56	4.57	4.52
1	8.39	92.00	92.00	88.80	4.52	4.52	4.49
2	8.35	83.65	82.01	81.17	4.43	4.41	4.40
4	8.40	65.05	63.32	63.86	4.18	4.15	4.16
6	8.35	50.41	51.87	50.45	3.92	3.95	3.92
8	8.51	41.05	40.39	41.12	3.71	3.70	3.72
10	8.40	28.99	28.65	29.60	3.37	3.36	3.39
12	8.36	24.32	24.05	24.50	3.19	3.18	3.20
14	8.47	19.01	19.19	19.12	2.95	2.95	2.95
16	8.43	13.83	14.07	13.72	2.63	2.64	2.62
20	8.41	8.32	8.50	8.18	2.12	2.14	2.10
24	8.49	8.54	8.56	8.40	2.14	2.15	2.13
30	8.40	7.92	8.04	8.05	2.07	2.08	2.09
36	8.47	8.37	8.33	8.05	2.12	2.12	2.09
48	8.45	8.45	8.29	8.25	2.13	2.12	2.11
72	8.45	8.15	8.36	8.23	2.10	2.12	2.11
96	8.40	7.89	7.87	8.01	2.07	2.06	2.08
120	8.36	8.55	8.66	8.55	2.15	2.16	2.15
144	8.32	8.43	8.48	8.08	2.13	2.14	2.09
168	8.37	7.96	8.05	8.25	2.07	2.09	2.11
192	8.36	8.86	8.71	8.70	2.18	2.16	2.16
216	8.33	8.24	8.41	8.09	2.11	2.13	2.09
264	8.40	8.47	8.63	8.66	2.14	2.15	2.16
312	8.49	8.08	8.03	7.90	2.09	2.08	2.07
360	8.45	8.49	8.68	8.58	2.14	2.16	2.15

First-order degradation rate constant = 0.1214 h^{-1}

Table B28 Photodegradation data of 1:5 nifedipine:PVP K30 microspheres.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.51	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.46	95.09	94.66	94.50	4.55	4.55	4.55
1	8.45	84.32	86.54	85.33	4.43	4.46	4.45
2	8.50	74.81	74.12	73.68	4.31	4.31	4.30
4	8.46	59.53	59.18	58.73	4.09	4.08	4.07
6	8.42	47.34	47.94	45.73	3.86	3.87	3.82
8	8.37	37.64	38.13	38.51	3.63	3.64	3.65
10	8.36	29.44	29.30	29.37	3.38	3.38	3.38
12	8.40	23.15	22.72	22.09	3.14	3.12	3.10
14	8.37	18.47	17.96	18.15	2.92	2.89	2.90
16	8.44	14.43	14.54	14.17	2.67	2.68	2.65
20	8.33	9.59	9.60	9.15	2.26	2.26	2.21
24	8.38	5.82	5.68	5.58	1.76	1.74	1.72
30	8.36	6.06	5.63	5.46	1.80	1.73	1.70
36	8.48	5.39	5.99	6.00	1.68	1.79	1.79
48	8.49	5.57	5.61	6.04	1.72	1.72	1.80
72	8.40	5.27	6.17	5.55	1.66	1.82	1.71
96	8.37	5.62	5.86	6.14	1.73	1.77	1.81
120	8.38	6.00	5.66	5.58	1.79	1.73	1.72
144	8.45	5.95	6.01	5.31	1.78	1.79	1.67
168	8.32	5.56	5.92	5.67	1.72	1.78	1.74
192	8.39	5.46	6.01	6.02	1.70	1.79	1.79
216	8.43	5.59	6.43	5.22	1.72	1.86	1.65
264	8.37	5.95	5.89	5.53	1.78	1.77	1.71
312	8.49	5.49	6.01	5.97	1.70	1.79	1.79
360	8.35	5.32	6.05	6.01	1.67	1.80	1.79

First-order degradation rate constant = 0.1208 h^{-1}

Table B29 Photodegradation data of 1:10 nifedipine:PVP K30 microspheres.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.48	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.35	93.30	93.34	88.94	4.54	4.54	4.49
1	8.48	88.61	89.91	88.84	4.48	4.50	4.49
2	8.36	79.05	80.29	80.18	4.37	4.39	4.38
4	8.50	64.29	64.09	61.95	4.16	4.16	4.13
6	8.44	49.41	49.55	47.79	3.90	3.90	3.87
8	8.48	37.87	37.96	36.21	3.63	3.64	3.59
10	8.47	28.14	28.56	28.39	3.34	3.35	3.35
12	8.46	24.53	24.20	23.42	3.20	3.19	3.15
14	8.42	19.55	19.41	19.51	2.97	2.97	2.97
16	8.46	14.68	14.99	14.53	2.69	2.71	2.68
20	8.43	9.22	9.05	9.00	2.22	2.20	2.20
24	8.39	6.92	6.88	6.79	1.93	1.93	1.92
30	8.42	7.10	8.00	8.16	1.96	2.08	2.10
36	8.43	6.57	7.42	6.71	1.88	2.00	1.90
48	8.44	8.40	7.30	7.56	2.13	1.99	2.02
72	8.41	6.34	5.98	7.04	1.85	1.79	1.95
96	8.48	7.18	7.41	8.22	1.97	2.00	2.11
120	8.50	7.37	10.64	6.99	2.00	2.36	1.94
144	8.42	7.44	6.97	6.32	2.01	1.94	1.84
168	8.38	8.50	7.93	8.17	2.14	2.07	2.10
192	8.49	7.41	8.79	6.11	2.00	2.17	1.81
216	8.39	6.92	9.54	6.86	1.93	2.26	1.93
264	8.48	6.96	7.42	7.22	1.94	2.00	1.98
312	8.44	7.38	7.74	7.42	2.00	2.05	2.00
360	8.35	8.49	6.81	7.37	2.14	1.92	2.00

First-order degradation rate constant = 0.1201 h^{-1}

Table B30 Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation data of nifedipine microspheres varied nifedipine:Eudragit RS100 mixing ratios

nifedipine : Eudragit RS100		Zero-order	First-order	Second-order	Third-order
1 : 1	R^2	0.8989	0.9990	0.9376	0.8673
	SE	11.9404	3.741 E-02	1.615 E-02	4.520 E-03
	F	259.188	22481.674	267.316	72.832
1 : 3	R^2	0.8983	0.9976	0.9111	0.8169
	SE	12.1274	4.079 E-02	1609 E-02	4.311 E-03
	F	258.991	19091.882	269.017	78.575
1 : 5	R^2	0.8906	0.9982	0.9438	0.8701
	SE	11.8360	4.580 E-02	1.379 E-02	3.664 E-03
	F	243.800	13786.677	312-092	81.662
1 : 10	R^2	0.8703	0.9956	0.9592	0.8995
	SE	8.8006	2.435 E-02	8.928 E-03	1.621 E-03
	F	408.586	32659.795	281.784	74.415

Critical F value = 4.10

Table B31 Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation data of nifedipine microspheres varied nifedipine:PVP K30 mixing ratios

nifedipine : PVP K30		Zero-order	First-order	Second-order	Third-order
1 : 1	R^2	0.9176	0.9974	0.9355	0.8656
	SE	11.8733	4.365 E-02	1.667 E-02	4.619 E-03
	F	254.328	16728.787	268.695	78.650
1 : 3	R^2	0.8979	0.9978	0.9426	0.8737
	SE	8.9076	3.829 E-02	1.227 E-02	2.454 E-03
	F	441.915	15394.551	205.115	58.992
1 : 5	R^2	0.8739	0.9966	0.9559	0.8921
	SE	11.8130	2.835 E-02	1.828 E-02	5.228 E-03
	F	252.216	38185.779	212.288	59.844
1 : 10	R^2	0.9231	0.9946	0.9479	0.8976
	SE	9.4353	2.959 E-02	1.002 E-02	1.965 E-03
	F	373.008	23952.075	262.883	68.045

Critical F value = 4.10

Effect of light intensity

Table B32 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres by 400 lux light intensity.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.50	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.50	95.64	97.02	95.66	4.56	4.57	4.56
1	8.43	93.22	89.24	93.01	4.53	4.49	4.53
2	8.34	82.11	85.10	83.87	4.41	4.44	4.43
4	8.34	72.06	70.64	72.35	4.28	4.26	4.28
6	8.37	60.88	61.00	62.20	4.11	4.11	4.13
8	8.40	50.61	52.97	53.97	3.92	3.97	3.99
10	8.43	45.63	43.97	46.02	3.82	3.78	3.83
12	8.34	41.46	38.91	38.30	3.72	3.66	3.65
14	8.37	35.01	30.89	33.69	3.56	3.43	3.52
16	8.51	27.62	28.97	30.20	3.32	3.37	3.41
20	8.46	20.20	22.40	23.66	3.01	3.11	3.16
24	8.45	15.96	18.64	14.98	2.77	2.93	2.71
30	8.35	10.20	9.53	11.87	2.32	2.25	2.47
36	8.49	7.88	6.24	7.06	2.06	1.83	1.95
48	8.38	6.68	7.30	7.61	1.90	1.99	2.03
72	8.36	7.52	6.22	7.60	2.02	1.83	2.03
96	8.43	7.21	6.64	7.73	1.98	1.89	2.05
120	8.49	6.86	7.67	6.87	1.93	2.04	1.93
144	8.39	7.26	7.53	6.83	1.98	2.02	1.92
168	8.51	7.69	7.50	6.54	2.04	2.01	1.88
192	8.45	7.05	7.35	6.87	1.95	1.99	1.93
216	8.41	6.34	7.61	7.61	1.85	2.03	2.03
264	8.38	6.75	7.10	7.75	1.91	1.96	2.05
312	8.47	7.55	6.95	6.95	2.02	1.94	1.94
360	8.47	6.72	6.74	7.89	1.91	1.91	2.07

First-order degradation rate constant = 0.0757 h^{-1}

Table B33 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres by 800 lux light intensity.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.39	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.39	95.21	92.30	97.20	4.56	4.53	4.58
1	8.35	92.99	90.03	90.87	4.53	4.50	4.51
2	8.48	84.93	82.01	80.35	4.44	4.41	4.39
4	8.47	69.00	69.42	65.22	4.23	4.24	4.18
6	8.38	55.00	56.37	58.69	4.01	4.03	4.07
8	8.43	48.36	46.07	45.66	3.88	3.83	3.82
10	8.39	38.57	36.99	38.97	3.65	3.61	3.66
12	8.46	33.24	30.60	31.59	3.50	3.42	3.45
14	8.34	27.32	25.99	24.86	3.31	3.26	3.21
16	8.40	22.00	20.85	23.02	3.09	3.04	3.14
20	8.36	15.67	14.93	16.00	2.75	2.70	2.77
24	8.42	12.30	10.51	10.68	2.51	2.35	2.37
30	8.37	6.55	6.86	6.99	1.88	1.93	1.94
36	8.33	4.20	4.66	4.22	1.44	1.54	1.44
48	8.50	4.10	4.68	4.21	1.41	1.54	1.44
72	8.40	4.66	4.29	3.80	1.54	1.46	1.34
96	8.36	3.87	4.67	4.08	1.35	1.54	1.41
120	8.32	4.71	3.55	4.87	1.55	1.27	1.58
144	8.40	5.20	3.25	4.53	1.65	1.18	1.51
168	8.40	4.98	3.55	4.93	1.61	1.27	1.60
192	8.34	5.20	3.99	3.54	1.65	1.38	1.26
216	8.32	3.58	4.98	4.28	1.28	1.61	1.45
264	8.50	3.25	5.03	4.66	1.18	1.62	1.54
312	8.40	4.65	3.90	4.30	1.54	1.36	1.46
360	8.46	4.47	3.36	4.95	1.50	1.21	1.60

First-order degradation rate constant = 0.0908 h^{-1}

Table B34 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres by 1200 lux light intensity.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.44	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.43	96.33	93.34	93.81	4.57	4.54	4.54
1	8.42	82.99	80.71	84.09	4.42	4.39	4.43
2	8.46	77.46	82.42	76.02	4.35	4.41	4.33
4	8.37	66.26	62.10	63.92	4.19	4.13	4.16
6	8.51	55.78	50.58	48.45	4.02	3.92	3.88
8	8.38	41.77	40.24	41.13	3.73	3.69	3.72
10	8.45	32.46	33.30	31.83	3.48	3.51	3.46
12	8.48	22.75	25.52	24.53	3.12	3.24	3.20
14	8.35	16.18	17.32	16.27	2.78	2.85	2.79
16	8.43	14.12	15.13	15.15	2.65	2.72	2.72
20	8.33	8.54	9.27	9.12	2.15	2.23	2.21
24	8.34	5.68	5.44	6.00	1.74	1.69	1.79
30	8.40	5.30	5.01	5.51	1.67	1.61	1.71
36	8.35	5.59	4.89	5.53	1.72	1.59	1.71
48	8.35	5.44	5.78	5.41	1.69	1.76	1.69
72	8.32	5.34	5.62	5.33	1.68	1.73	1.67
96	8.43	5.23	6.17	5.53	1.65	1.82	1.71
120	8.45	5.43	5.62	5.25	1.69	1.73	1.66
144	8.35	5.58	5.44	5.56	1.72	1.69	1.72
168	8.40	5.43	5.21	5.27	1.69	1.65	1.66
192	8.49	5.66	5.79	5.70	1.73	1.76	1.74
216	8.49	5.79	5.83	5.35	1.76	1.76	1.68
264	8.44	5.25	5.43	5.55	1.66	1.69	1.71
312	8.51	5.88	5.27	5.19	1.77	1.66	1.65
360	8.32	5.03	5.16	5.65	1.62	1.64	1.73

First-order degradation rate constant = 0.1199 h^{-1}

Table B35 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres by 2000 lux light intensity.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	8.49	100.00	100.00	100.00	4.61	4.61	4.61
0.5	8.36	91.61	93.25	94.30	4.52	4.54	4.55
1	8.37	82.67	85.66	80.64	4.41	4.45	4.39
2	8.48	68.71	71.82	74.97	4.23	4.27	4.32
4	8.42	55.04	55.69	50.31	4.01	4.02	3.92
6	8.38	38.61	40.80	39.99	3.65	3.71	3.69
8	8.38	30.20	27.69	31.21	3.41	3.32	3.44
10	8.50	23.27	20.51	22.00	3.15	3.02	3.09
12	8.44	15.30	14.37	14.08	2.73	2.67	2.64
14	8.37	10.30	9.40	11.60	2.33	2.24	2.45
16	8.36	7.50	8.70	7.12	2.01	2.16	1.96
20	8.47	4.30	4.02	4.80	1.46	1.39	1.57
24	8.38	4.20	4.78	4.12	1.44	1.56	1.42
30	8.39	4.38	4.72	3.70	1.48	1.55	1.31
36	8.47	4.00	4.06	4.76	1.39	1.40	1.56
48	8.37	4.12	4.97	4.10	1.42	1.60	1.41
72	8.37	4.25	4.64	4.11	1.45	1.53	1.41
96	8.34	4.80	4.07	4.13	1.57	1.40	1.42
120	8.39	4.04	4.87	4.23	1.40	1.58	1.44
144	8.35	4.55	4.31	4.26	1.52	1.46	1.45
168	8.34	4.37	4.03	4.19	1.47	1.39	1.43
192	8.49	4.21	4.00	4.89	1.44	1.39	1.59
216	8.34	4.71	3.40	4.68	1.55	1.22	1.54
264	8.50	4.12	4.09	4.40	1.42	1.41	1.48
312	8.33	4.13	4.10	4.55	1.42	1.41	1.51
360	8.36	4.34	4.45	3.99	1.47	1.49	1.38

First-order degradation rate constant = 0.1583 h^{-1}

Table B36 Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation data of nifedipine microspheres (nifedipine:Eudragit RS100:PVP K30 of 1:2:8) under varied light intensities

Light intensity (lux)		Zero-order	First-order	Second-order	Third-order
400	R^2	0.8709	0.9992	0.9469	0.8780
	SE	11.4042	5.530 E-02	1.368 E-02	3.602 E-03
	F	286.689	9374.330	280.605	80.198
800	R^2	0.8701	0.9994	0.9477	0.8810
	SE	13.8727	5.696 E-02	2.300 E-02	8.363 E-03
	F	207.049	12687.487	262.604	76.547
1200	R^2	0.9308	0.9990	0.9853	0.9618
	SE	10.7913	6.252 E-02	1.890 E-02	5.299 E-03
	F	313.356	8110.089	206.410	61.927
2000	R^2	0.9308	0.9990	0.9853	0.9618
	SE	12.0132	6.336 E-02	2.739 E-02	9.868 E-03
	F	249.053	9152.135	161.020	47.147

Critical F value = 4.10

Photostabilization of nifedipine in solution state

Table B37 Photodegradation data of 2 mg%nifedipine solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	71.45	73.20	71.28	4.27	4.29	4.27
30	49.52	50.20	49.76	3.90	3.92	3.91
45	32.84	33.80	32.99	3.49	3.52	3.50
60	21.07	23.20	20.72	3.05	3.14	3.03
75	14.61	14.80	14.59	2.68	2.69	2.68
90	10.50	9.89	10.43	2.35	2.29	2.35
105	6.74	7.25	6.96	1.91	1.98	1.94
120	5.11	5.13	5.10	1.63	1.64	1.63
135	3.32	3.88	3.58	1.20	1.36	1.28
150	2.43	2.26	2.31	0.89	0.82	0.84
165	1.49	1.50	1.36	0.40	0.41	0.31
180	0.00	0.00	0.00	-	-	-
195	0.00	0.00	0.00	-	-	-
210	0.00	0.00	0.00	-	-	-
225	0.00	0.00	0.00	-	-	-
240	0.00	0.00	0.00	-	-	-
255	0.00	0.00	0.00	-	-	-
270	0.00	0.00	0.00	-	-	-
285	0.00	0.00	0.00	-	-	-
300	0.00	0.00	0.00	-	-	-

First-order degradation rate constant = 0.0255 min^{-1}

Table B38 Photodegradation data of 2 mg%nifedipine with 2 mg% curcumin solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	92.70	93.20	92.81	4.53	4.53	4.53
30	85.07	85.36	85.10	4.44	4.45	4.44
45	81.56	82.12	81.72	4.40	4.41	4.40
60	76.00	74.03	74.87	4.33	4.30	4.32
75	69.75	71.75	70.73	4.24	4.27	4.26
90	67.21	65.63	66.28	4.21	4.18	4.19
105	60.55	60.29	60.37	4.10	4.10	4.10
120	59.01	57.24	57.29	4.08	4.05	4.05
135	52.91	54.67	53.64	3.97	4.00	3.98
150	51.00	49.61	50.03	3.93	3.90	3.91
165	48.00	47.70	47.40	3.87	3.86	3.86
180	44.68	45.58	44.82	3.80	4.80	5.80
195	41.59	43.20	42.28	6.80	7.80	8.80
210	39.00	38.16	37.32	9.80	10.80	11.80
225	36.02	36.52	36.21	12.80	13.80	14.80
240	33.96	34.81	34.26	15.80	16.80	17.80
255	32.05	32.91	32.34	18.80	19.80	20.80
270	30.15	31.00	30.44	21.80	22.80	23.80
285	29.12	28.24	28.50	24.80	25.80	26.80
300	26.92	26.52	26.69	27.80	28.80	29.80

First-order degradation rate constant = 0.0045 min^{-1}

Table B39 Photodegradation data of 2 mg%nifedipine with 4 mg% curcumin solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	95.12	97.12	94.74	4.56	4.58	4.55
30	90.14	91.88	91.43	4.50	4.52	4.52
45	89.12	88.72	88.35	4.49	4.49	4.48
60	83.37	84.98	88.36	4.42	4.44	4.48
75	82.18	81.81	82.22	4.41	4.40	4.41
90	77.53	78.48	81.11	4.35	4.36	4.40
105	73.75	76.89	77.00	4.30	4.34	4.34
120	74.59	72.24	73.70	4.31	4.28	4.30
135	70.57	71.02	71.77	4.26	4.26	4.27
150	68.38	69.77	68.83	4.23	4.25	4.23
165	67.21	65.22	65.51	4.21	4.18	4.18
180	66.19	62.31	64.16	4.19	4.13	4.16
195	63.98	62.27	61.73	4.16	4.13	4.12
210	61.05	60.64	58.94	4.11	4.10	4.08
225	56.17	58.93	57.55	4.03	4.08	4.05
240	56.20	56.81	52.80	4.03	4.04	3.97
255	53.92	53.38	53.59	3.99	3.98	3.98
270	51.53	51.71	52.01	3.94	3.95	3.95
285	48.77	47.79	52.90	3.89	3.87	3.97
300	46.67	49.11	46.30	3.84	3.89	3.84

First-order degradation rate constant = 0.0025 min^{-1}

Table B40 Photodegradation data of 2 mg%nifedipine with 8 mg% curcumin solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	95.60	97.15	98.85	4.56	4.58	4.59
30	94.95	93.17	97.81	4.55	4.53	4.58
45	91.00	92.08	94.48	4.51	4.52	4.55
60	91.44	90.02	90.73	4.52	4.50	4.51
75	88.81	85.11	89.33	4.49	4.44	4.49
90	87.82	85.70	86.76	4.48	4.45	4.46
105	84.00	82.58	84.67	4.43	4.41	4.44
120	82.73	79.98	83.50	4.42	4.38	4.42
135	83.39	79.85	78.32	4.42	4.38	4.36
150	79.23	78.93	78.30	4.37	4.37	4.36
165	79.38	75.07	77.23	4.37	4.32	4.35
180	75.63	72.11	76.51	4.33	4.28	4.34
195	75.02	71.85	73.44	4.32	4.27	4.30
210	74.00	70.09	72.04	4.30	4.25	4.28
225	72.99	68.32	68.81	4.29	4.22	4.23
240	65.85	68.10	70.44	4.19	4.22	4.25
255	64.42	68.92	67.60	4.17	4.23	4.21
270	64.30	63.66	67.85	4.16	4.15	4.22
285	66.91	62.11	60.94	4.20	4.13	4.11
300	62.21	62.11	62.16	4.13	4.13	4.13

First-order degradation rate constant = 0.0016 min^{-1}

Table B41 Photodegradation data of 2 mg%nifedipine with 16 mg% curcumin solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	97.25	99.00	99.31	4.58	4.60	4.60
30	96.30	97.13	98.26	4.57	4.58	4.59
45	94.44	97.75	95.90	4.55	4.58	4.56
60	96.75	92.00	95.83	4.57	4.52	4.56
75	91.11	95.72	91.42	4.51	4.56	4.52
90	93.51	89.98	92.15	4.54	4.50	4.52
105	89.99	93.20	87.47	4.50	4.53	4.47
120	87.25	90.13	91.03	4.47	4.50	4.51
135	90.01	87.77	86.85	4.50	4.47	4.46
150	88.12	86.62	86.26	4.48	4.46	4.46
165	86.98	84.45	85.91	4.47	4.44	4.45
180	87.00	82.28	84.04	4.47	4.41	4.43
195	80.88	82.97	85.57	4.39	4.42	4.45
210	81.00	83.85	80.22	4.39	4.43	4.38
225	80.80	77.25	81.92	4.39	4.35	4.41
240	79.45	76.99	78.28	4.38	4.34	4.36
255	76.87	78.92	77.43	4.34	4.37	4.35
270	78.23	73.33	76.38	4.36	4.29	4.34
285	76.82	74.42	73.79	4.34	4.31	4.30
300	70.97	75.88	75.75	4.26	4.33	4.33

First-order degradation rate constant = 0.0010 min^{-1}

Table B42 Photodegradation data of 2 mg%nifedipine with 2 mg% curcumin crude extract solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	85.78	82.44	84.11	4.45	4.41	4.43
30	67.82	64.84	66.33	4.22	4.17	4.19
45	48.88	47.87	48.38	3.89	3.87	3.88
60	37.00	38.01	37.51	3.61	3.64	3.62
75	29.01	29.87	29.44	3.37	3.40	3.38
90	25.73	23.15	24.44	3.25	3.14	3.20
105	17.85	19.91	18.88	2.88	2.99	2.94
120	15.94	12.50	14.22	2.77	2.53	2.65
135	12.73	10.19	11.46	2.54	2.32	2.44
150	8.40	9.72	9.06	2.13	2.27	2.20
165	7.09	8.29	7.69	1.96	2.11	2.04
180	5.19	6.67	5.93	1.65	2.65	3.65
195	4.93	4.49	4.71	4.65	5.65	6.65
210	3.79	3.70	3.74	7.65	8.65	9.65
225	3.17	3.50	3.33	10.65	11.65	12.65
240	2.72	2.55	2.64	13.65	14.65	15.65
255	2.00	2.17	2.09	16.65	17.65	18.65
270	1.52	1.94	1.73	19.65	20.65	21.65
285	1.28	1.31	1.30	22.65	23.65	24.65
300	1.20	1.12	1.16	25.65	26.65	27.65

First-order degradation rate constant = 0.0154 min^{-1}

Table B43 Photodegradation data of 2 mg%nifedipine with 4 mg% curcumin crude extract solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	90.27	86.74	87.62	4.50	4.46	4.47
30	75.95	77.04	79.36	4.33	4.34	4.37
45	71.03	69.21	67.09	4.26	4.24	4.21
60	55.85	55.97	57.71	4.02	4.02	4.06
75	50.11	47.91	50.21	3.91	3.87	3.92
90	40.89	44.17	41.75	3.71	3.79	3.73
105	36.98	38.20	37.08	3.61	3.64	3.61
120	30.99	33.35	32.35	3.43	3.51	3.48
135	29.84	26.68	25.17	3.40	3.28	3.23
150	21.96	22.87	26.15	3.09	3.13	3.26
165	23.87	19.98	19.06	3.17	2.99	2.95
180	20.42	18.01	18.90	3.02	2.89	2.94
195	16.02	16.88	14.23	2.77	2.83	2.66
210	13.85	14.54	13.31	2.63	2.68	2.59
225	9.75	11.00	12.22	2.28	2.40	2.50
240	9.21	8.96	9.55	2.22	2.19	2.26
255	9.31	7.66	8.20	2.23	2.04	2.10
270	7.20	7.13	7.03	1.97	1.96	1.95
285	6.99	7.14	6.15	1.94	1.97	1.82
300	6.12	6.85	5.09	1.81	1.92	1.63

First-order degradation rate constant = 0.0096 min^{-1}

Table B44 Photodegradation data of 2 mg%nifedipine with 8 mg% curcumin crude extract solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	92.84	92.33	94.52	4.53	4.53	4.55
30	86.98	84.87	83.47	4.47	4.44	4.42
45	77.94	76.27	80.24	4.36	4.33	4.39
60	69.24	69.57	66.90	4.24	4.24	4.20
75	61.87	62.59	59.50	4.13	4.14	4.09
90	55.82	57.27	56.71	4.02	4.05	4.04
105	50.99	52.01	50.69	3.93	3.95	3.93
120	47.88	46.27	48.41	3.87	3.83	3.88
135	44.82	43.24	41.81	3.80	3.77	3.73
150	39.41	38.02	39.09	3.67	3.64	3.67
165	36.40	36.00	36.23	3.59	3.58	3.59
180	33.70	33.24	32.39	3.52	3.50	3.48
195	30.10	30.05	29.70	3.40	3.40	3.39
210	28.27	27.00	28.26	3.34	3.30	3.34
225	26.89	26.31	25.00	3.29	3.27	3.22
240	24.93	24.22	23.48	3.22	3.19	3.16
255	22.62	22.05	21.37	3.12	3.09	3.06
270	19.35	19.36	21.80	2.96	2.96	3.08
285	19.76	19.69	18.21	2.98	2.98	2.90
300	18.20	17.16	16.34	2.90	2.84	2.79

First-order degradation rate constant = 0.0060 min^{-1}

Table B45 Photodegradation data of 2 mg%nifedipine with 16 mg% curcumin crude extract solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	97.08	96.39	95.10	4.58	4.57	4.55
30	92.07	91.35	93.34	4.52	4.51	4.54
45	87.11	88.40	86.93	4.47	4.48	4.47
60	83.72	84.82	83.58	4.43	4.44	4.43
75	80.34	79.44	80.85	4.39	4.38	4.39
90	75.89	76.49	78.12	4.33	4.34	4.36
105	72.71	73.20	72.73	4.29	4.29	4.29
120	70.56	69.51	69.84	4.26	4.24	4.25
135	65.25	65.74	66.52	4.18	4.19	4.20
150	62.49	62.16	64.33	4.13	4.13	4.16
165	58.83	58.79	59.30	4.07	4.07	4.08
180	55.93	54.88	56.77	4.02	4.01	4.04
195	52.04	51.86	54.35	3.95	3.95	4.00
210	49.91	51.34	49.89	3.91	3.94	3.91
225	46.95	48.67	47.42	3.85	3.89	3.86
240	45.05	44.58	46.19	3.81	3.80	3.83
255	43.03	42.22	44.08	3.76	3.74	3.79
270	42.56	41.57	41.00	3.75	3.73	3.71
285	38.82	39.34	39.35	3.66	3.67	3.67
300	38.72	38.26	36.24	3.66	3.64	3.59

First-order degradation rate constant = 0.0033 min^{-1}

Table B46 Photodegradation data of 2 mg%nifedipine with 2 mg% tartrazine solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	77.16	77.55	73.51	4.35	4.35	4.30
30	62.45	62.44	60.41	4.13	4.13	4.10
45	49.55	49.01	45.71	3.90	3.89	3.82
60	35.85	36.39	32.84	3.58	3.59	3.49
75	30.95	31.14	28.06	3.43	3.44	3.33
90	24.18	24.01	20.45	3.19	3.18	3.02
105	19.70	20.04	17.14	2.98	3.00	2.84
120	17.44	17.01	14.42	2.86	2.83	2.67
135	14.38	14.58	12.28	2.67	2.68	2.51
150	11.03	11.09	11.34	2.40	2.41	2.43
165	8.15	7.46	8.32	2.10	2.01	2.12
180	6.27	6.73	5.77	1.84	2.84	3.84
195	5.82	5.63	4.90	4.84	5.84	6.84
210	3.53	3.80	4.10	7.84	8.84	9.84
225	3.19	3.09	3.32	10.84	11.84	12.84
240	2.70	3.01	2.45	13.84	14.84	15.84
255	2.33	2.07	2.25	16.84	17.84	18.84
270	2.03	1.87	1.67	19.84	20.84	21.84
285	1.21	1.30	1.45	22.84	23.84	24.84
300	0.00	0.00	0.00	25.84	26.84	27.84

First-order degradation rate constant = 0.0152 min^{-1}

Table B47 Photodegradation data of 2 mg%nifedipine with 4 mg% tartrazine solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	82.83	84.89	81.42	4.42	4.44	4.40
30	70.15	73.51	70.54	4.25	4.30	4.26
45	62.27	65.98	61.74	4.13	4.19	4.12
60	55.29	56.87	52.67	4.01	4.04	3.96
75	45.71	49.22	47.61	3.82	3.90	3.86
90	39.75	41.45	35.59	3.68	3.72	3.57
105	31.98	35.42	30.53	3.47	3.57	3.42
120	30.74	30.11	27.76	3.43	3.40	3.32
135	26.35	22.05	24.52	3.27	3.09	3.20
150	20.10	22.99	20.43	3.00	3.13	3.02
165	18.77	15.11	16.48	2.93	2.72	2.80
180	15.17	15.69	13.53	2.72	2.75	2.61
195	12.43	13.00	14.29	2.52	2.56	2.66
210	11.96	10.62	11.30	2.48	2.36	2.43
225	9.99	9.96	9.26	2.30	2.30	2.23
240	7.22	7.82	8.33	1.98	2.06	2.12
255	6.78	7.23	7.02	1.91	1.98	1.95
270	5.00	6.01	5.35	1.61	1.79	1.68
285	4.98	5.11	5.10	1.61	1.63	1.63
300	5.02	4.72	4.28	1.61	1.55	1.45

First-order degradation rate constant = 0.0105 min^{-1}

Table B48 Photodegradation data of 2 mg%nifedipine with 8 mg% tartrazine solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	92.39	91.38	94.05	4.53	4.52	4.54
30	87.65	88.93	87.04	4.47	4.49	4.47
45	79.42	78.90	78.50	4.37	4.37	4.36
60	72.27	73.03	73.39	4.28	4.29	4.30
75	66.48	65.29	66.74	4.20	4.18	4.20
90	58.81	58.92	61.15	4.07	4.08	4.11
105	53.70	53.26	51.78	3.98	3.98	3.95
120	46.44	46.59	46.80	3.84	3.84	3.85
135	42.66	42.17	41.56	3.75	3.74	3.73
150	39.42	39.95	39.96	3.67	3.69	3.69
165	38.00	37.76	36.60	3.64	3.63	3.60
180	32.71	32.59	31.51	3.49	3.48	3.45
195	30.61	30.12	30.88	3.42	3.41	3.43
210	27.31	27.10	26.58	3.31	3.30	3.28
225	23.69	23.29	23.76	3.16	3.15	3.17
240	20.21	20.37	20.09	3.01	3.01	3.00
255	19.87	19.90	20.37	2.99	2.99	3.01
270	17.70	17.71	17.04	2.87	2.87	2.84
285	15.52	15.22	15.59	2.74	2.72	2.75
300	13.88	14.23	14.08	2.63	2.66	2.65

First-order degradation rate constant = 0.0064 min^{-1}

Table B49 Photodegradation data of 2 mg%nifedipine with 16 mg% tartrazine solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	91.84	92.76	95.76	4.52	4.53	4.56
30	90.78	85.63	87.42	4.51	4.45	4.47
45	83.93	86.49	82.93	4.43	4.46	4.42
60	79.04	78.26	83.20	4.37	4.36	4.42
75	75.19	75.94	73.17	4.32	4.33	4.29
90	71.52	71.52	68.81	4.27	4.27	4.23
105	67.31	65.37	64.96	4.21	4.18	4.17
120	66.56	64.72	61.29	4.20	4.17	4.12
135	61.56	60.34	60.22	4.12	4.10	4.10
150	58.57	55.70	56.21	4.07	4.02	4.03
165	53.52	55.71	52.50	3.98	4.02	3.96
180	52.04	48.42	47.65	3.95	3.88	3.86
195	47.94	45.15	46.30	3.87	3.81	3.84
210	46.99	45.15	43.43	3.85	3.81	3.77
225	43.17	40.85	39.79	3.77	3.71	3.68
240	38.86	39.25	41.36	3.66	3.67	3.72
255	38.86	39.86	36.22	3.66	3.69	3.59
270	37.93	36.97	35.22	3.64	3.61	3.56
285	33.12	35.09	33.51	3.50	3.56	3.51
300	33.33	31.50	30.90	3.51	3.45	3.43

First-order degradation rate constant = 0.0038 min^{-1}

Table B50 Photodegradation data of 2 mg%nifedipine with 2 mg% sunset yellow solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	78.72	77.28	77.78	4.37	4.35	4.35
30	62.38	63.54	64.19	4.13	4.15	4.16
45	48.72	49.25	50.01	3.89	3.90	3.91
60	39.99	40.03	41.41	3.69	3.69	3.72
75	34.07	34.10	34.70	3.53	3.53	3.55
90	27.83	27.59	27.23	3.33	3.32	3.30
105	21.73	22.15	22.30	3.08	3.10	3.10
120	19.07	18.94	19.29	2.95	2.94	2.96
135	15.34	15.43	14.70	2.73	2.74	2.69
150	11.29	11.31	11.06	2.42	2.43	2.40
165	9.43	9.36	9.38	2.24	2.24	2.24
180	7.21	7.31	7.41	1.98	2.98	3.98
195	6.51	6.56	6.72	4.98	5.98	6.98
210	5.03	5.08	4.92	7.98	8.98	9.98
225	4.15	4.19	4.23	10.98	11.98	12.98
240	2.99	2.93	3.02	13.98	14.98	15.98
255	2.48	2.40	2.43	16.98	17.98	18.98
270	0.00	0.00	0.00	19.98	20.98	21.98
285	0.00	0.00	0.00	22.98	23.98	24.98
300	0.00	0.00	0.00	25.98	26.98	27.98

First-order degradation rate constant = 0.0144 min^{-1}

Table B51 Photodegradation data of 2 mg%nifedipine with 4 mg% sunset yellow solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	89.11	88.24	90.72	4.49	4.48	4.51
30	76.92	76.46	79.45	4.34	4.34	4.38
45	67.66	68.23	67.85	4.21	4.22	4.22
60	60.80	60.66	58.37	4.11	4.11	4.07
75	52.09	52.29	49.83	3.95	3.96	3.91
90	43.35	42.97	42.44	3.77	3.76	3.75
105	37.09	36.95	36.39	3.61	3.61	3.59
120	32.78	32.15	32.22	3.49	3.47	3.47
135	28.28	28.75	29.26	3.34	3.36	3.38
150	26.38	26.16	26.64	3.27	3.26	3.28
165	23.52	24.09	23.85	3.16	3.18	3.17
180	20.44	20.09	19.88	3.02	3.00	2.99
195	17.84	18.10	18.41	2.88	2.90	2.91
210	15.98	16.01	15.91	2.77	2.77	2.77
225	13.86	13.83	13.29	2.63	2.63	2.59
240	10.68	10.70	10.89	2.37	2.37	2.39
255	9.37	9.41	9.15	2.24	2.24	2.21
270	8.09	8.21	8.39	2.09	2.11	2.13
285	6.98	6.83	6.84	1.94	1.92	1.92
300	6.06	5.92	5.98	1.80	1.78	1.79

First-order degradation rate constant = 0.0062 min^{-1}

Table B52 Photodegradation data of 2 mg%nifedipine with 8 mg% sunset yellow solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	87.16	87.16	92.00	4.47	4.47	4.52
30	82.99	82.99	87.59	4.42	4.42	4.47
45	78.10	78.10	82.43	4.36	4.36	4.41
60	70.91	70.91	74.85	4.26	4.26	4.32
75	63.22	63.22	66.73	4.15	4.15	4.20
90	57.47	57.47	60.66	4.05	4.05	4.11
105	52.00	52.00	54.88	3.95	3.95	4.01
120	48.38	48.38	51.07	3.88	3.88	3.93
135	42.47	42.47	44.82	3.75	3.75	3.80
150	41.41	41.41	43.71	3.72	3.72	3.78
165	37.51	37.51	39.60	3.62	3.62	3.68
180	33.19	33.19	35.03	3.50	3.50	3.56
195	33.39	33.39	35.24	3.51	3.51	3.56
210	30.68	30.68	32.38	3.42	3.42	3.48
225	28.23	28.23	29.80	3.34	3.34	3.39
240	26.23	26.23	27.68	3.27	3.27	3.32
255	21.87	21.87	23.09	3.09	3.09	3.14
270	21.09	21.09	22.26	3.05	3.05	3.10
285	18.72	18.72	19.76	2.93	2.93	2.98
300	18.74	18.74	19.78	2.93	2.93	2.98

First-order degradation rate constant = 0.0057 min^{-1}

Table B53 Photodegradation data of 2 mg%nifedipine with 16 mg% sunset yellow solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	94.86	94.95	97.16	4.55	4.55	4.58
30	91.33	92.33	92.66	4.51	4.53	4.53
45	90.59	90.44	89.22	4.51	4.50	4.49
60	84.07	83.86	88.14	4.43	4.43	4.48
75	80.29	82.07	81.73	4.39	4.41	4.40
90	77.29	79.46	77.74	4.35	4.38	4.35
105	76.00	76.36	75.25	4.33	4.34	4.32
120	74.12	72.10	73.65	4.31	4.28	4.30
135	69.62	69.92	70.58	4.24	4.25	4.26
150	66.96	65.71	66.67	4.20	4.19	4.20
165	65.45	64.78	62.90	4.18	4.17	4.14
180	62.01	62.57	61.64	4.13	4.14	4.12
195	59.51	60.20	61.16	4.09	4.10	4.11
210	55.62	57.41	56.86	4.02	4.05	4.04
225	54.48	53.74	55.05	4.00	3.98	4.01
240	52.73	52.97	51.67	3.97	3.97	3.94
255	51.83	50.74	51.97	3.95	3.93	3.95
270	49.92	50.35	49.84	3.91	3.92	3.91
285	49.15	48.24	48.30	3.89	3.88	3.88
300	47.28	47.37	46.64	3.86	3.86	3.84

First-order degradation rate constant = 0.0026 min^{-1}

Table B54 Photodegradation data of 2 mg%nifedipine with 0.05% sodium bisulfite solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	68.85	69.33	66.42	4.23	4.24	4.20
30	47.09	47.41	48.52	3.85	3.86	3.88
45	32.07	31.46	32.50	3.47	3.45	3.48
60	22.20	22.36	22.18	3.10	3.11	3.10
75	14.46	14.48	14.29	2.67	2.67	2.66
90	10.80	10.82	11.02	2.38	2.38	2.40
105	6.88	6.90	6.88	1.93	1.93	1.93
120	4.87	4.97	5.02	1.58	1.60	1.61
135	3.12	3.06	3.01	1.14	1.12	1.10
150	1.86	1.89	1.91	0.62	0.64	0.65
165	1.46	1.44	1.44	0.38	0.36	0.36
180	0.00	0.00	0.00	-	-	-
195	0.00	0.00	0.00	-	-	-
210	0.00	0.00	0.00	-	-	-
225	0.00	0.00	0.00	-	-	-
240	0.00	0.00	0.00	-	-	-
255	0.00	0.00	0.00	-	-	-
270	0.00	0.00	0.00	-	-	-
285	0.00	0.00	0.00	-	-	-
300	0.00	0.00	0.00	-	-	-

First-order degradation rate constant = 0.0257 min^{-1}

Table B55 Photodegradation data of 2 mg%nifedipine with 0.1% sodium bisulfite solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No 2	No 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	69.44	68.09	69.52	4.24	4.22	4.24
30	48.63	49.81	48.84	3.88	3.91	3.89
45	32.01	31.89	30.79	3.47	3.46	3.43
60	23.33	22.89	23.23	3.15	3.13	3.15
75	16.67	16.67	17.19	2.81	2.81	2.84
90	11.38	11.43	11.03	2.43	2.44	2.40
105	7.75	7.91	7.81	2.05	2.07	2.05
120	5.37	5.30	5.30	1.68	1.67	1.67
135	3.42	3.53	3.47	1.23	1.26	1.24
150	0.00	0.00	0.00	-	-	-
165	0.00	0.00	0.00	-	-	-
180	0.00	0.00	0.00	-	-	-
195	0.00	0.00	0.00	-	-	-
210	0.00	0.00	0.00	-	-	-
225	0.00	0.00	0.00	-	-	-
240	0.00	0.00	0.00	-	-	-
255	0.00	0.00	0.00	-	-	-
270	0.00	0.00	0.00	-	-	-
285	0.00	0.00	0.00	-	-	-
300	0.00	0.00	0.00	-	-	-

First-order degradation rate constant = 0.0245 min^{-1}

Table B56 Photodegradation data of 2 mg%nifedipine with 0.5% sodium bisulfite solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No 3	No 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	69.77	69.30	71.41	4.25	4.24	4.27
30	54.13	55.24	53 72	3.99	4.01	3.98
45	40.01	40.35	41.16	3.69	3.70	3.72
60	28.00	28.60	28.22	3.33	3.35	3.34
75	20.60	20.39	19.77	3.03	3.02	2.98
90	14.53	14.85	14.43	2.68	2.70	2.67
105	10.61	10.83	10.69	2.36	2.38	2.37
120	7.46	7.38	7.44	2.01	2.00	2.01
135	5.41	5.39	5.46	1.69	1.68	1.70
150	3.60	3.61	3.63	1.28	1.28	1.29
165	2.62	2.62	2.60	0.96	0.96	0.95
180	2.04	2 04	1.95	0.71	0.72	0.67
195	1.52	1.57	1.54	0 42	0.45	0.43
210	1.16	1.19	1.16	0.15	0.18	0.15
225	0.00	0.00	0.00	-	-	-
240	0.00	0.00	0.00	-	-	-
255	0.00	0.00	0.00	-	-	-
270	0.00	0.00	0.00	-	-	-
285	0.00	0.00	0.00	-	-	-
300	0.00	0.00	0.00	-	-	-

First-order degradation rate constant = 0.0216 min^{-1}

Table B57 Photodegradation data of 2 mg%nifedipine with 1% sodium bisulfite solution.

Time (h)	% nifedipine Remaining			ln (% nifedipine Remaining)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
0	100.00	100.00	100.00	4.61	4.61	4.61
15	65.95	64.50	64.79	4.19	4.17	4.17
30	48.59	48.59	51.22	3.88	3.88	3.94
45	36.90	36.25	36.70	3.61	3.59	3.60
60	27.41	27.66	28.15	3.31	3.32	3.34
75	21.53	21.91	22 29	3.07	3.09	3.10
90	16.17	16.60	16.34	2.78	2.81	2.79
105	12.54	12.37	12.19	2.53	2.52	2.50
120	8.52	8.43	8.34	2.14	2.13	2.12
135	6.87	6.87	6.82	1.93	1.93	1.92
150	5.47	5.37	5.34	1.70	1.68	1.68
165	4.09	4.00	4.06	1.41	1.39	1.40
180	2.84	2.88	2.82	1.04	1.06	1.04
195	2.10	2.16	2.14	0.74	0.77	0.76
210	1.55	1.52	1.55	0.44	0.42	0.44
225	0.00	0.00	0.00	-	-	-
240	0.00	0 00	0.00	-	-	-
255	0.00	0.00	0.00	-	-	-
270	0.00	0.00	0.00	-	-	-
285	0.00	0.00	0.00	-	-	-
300	0.00	0.00	0.00	-	-	-

First-order degradation rate constant = 0.0199 min^{-1}

Table B58 (cont.) Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation data of nifedipine 2 mg% solution added with various UV absorbers and antioxidant of varied concentrations

UV absorber / Antioxidant		Zero-order	First-order	Second-order	Third-order
tartrazine 8 mg%	R^2	0.9489	0.9972	0.9665	0.9355
	SE	6.1701	3.373 E-02	5.280 E-03	6.799 E-04
	F	1111.497	20164.180	688.286	206.793
tartrazine 16 mg%	R^2	0.9759	0.9984	0.9932	0.9866
	SE	3.5746	3.068 E-02	1.144 E-03	8.004 E-05
	F	1996.626	7924.091	1918.901	605.188
sunset yellow 2 mg%	R^2	0.8154	0.9984	0.7898	0.5413
	SE	12.1709	4.525 E-02	5.321 E-02	3.072 E-02
	F	227.831	195.368	195.368	61.232
sunset yellow 4 mg%	R^2	0.8864	0.9972	0.9151	0.8338
	SE	9.5946	4.746 E-02	1.784 E-02	4.566 E-03
	F	469.788	19913.780	344.901	108.607
sunset yellow 8 mg%	R^2	0.9409	0.9956	0.9829	0.9649
	SE	6.1850	4.248 E-02	3.093 E-03	3.457 E-04
	F	918.017	9144.228	1111.391	307.917
sunset yellow 16 mg%	R^2	0.9819	0.9970	0.9779	0.9966
	SE	2.4140	1.743 E-02	3.315 E-04	1.898 E-05
	F	2826.980	11372.481	7022.585	2038.254
sod. bisulfite 0.05 %	R^2	0.7781	0.9986	0.7593	0.5466
	SE	14.5470	5.041 E-02	0.1080	9.975 E-02
	F	118.213	25572.375	107.415	40.863
sod. bisulfite 0.1 %	R^2	0.8369	0.9990	0.8536	0.7167
	SE	12.7402	3.449 E-02	3.865 E-02	1.681 E-02
	F	141.980	28268.351	120.165	38.553
sod. bisulfite 0.5 %	R^2	0.7630	0.9990	0.4545	0.2622
	SE	14.4098	4.931 E-02	0.1199	0.1365
	F	137.401	36497.071	158.784	54.416
sod. bisulfite 1 %	R^2	0.7520	0.9986	0.6295	0.4016
	SE	14.0168	4.878 E-02	9.042 E-02	8.012 E-02
	F	129.134	29333.444	142.539	46.257

Critical F value = 4.10

Photostabilization of nifedipine in solid state

Table B59 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres, control group.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
100.00	8.43	100.00	100.00	4.61	4.61	4.61	100.00
96.88	8.51	95.69	96.52	4.57	4.56	4.57	96.88
96.52	8.36	96.60	95.00	4.57	4.57	4.55	96.52
94 98	8.46	97.06	96.62	4.55	4.58	4.57	94.98
96.12	8.37	95.55	97.29	4.57	4.56	4.58	96.12
96.74	8.41	96.70	95.39	4.57	4.57	4.56	96.74
96.63	8.37	96.50	95.50	4.57	4.57	4.56	96.63
96.02	8.46	97.23	94.97	4.56	4.58	4.55	96.02
95.37	8.51	95.37	95.02	4.56	4.56	4.55	95.37
96.62	8.48	95.09	97.02	4.57	4.55	4.57	96.62
95.24	8.46	96.10	96.56	4.56	4.57	4.57	95.24
95.91	8.34	95.03	96.99	4.56	4.55	4.57	95.91
95.58	8.32	96.69	95.04	4.56	4.57	4.55	95.58
96.84	8.46	95.58	95.02	4.57	4.56	4.55	96.84
96.78	8.45	96.97	96.11	4.57	4.57	4.57	96.78
96.68	8.51	96.69	96.38	4.57	4.57	4.57	96.68
96.57	8.33	94.94	96.80	4.57	4.55	4.57	96.57
94.92	8.40	97.16	96.31	4.55	4.58	4.57	94.92
97.21	8.49	95.62	96.87	4.58	4.56	4.57	97.21
95.19	8.43	95.25	95.52	4.56	4.56	4.56	95.19
97.16	8.47	97.00	96.13	4.58	4.57	4.57	97.16
96.08	8.44	96.32	96.45	4.57	4.57	4.57	96.08
95.66	8.49	96.21	96.03	4.56	4.57	4.56	95.66
96.03	8.50	96.22	96.25	4.56	4.57	4.57	96.03
95.84	8.41	97.10	96.19	4.56	4.58	4.57	95.84
97.02	8.47	96.44	97.25	4.57	4.57	4.58	97.02

First-order degradation rate constant = 0.0041 h^{-1}

Table B60 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres..

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
100.00	8.33	100.00	100.00	100.00	4.61	4.61	4.61
96.88	8.41	96.33	93.34	93.81	4.57	4.54	4.54
96.52	8.49	82.99	80.71	84.09	4.42	4.39	4.43
94.98	8.42	77.46	82.42	76.02	4.35	4.41	4.33
96.12	8.35	66.26	62.10	63.92	4.19	4.13	4.16
96.74	8.33	55.78	50.58	48.45	4.02	3.92	3.88
96.63	8.41	41.77	40.24	41.13	3.73	3.69	3.72
96.02	8.43	32.46	33.30	31.83	3.48	3.51	3.46
95.37	8.47	22.75	25.52	24.53	3.12	3.24	3.20
96.62	8.38	16.18	17.32	16.27	2.78	2.85	2.79
95.24	8.46	14.12	15.13	15.15	2.65	2.72	2.72
95.91	8.44	8.54	9.27	9.12	2.15	2.23	2.21
95.58	8.49	5.68	5.44	6.00	1.74	1.69	1.79
96.84	8.37	5.30	5.01	5.51	1.67	1.61	1.71
96.78	8.42	5.59	4.89	5.53	1.72	1.59	1.71
96.68	8.43	5.44	5.78	5.41	1.69	1.76	1.69
96.57	8.46	5.34	5.62	5.33	1.68	1.73	1.67
94.92	8.40	5.23	6.17	5.53	1.65	1.82	1.71
97.21	8.33	5.43	5.62	5.25	1.69	1.73	1.66
95.19	8.33	5.58	5.44	5.56	1.72	1.69	1.72
97.16	8.35	5.43	5.21	5.27	1.69	1.65	1.66
96.08	8.49	5.66	5.79	5.70	1.73	1.76	1.74
95.66	8.34	5.79	5.83	5.35	1.76	1.76	1.68
96.03	8.37	5.25	5.43	5.55	1.66	1.69	1.71
95.84	8.43	5.88	5.27	5.19	1.77	1.66	1.65
97.02	8.47	5.03	5.16	5.65	1.62	1.64	1.73

First-order degradation rate constant = 0.1205 h^{-1}

Table B61 Photodegradation data of 1:2:8:4 nifedipine:Eudragit RS100:PVP K30:curcumin microspheres, control group.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
100.00	8.42	100.00	100.00	100.00	4.61	4.61	4.61
96.88	8.48	95.44	95.79	94.70	4.56	4.56	4.55
96.52	8.42	93.83	94.41	95.85	4.54	4.55	4.56
94.98	8.47	95.15	95.66	95.45	4.56	4.56	4.56
96.12	8.39	95.04	94.87	94.18	4.55	4.55	4.55
96.74	8.50	95.03	95.23	94.74	4.55	4.56	4.55
96.63	8.37	93.90	94.64	95.78	4.54	4.55	4.56
96.02	8.39	95.80	95.46	95.90	4.56	4.56	4.56
95.37	8.51	94.85	95.94	94.78	4.55	4.56	4.55
96.62	8.50	94.95	94.03	94.93	4.55	4.54	4.55
95.24	8.37	95.55	95.32	94.03	4.56	4.56	4.54
95.91	8.45	95.25	95.50	94.68	4.56	4.56	4.55
95.58	8.33	94.98	95.24	94.95	4.55	4.56	4.55
96.84	8.33	94.89	94.50	94.97	4.55	4.55	4.55
96.78	8.51	94.81	94.23	96.14	4.55	4.55	4.57
96.68	8.41	94.64	95.53	93.81	4.55	4.56	4.54
96.57	8.40	94.68	94.42	94.84	4.55	4.55	4.55
94.92	8.40	96.05	95.71	95.81	4.56	4.56	4.56
97.21	8.46	95.30	95.18	94.96	4.56	4.56	4.55
95.19	8.38	94.87	94.53	95.87	4.55	4.55	4.56
97.16	8.37	94.01	94.08	94.50	4.54	4.54	4.55
96.08	8.50	94.06	95.06	94.24	4.54	4.55	4.55
95.66	8.49	95.18	93.81	95.77	4.56	4.54	4.56
96.03	8.47	93.88	95.46	94.36	4.54	4.56	4.55
95.84	8.43	94.97	95.27	95.73	4.55	4.56	4.56
97.02	8.37	94.38	94.14	94.43	4.55	4.54	4.55

First-order degradation rate constant = 0.0004 h^{-1}

Table B62 Photodegradation data of 1:2:8:4 nifedipine:Eudragit RS100:PVP K30:curcumin microsphere.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
100.00	8.38	100.00	100.00	100.00	4.61	4.61	4.61
96.88	8.34	99.57	101.07	101.23	4.60	4.62	4.62
96.52	8.33	100.94	101.46	99.34	4.61	4.62	4.60
94.98	8.51	100.06	100.40	101.34	4.61	4.61	4.62
96.12	8.51	101.13	100.03	99.19	4.62	4.61	4.60
96.74	8.35	101.20	99.72	99.25	4.62	4.60	4.60
96.63	8.33	99.43	99.75	99.86	4.60	4.60	4.60
96.02	8.37	99.30	100.88	99.72	4.60	4.61	4.60
95.37	8.35	99.31	99.83	100.73	4.60	4.60	4.61
96.62	8.49	100.81	101.18	99.69	4.61	4.62	4.60
95.24	8.36	101.33	100.93	99.89	4.62	4.61	4.60
95.91	8.41	100.72	100.78	100.92	4.61	4.61	4.61
95.58	8.41	100.96	99.28	100.48	4.61	4.60	4.61
96.84	8.34	99.19	100.69	100.69	4.60	4.61	4.61
96.78	8.46	101.20	100.03	99.65	4.62	4.61	4.60
96.68	8.44	100.90	101.16	99.20	4.61	4.62	4.60
96.57	8.51	100.86	100.57	101.14	4.61	4.61	4.62
94.92	8.33	99.67	99.40	99.64	4.60	4.60	4.60
97.21	8.41	99.27	100.09	100.08	4.60	4.61	4.61
95.19	8.32	99.14	100.21	100.04	4.60	4.61	4.61
97.16	8.39	99.32	100.86	101.26	4.60	4.61	4.62
96.08	8.49	99.80	100.52	101.08	4.60	4.61	4.62
95.66	8.43	99.89	99.27	101.07	4.60	4.60	4.62
96.03	8.47	101.04	100.96	101.04	4.62	4.61	4.62
95.84	8.49	99.95	101.12	99.54	4.60	4.62	4.60
97.02	8.37	99.15	101.41	99.53	4.60	4.62	4.60

First-order degradation rate constant = 0.0014 h^{-1}

Table B63 Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation data of nifedipine microspheres (nifedipine:Eudragit RS100:PVP K30 of 1:2:8 mixing ratio) with and without curcumin

		Zero-order	First-order	Second-order	Third-order
Without curcumin, control	R^2	0.2099	0.2116	0.2123	0.2127
	SE	3.6665	3.673 E-02	3.683 E-04	7.396 E-06
	F	1.565	1.462	1.363	1.266
Without curcumin, experimental	R^2	0.8973	0.9968	0.8507	0.6321
	SE	3.6143	3.611 E-02	3.612 E-04	7.236 E-06
	F	3.512	3.408	3.304	3.201
With curcumin, control	R^2	0.0694	0.0706	0.0718	0.0729
	SE	10.7913	6.252 E-02	1.890 E-02	5.266 E-03
	F	313.358	8110.089	206.410	61.927
With curcumin, experimental	R^2	0.0006	0.0006	0.0006	0.0007
	SE	0.7883	7.849 E-03	7.815 E-05	1.556 E-06
	F	0.031	0.029	0.027	0.025

Critical F value = 4.10

Effect of light, relative humidity and temperature in ambient atmosphere on stabilized nifedipine microspheres.

Table B64 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres in ambient atmosphere.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
100.00	8.37	100.00	100.00	100.00	4.61	4.61	4.61
96.88	8.46	96.31	96.66	93.80	4.57	4.57	4.54
96.52	8.33	88.62	86.18	87.29	4.48	4.46	4.47
94.98	8.45	76.66	78.58	77.21	4.34	4.36	4.35
96.12	8.40	62.03	62.44	63.96	4.13	4.13	4.16
96.74	8.45	53.80	53.59	53.17	3.99	3.98	3.97
96.63	8.41	43.71	44.86	44.21	3.78	3.80	3.79
96.02	8.48	37.65	37.73	36.65	3.63	3.63	3.60
95.37	8.50	30.14	30.69	29.98	3.41	3.42	3.40
96.62	8.45	25.59	25.73	25.28	3.24	3.25	3.23
95.24	8.36	20.54	20.29	20.64	3.02	3.01	3.03
95.91	8.41	13.81	13.99	13.82	2.63	2.64	2.63
95.58	8.36	9.53	9.50	9.72	2.25	2.25	2.27
96.84	8.33	9.84	9.84	9.33	2.29	2.29	2.23
96.78	8.41	11.03	10.90	10.76	2.40	2.39	2.38
96.68	8.33	10.47	10.22	10.17	2.35	2.32	2.32
96.57	8.36	9.94	10.05	10.15	2.30	2.31	2.32
94.92	8.46	9.88	9.88	9.95	2.29	2.29	2.30
97.21	8.43	12.58	12.53	12.76	2.53	2.53	2.55
95.19	8.36	10.42	10.26	10.24	2.34	2.33	2.33
97.16	8.44	9.77	9.76	9.98	2.28	2.28	2.30
96.08	8.44	12.04	12.04	11.81	2.49	2.49	2.47
95.66	8.46	10.00	9.79	9.82	2.30	2.28	2.28
96.03	8.42	10.32	10.31	9.99	2.33	2.33	2.30
95.84	8.50	10.92	10.76	11.06	2.39	2.38	2.40
97.02	8.45	10.23	10.48	10.36	2.32	2.35	2.34

First-order degradation rate constant = 0.0967 h^{-1}

Table B65 Photodegradation data of 1:2:8:4 nifedipine:Eudragit RS100:PVP K30:curcumin microspheres in ambient atmosphere.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
100.00	8.37	100.00	100.00	100.00	4.61	4.61	4.61
96.88	8.40	99.65	99.08	99.68	4.60	4.60	4.60
96.52	8.33	98.02	98.34	100.05	4.59	4.59	4.61
94.98	8.36	98.28	98.90	98.27	4.59	4.59	4.59
96.12	8.36	99.76	99.88	99.20	4.60	4.60	4.60
96.74	8.40	99.00	98.14	98.95	4.60	4.59	4.59
96.63	8.34	99.00	100.02	99.71	4.60	4.61	4.60
96.02	8.47	98.30	98.90	98.82	4.59	4.59	4.59
95.37	8.41	98.72	99.17	97.96	4.59	4.60	4.58
96.62	8.35	98.79	98.27	99.62	4.59	4.59	4.60
95.24	8.47	99.98	98.28	99.32	4.61	4.59	4.60
95.91	8.42	99.89	98.21	99.76	4.60	4.59	4.60
95.58	8.39	99.59	99.74	100.08	4.60	4.60	4.61
96.84	8.47	100.20	100.04	99.90	4.61	4.61	4.60
96.78	8.47	99.69	99.09	99.59	4.60	4.60	4.60
96.68	8.43	100.18	100.19	98.39	4.61	4.61	4.59
96.57	8.42	98.40	100.09	98.35	4.59	4.61	4.59
94.92	8.49	98.39	99.65	99.61	4.59	4.60	4.60
97.21	8.36	99.63	99.76	98.63	4.60	4.60	4.59
95.19	8.48	97.88	100.18	99.67	4.58	4.61	4.60
97.16	8.34	99.12	97.96	97.99	4.60	4.58	4.58
96.08	8.32	100.17	100.02	99.19	4.61	4.61	4.60
95.66	8.46	98.90	98.46	100.10	4.59	4.59	4.61
96.03	8.42	98.14	98.91	98.92	4.59	4.59	4.59
95.84	8.39	97.88	98.78	100.12	4.58	4.59	4.61
97.02	8.41	99.49	100.01	98.99	4.60	4.61	4.60

First-order degradation rate constant = 0.0005 h^{-1}

Table B66 Photodegradation data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres in ambient atmosphere, control group.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
100.00	8.33	100.00	100.00	100.00	4.61	4.61	4.61
96.88	8.37	100.10	100.37	100.11	4.61	4.61	4.61
96.52	8.34	100.23	100.10	100.12	4.61	4.61	4.61
94.98	8.40	100.15	100.42	100.19	4.61	4.61	4.61
96.12	8.49	100.07	100.32	100.46	4.61	4.61	4.61
96.74	8.45	100.64	100.44	100.26	4.61	4.61	4.61
96.63	8.50	100.63	100.55	99.96	4.61	4.61	4.60
96.02	8.38	100.47	100.62	100.55	4.61	4.61	4.61
95.37	8.33	100.59	100.58	100.42	4.61	4.61	4.61
96.62	8.44	100.39	100.67	100.23	4.61	4.61	4.61
95.24	8.43	100.43	100.30	100.39	4.61	4.61	4.61
95.91	8.37	100.58	99.93	100.25	4.61	4.60	4.61
95.58	8.37	100.70	100.16	100.01	4.61	4.61	4.61
96.84	8.34	100.43	99.98	100.41	4.61	4.60	4.61
96.78	8.33	100.06	100.19	100.18	4.61	4.61	4.61
96.68	8.34	100.06	100.51	100.19	4.61	4.61	4.61
96.57	8.42	100.72	100.22	100.56	4.61	4.61	4.61
94.92	8.40	100.19	100.44	100.56	4.61	4.61	4.61
97.21	8.49	100.02	100.29	100.10	4.61	4.61	4.61
95.19	8.36	100.35	100.42	100.14	4.61	4.61	4.61
97.16	8.43	100.68	100.40	100.57	4.61	4.61	4.61
96.08	8.47	100.36	100.00	100.42	4.61	4.61	4.61
95.66	8.44	100.36	100.51	100.02	4.61	4.61	4.61
96.03	8.36	100.49	100.43	100.44	4.61	4.61	4.61
95.84	8.36	100.08	100.14	100.10	4.61	4.61	4.61
97.02	8.51	100.65	100.66	100.24	4.61	4.61	4.61

First-order degradation rate constant = 0.0005 h^{-1}

Table B67 Photodegradation data of 1:2:8:4 nifedipine:Eudragit RS100:PVP K30:curcumin microspheres in ambient atmosphere, control group.

Time (h)	Control	% nifedipine Remaining			ln (% nifedipine Remaining)		
		No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
100.00	8.49	100.00	100.00	100.00	4.61	4.61	4.61
96.88	8.41	100.04	100.62	100.13	4.61	4.61	4.61
96.52	8.40	100.37	100.16	100.59	4.61	4.61	4.61
94.98	8.42	100.26	100.51	100.11	4.61	4.61	4.61
96.12	8.48	99.99	99.96	100.65	4.61	4.60	4.61
96.74	8.34	100.65	100.20	100.33	4.61	4.61	4.61
96.63	8.38	100.31	100.40	100.29	4.61	4.61	4.61
96.02	8.49	100.53	100.01	100.40	4.61	4.61	4.61
95.37	8.45	100.45	99.94	100.16	4.61	4.60	4.61
96.62	8.43	99.96	100.38	100.00	4.60	4.61	4.61
95.24	8.34	100.00	100.42	100.19	4.61	4.61	4.61
95.91	8.36	100.54	100.21	100.32	4.61	4.61	4.61
95.58	8.32	100.27	100.20	100.66	4.61	4.61	4.61
96.84	8.39	100.53	100.72	100.71	4.61	4.61	4.61
96.78	8.50	100.06	100.01	100.09	4.61	4.61	4.61
96.68	8.46	100.00	100.31	100.03	4.61	4.61	4.61
96.57	8.48	100.42	100.39	100.05	4.61	4.61	4.61
94.92	8.37	100.52	100.42	100.17	4.61	4.61	4.61
97.21	8.40	100.12	100.02	100.16	4.61	4.61	4.61
95.19	8.45	100.15	100.57	100.41	4.61	4.61	4.61
97.16	8.41	100.29	100.25	99.94	4.61	4.61	4.60
96.08	8.43	100.14	100.12	100.22	4.61	4.61	4.61
95.66	8.40	100.08	100.71	100.05	4.61	4.61	4.61
96.03	8.33	100.64	100.53	100.20	4.61	4.61	4.61
95.84	8.37	100.68	100.06	100.52	4.61	4.61	4.61
97.02	8.46	100.72	100.67	100.55	4.61	4.61	4.61

First-order degradation rate constant = 0.0002 h^{-1}

Table B68 Coefficient of determinations (R^2) of zero-order, first-order, second-order and third-order kinetics of photodegradation data of nifedipine microspheres (nifedipine:Eudragit RS100:PVP K30 of 1:2:8 mixing ratio) with and without curcumin under ambient atmosphere

		Zero-order	First-order	Second-order	Third-order
Without curcumin, control	R^2	0.1782	0.1779	0.1778	0.1778
	SE	28.1984	0.5854	1.878 E-02	1.895 E-03
	F	10.548	7.372	3.929	1.880
Without curcumin, experimental	R^2	0.9023	0.9991	0.9577	0.9054
	SE	0.8785	8.854 E-03	8.924 E-05	1.799 E-06
	F	0.336	0.356	0.346	0.356
With curcumin, control	R^2	0.1369	0.1368	0.1367	0.1367
	SE	3.6147	3.611 E-02	3.612 E-04	7.236 E-06
	F	3.512	3.408	3.304	3.201
With curcumin, experimental	R^2	0.0006	0.0080	0.0081	0.0081
	SE	3.665	3.673 E-02	3.683 E-04	7.396 E-06
	F	1.565	1.462	1.363	1.266

Critical F value = 4.10

APPENDICES C

Dissolution data

and summary of coefficient of determination of zero-order, first-order, second-order and Higuchi equation.

Table C1 Dissolution data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres in the control group.

Time (min.)	%nifedipine released			ln (%nifedipine released)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
5	28.43	29.12	31.01	3.35	3.37	3.43
10	34.48	34.18	32.53	3.54	3.53	3.48
15	36.26	34.13	34.67	3.59	3.53	3.55
20	36.47	36.16	36.64	3.60	3.59	3.60
30	37.16	37.81	39.03	3.62	3.63	3.66
45	39.79	40.07	40.14	3.68	3.69	3.69
60	43.98	45.21	45.81	3.78	3.81	3.82
90	46.98	47.24	46.40	3.85	3.86	3.84
120	51.09	49.66	50.12	3.93	3.91	3.91
180	55.10	54.58	52.98	4.01	4.00	3.97
240	58.00	57.21	58.03	4.06	4.05	4.06
300	62.37	62.63	63.84	4.13	4.14	4.16
360	66.41	66.34	65.94	4.20	4.19	4.19
420	71.00	69.98	68.36	4.26	4.25	4.22
540	74.53	72.67	74.12	4.31	4.29	4.31
660	78.28	76.34	78.06	4.36	4.34	4.36
780	82.16	81.90	79.57	4.41	4.41	4.38
1200	95.33	95.11	92.91	4.56	4.56	4.53
1440	97.62	98.33	97.59	4.58	4.59	4.58
Higuchi dissolution rate constant (% released / $h^{-1/2}$)				1.9386	1.9282	1.8837

Table C2 Dissolution data of 1:2:8 nifedipine:Eudragit RS100:PVP K30 microspheres in the experimental group.

Time (min.)	%nifedipine released			ln (%nifedipine released)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
5	28.25	28.54	25.34	3.34	3.35	3.23
10	27.14	28.52	28.16	3.30	3.35	3.34
15	29.42	29.67	28.53	3.38	3.39	3.35
20	31.80	31.61	29.08	3.46	3.45	3.37
30	34.34	35.16	34.18	3.54	3.56	3.53
45	35.01	35.25	34.51	3.56	3.56	3.54
60	37.84	37.74	34.63	3.63	3.63	3.54
90	40.85	41.39	43.25	3.71	3.72	3.77
120	43.70	45.16	45.09	3.78	3.81	3.81
180	49.35	50.08	47.60	3.90	3.91	3.86
240	50.61	50.01	51.69	3.92	3.91	3.95
300	57.42	57.22	56.87	4.05	4.05	4.04
360	62.04	62.28	59.40	4.13	4.13	4.08
420	64.46	64.69	62.16	4.17	4.17	4.13
540	65.48	66.14	65.93	4.18	4.19	4.19
660	70.99	71.18	74.16	4.26	4.27	4.31
780	76.35	75.45	74.91	4.34	4.32	4.32
1200	88.65	88.62	87.17	4.48	4.48	4.47
1440	95.16	95.05	96.74	4.56	4.55	4.57
Higuchi dissolution rate constant (% released / $h^{-1/2}$)				1.9095	1.8837	1.9478

Table C3 Dissolution data of 1:2:8:4 nifedipine:Eudragit RS100:PVP K30:curcumin microspheres in the control group.

Time (min.)	%nifedipine released			ln (%nifedipine released)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
5	23.60	23.06	28.25	3.16	3.14	3.34
10	28.72	27.67	24.22	3.36	3.32	3.19
15	29.05	28.26	28.88	3.37	3.34	3.36
20	30.88	31.09	28.87	3.43	3.44	3.36
30	33.95	35.56	32.55	3.52	3.57	3.48
45	34.92	36.14	39.01	3.55	3.59	3.66
60	38.17	40.61	40.86	3.64	3.70	3.71
90	44.82	44.17	45.59	3.80	3.79	3.82
120	49.45	47.97	45.83	3.90	3.87	3.83
180	53.83	52.13	49.62	3.99	3.95	3.90
240	53.82	55.70	55.42	3.99	4.02	4.01
300	59.31	63.59	60.94	4.08	4.15	4.11
360	62.08	62.44	64.02	4.13	4.13	4.16
420	66.75	65.87	63.64	4.20	4.19	4.15
540	70.88	67.13	68.83	4.26	4.21	4.23
660	72.62	76.84	75.05	4.29	4.34	4.32
780	79.74	79.39	73.57	4.38	4.37	4.30
1200	87.85	86.37	91.64	4.48	4.46	4.52
1440	93.54	97.06	94.73	4.54	4.58	4.55
Higuchi dissolution rate constant (% released / $h^{-1/2}$)				1.9428	1.9722	1.9526

Table C4 Dissolution data of 1:2:8:4 nifedipine:Eudragit RS100:PVP K30:curcumin microspheres in the experimental group.

Time (min.)	%nifedipine released			ln (%nifedipine released)		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
5	25.62	25.65	27.55	3.24	3.24	3.32
10	28.04	28.57	26.73	3.33	3.35	3.29
15	31.27	29.63	31.64	3.44	3.39	3.45
20	32.01	31.92	31.11	3.47	3.46	3.44
30	32.91	34.18	33.47	3.49	3.53	3.51
45	36.63	35.00	35.92	3.60	3.56	3.58
60	36.23	36.07	38.95	3.59	3.59	3.66
90	41.35	40.43	38.55	3.72	3.70	3.65
120	43.52	44.26	42.90	3.77	3.79	3.76
180	48.56	49.55	48.74	3.88	3.90	3.89
240	51.78	51.66	53.19	3.95	3.94	3.97
300	56.98	57.19	57.31	4.04	4.05	4.05
360	60.54	60.17	58.78	4.10	4.10	4.07
420	63.57	63.31	61.75	4.15	4.15	4.12
540	68.49	68.87	65.74	4.23	4.23	4.19
660	73.23	71.55	71.25	4.29	4.27	4.27
780	74.95	76.98	75.74	4.32	4.34	4.33
1200	89.68	87.92	88.12	4.50	4.48	4.48
1440	94.24	94.00	94.84	4.55	4.54	4.55
Higuchi dissolution rate constant (% released / $h^{-1/2}$)				1.9153	1.8931	1.8870

Table C5 Coefficient of determination (R^2) of zero-order, first-order, second-order kinetics and Higuchi equation of dissolution data of nifedipine microspheres (nifedipine:Eudragit RS100:PVP K30 of 1:2:8) with and without curcumin

		Zero-order	First-order	Second-order	Higuchi equation
Without curcumin, control	R^2	**0.8955**	**0.7838**	**0.6519**	**0.9948**
	SE	6.6777	0.1685	4.154 E-03	1.6366
	F	470.178	199.014	102.854	8688.412
Without curcumin, experimental	R^2	**0.9172**	**0.8019**	**0.6659**	**0.9622**
	SE	5.9417	0.1762	4.946 E-03	1.4546
	F	606.151	221.197	108.375	10176.012
With curcumin, control	R^2	**0.8692**	**0.7305**	**0.5740**	**0.9825**
	SE	7.6578	0.2151	6.059 E-03	2.7204
	F	365.112	148.907	74.003	3274.028
With curcumin, experimental	R^2	**0.9168**	**0.8023**	**0.6647**	**0.9582**
	SE	5.9294	0.1753	4.929 E-03	1.0626
	F	604.076	222.960	108.978	20468.230

Critical F value = 4.10

APPENDICES D

Moisture uptake data

Table D1 % Moisture uptake at 31 %RH 40 °C by nifedipine microspheres spray dried at 55 °C.

Nifedipine:Eudragit RS100:PVP K30	Day						
	0	1	2	5	11	16	21
1:10:0	0	-0.62	-0.09	-0.19	0.19	0.01	-0.31
1:5:5	0	-0.79	-0.09	-0.49	-0.63	-0.37	-1.00
1:0:10	0	-0.35	-0.09	0.45	0.22	0.45	-0.14

Table D2 % Moisture uptake at 31 %RH 40 °C by nifedipine microspheres spray dried at 65 °C.

Nifedipine:Eudragit RS100:PVP K30	Day						
	0	1	2	5	11	16	21
1:10:0	0	-0.53	-0.43	-0.16	-0.08	-0.53	-0.12
1:5:5	0	-2.28	-2.30	-2.78	-2.32	-3.17	-2.92
1:2:8	0	-0.65	-0.34	-0.74	-0.26	-1.01	-0.73
1:0:10	0	0.54	0.71	-0.03	0.58	0.03	0.30

Table D3 % Moisture uptake at 31 %RH 40 °C by nifedipine microspheres spray dried at 75 °C.

Nifedipine:Eudragit RS100:PVP K30	Day						
	0	1	2	5	11	16	21
1:10:0	0	0.43	0.32	0.46	0.40	0.11	0.11
1:5:5	0	-0.71	-0.52	-0.46	-0.63	-1.04	-1.14
1:2:8	0	-0.05	0.85	0.42	0.73	0.41	0.42

Table D4 % Moisture uptake at 53 %RH 40 °C by nifedipine microspheres spray dried at 55 °C.

Nifedipine:Eudragit RS100:PVP K30	Day							
	0	1	2	3	6	12	17	21
1:10:0	0	0.17	0.55	0.87	0.60	0.79	0.67	0.69
1:8:2	0	1.12	1.48	1.25	1.91	1.98	1.46	1.64
1:5:5	0	2.46	2.68	2.89	3.12	3.11	3.08	3.01
1:2:8	0	3.72	4.20	4.20	4.03	4.48	4.36	4.39
1:0:10	0	5.18	5.59	5.26	5.44	5.71	5.45	5.37

Table D5 % Moisture uptake at 53 %RH 40 °C by nifedipine microspheres spray dried at 65 °C.

Nifedipine:Eudragit RS100:PVP K30	Day							
	0	1	2	3	6	12	17	21
1:10:0	0	0.05	-0.26	0.14	0.03	0.33	-0.09	-0.14
1:8:2	0	1.02	0.61	1.23	1.51	1.70	1.12	1.70
1:5:5	0	0.89	1.64	1.92	2.52	2.60	2.28	2.44
1:2:8	0	2.12	2.77	3.64	4.08	4.10	3.26	3.93
1:0:10	0	2.75	4.53	5.41	5.08	5.68	4.96	5.65

Table D6 % Moisture uptake at 53 %RH 40 °C by nifedipine microspheres spray dried at 75 °C.

Nifedipine:Eudragit RS100:PVP K30	Day							
	0	1	2	3	6	12	17	21
1:10:0	0	0.21	0.55	0.83	0.79	0.95	0.38	0.82
1:8:2	0	1.00	1.42	1.46	1.34	1.36	1.26	1.06
1:5:5	0	1.88	2.20	2.55	2.25	2.75	2.41	2.79
1:2:8	0	2.75	3.28	3.52	3.32	3.21	3.00	3.45
1:0:10	0	6.01	6.41	6.67	6.55	6.38	6.11	6.27

Table D7 % Moisture uptake at 75 %RH 40 °C by nifedipine microspheres spray dried at 55 °C.

Nifedipine.Eudragit RS100:PVP K30	Day							
	0	1	2	3	6	12	17	21
1:10:0	0.00	1.46	1.77	1.89	2.03	1.91	1.62	1.63
1:8:2	0.00	4.49	4.89	4.84	5.17	5.12	4.83	4.94
1:5:5	0.00	7.86	8.50	8.37	8.64	8.68	8.42	8.66
1:2:8	0.00	12.67	12.98	13.41	13.76	13.42	13.28	13.30
1:0:10	0.00	15.84	16.49	16.66	16.92	16.88	16.66	16.70

Table D8 % Moisture uptake at 75 %RH 40 °C by nifedipine microspheres spray dried at 65 °C.

Nifedipine:Eudragit RS100:PVP K30	Day							
	0	1	2	3	6	12	17	21
1:10:0	0	0.47	0.91	0.92	1.18	0.84	0.72	0.66
1:8:2	0	4.05	4.41	4.27	4.83	4.81	4.55	4.18
1:5:5	0	8.06	8.41	8.79	8.95	8.61	8.09	8.59
1:2:8	0	12.48	13.07	13.01	13.36	13.32	12.94	12.98
1:0:10	0	15.81	16.35	16.57	17.18	16.93	16.88	16.91

Table D9 % Moisture uptake at 75 %RH 40 °C by nifedipine microspheres spray dried at 75 °C.

Nifedipine:Eudragit RS100:PVP K30	Day							
	0	1	2	3	7	13	18	21
1:10:0	0	0.64	1.12	1.27	1.48	1.54	1.63	1.67
1:8:2	0	4.35	4.46	4.71	4.79	4.76	4.33	4.86
1:5:5	0	6.81	8.05	8.44	8.38	8.51	8.78	8.82
1:2:8	0	10.72	11.70	12.17	12.52	12.62	12.22	12.31
1:0:10	0	14.91	16.55	17.55	17.66	17.84	17.84	17.81

Table D10 % Moisture uptake at 96 %RH 40 °C by nifedipine microspheres spray dried at 55 °C.

Nifedipine:Eudragit RS100:PVP K30	Day							
	0	1	2	3	6	12	17	21
1:10:0	0	4.88	5.29	5.46	6.29	6.12	6.24	6.11
1:8:2	0	13.29	15.53	17.15	18.91	21.96	21.46	21.09
1:5:5	0	22.85	29.43	31.52	36.10	41.31	40.61	40.14
1:2:8	0	31.33	38.41	40.80	52.30	56.89	59.02	59.18
1:0:10	0	36.89	46.75	51.06	64.79	71.58	70.05	70.79

Table D11 % Moisture uptake at 96 %RH 40 °C by nifedipine microspheres spray dried at 65 °C.

Nifedipine:Eudragit RS100:PVP K30	Day							
	0	1	2	3	6	12	17	21
1:10:0	0	4.57	5.59	5.22	6.58	6.16	5.97	5.68
1:8:2	0	13.54	15.99	16.13	19.10	19.33	20.37	19.52
1:5:5	0	23.41	28.88	29.60	36.72	39.91	42.47	39.26
1:2:8	0	30.92	37.70	40.26	52.28	56.65	59.34	56.70
1:0:10	0	36.69	45.59	50.91	63.78	72.47	70.30	70.22

Table D12 % Moisture uptake at 96 %RH 40 °C by nifedipine microspheres spray dried at 75 °C.

Nifedipine:Eudragit RS100:PVP K30	Day							
	0	1	2	3	6	12	17	21
1:10:0	0	4.22	5.64	4.89	5.99	6.16	5.09	4.68
1:8:2	0	13.24	15.09	15.28	20.07	19.74	20.28	18.70
1:5:5	0	22.18	27.95	30.24	36.83	37.04	40.03	38.77
1:2:8	0	29.85	38.06	41.13	51.19	57.30	59.13	57.01
1:0:10	0	37.38	46.10	51.00	65.49	73.38	73.98	72.37

APPENDICES E

Data Statistic Analysis

Table E1 Kruskal-Wallis test for nifedipine microspheres particle sizes

	N	Mean rank
550	1	15.00
552	1	12.00
555	1	14.00
558	1	10.00
5510	1	8.00
650	1	7.00
652	1	13.00
655	1	6.00
658	1	3.00
6510	1	11.00
750	1	9.00
752	1	5.00
755	1	4.00
758	1	2.00
7510	1	1.00
Kruskal-Wallis test	Chi-square	= 14.00
	Critical Chi-square	= 23.685
	df	= 14
	p-value	= 0.450

Table E2 Three-way analysis of variance for degradation rate constant (k) of nifedipine microsphere of varied PVP K30 content and inlet air temperature

Source	df	SS	MS	F cal	F critical value	p-value
Between temp	2	3.994E-02	1.997E-02	58.208	19.50	0.000
Between PVP	4	0.334	8.338E-02	243.049	5.63	0.000
Between time	13	402.193	30.938	90183.432	2.21	0.000
temp-PVP interaction	8	0.138	1.719 E-02	50.122	2.93	0.000
temp-time interaction	24	0.276	1.149 E-02	33.499	1.73	0.000
PVP-time interaction	48	0.348	7.247 E-03	21.126	1.56	0.000
temp-PVP-time interaction	92	0.429	4.658 E-03	13.578	1.46	0.000
Error	384	0.132	3.431 E-04			
Total	576	7642.251				

Test between inlet air temperature

Multiple Comparisons

Dependent Variable: ln C

Scheffe

(I) Inlet Air Temp	(J) Inlet Air Temp	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
55 Deg Celc	65 Deg Celc	-1.472E-02*	1.898E-03	.000	-1.94E-02	-1.01E-02
	75 Deg Celc	4.514E-02*	1.883E-03	.000	4.051E-02	4.977E-02
65 Deg Celc	55 Deg Celc	1.472E-02*	1.898E-03	.000	1.006E-02	1.939E-02
	75 Deg Celc	5.986E-02*	1.891E-03	.000	5.522E-02	6.451E-02
75 Deg Celc	55 Deg Celc	-4.514E-02*	1.883E-03	.000	-4.98E-02	-4.05E-02
	65 Deg Celc	-5.986E-02*	1.891E-03	.000	-6.45E-02	-5.52E-02

Based on observed means.

*. The mean difference is significant at the .05 level.

Test between PVP K30 ratio

Multiple Comparisons

Dependent Variable: ln C

Scheffe

(I) PVP ratio	(J) PVP ratio	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0	2	9.081E-02*	2.437E-03	.000	8.327E-02	9.836E-02
	5	.1792*	2.422E-03	.000	.1717	.1867
	8	5.009E-02*	2.453E-03	.000	4.249E-02	5.768E-02
	10	-5.811E-03	2.470E-03	.239	-1.35E-02	1.834E-03
2	0	-9.081E-02*	2.437E-03	.000	-9.84E-02	-8.33E-02
	5	8.835E-02*	2.406E-03	.000	8.091E-02	9.580E-02
	8	-4.072E-02*	2.437E-03	.000	-4.83E-02	-3.32E-02
	10	-9.662E-02*	2.454E-03	.000	-.1042	-8.90E-02
5	0	-.1792*	2.422E-03	.000	-.1867	-.1717
	2	-8.835E-02*	2.406E-03	.000	-9.58E-02	-8.09E-02
	8	-.1291*	2.422E-03	.000	-.1366	-.1216
	10	-.1850*	2.439E-03	.000	-.1925	-.1774
8	0	-5.009E-02*	2.453E-03	.000	-5.77E-02	-4.25E-02
	2	4.072E-02*	2.437E-03	.000	3.318E-02	4.827E-02
	5	.1291*	2.422E-03	.000	.1216	.1366
	10	-5.590E-02*	2.470E-03	.000	-6.35E-02	-4.83E-02
10	0	5.811E-03	2.470E-03	.239	-1.83E-03	1.346E-02
	2	9.662E-02*	2.454E-03	.000	8.903E-02	.1042
	5	.1850*	2.439E-03	.000	.1774	.1925
	8	5.590E-02*	2.470E-03	.000	4.825E-02	6.354E-02

Based on observed means.

* The mean difference is significant at the .05 level.

Test between formulas

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
550	552	4.949E-02*	4.194E-03	.000	2.892E-02	7.006E-02
	555	5.615E-02*	4.194E-03	.000	3.559E-02	7.672E-02
	558	6.513E-02*	4.194E-03	.000	4.456E-02	8.570E-02
	650	-.1345*	4.281E-03	.000	-.1555	-.1135
	652	3.667E-02*	4.194E-03	.000	1.610E-02	5.723E-02
	655	.2725*	4.119E-03	.000	.2523	.2927
	658	-.1223*	4.281E-03	.000	-.1433	-.1013
	750	5.385E-03	4.194E-03	1.000	-1.52E-02	2.595E-02
	752	6.436E-02*	4.194E-03	.000	4.379E-02	8.493E-02
	755	7.667E-02*	4.194E-03	.000	5.610E-02	9.723E-02
	758	7.538E-02*	4.194E-03	.000	5.482E-02	9.595E-02
	5510	-.1131*	4.281E-03	.000	-.1341	-9.21E-02
	6510	-.1073*	4.281E-03	.000	-.1283	-8.63E-02
	7510	7.128E-02*	4.194E-03	.000	5.071E-02	9.185E-02
552	550	-4.9487E-02*	4.194E-03	.000	-7.01E-02	-2.89E-02
	555	6.667E-03	4.194E-03	1.000	-1.39E-02	2.723E-02
	558	1.564E-02	4.194E-03	.459	-4.93E-03	3.621E-02
	650	-.1840*	4.281E-03	.000	-.2050	-.1630
	652	-1.2821E-02	4.194E-03	.806	-3.34E-02	7.747E-03
	655	.2230*	4.119E-03	.000	.2028	.2432
	658	-.1718*	4.281E-03	.000	-.1928	-.1508
	750	-4.4103E-02*	4.194E-03	.000	-6.47E-02	-2.35E-02
	752	1.487E-02	4.194E-03	.561	-5.70E-03	3.544E-02
	755	2.718E-02*	4.194E-03	.000	6.612E-03	4.775E-02
	758	2.590E-02*	4.194E-03	.001	5.330E-03	4.647E-02
	5510	-.1626*	4.281E-03	.000	-.1836	-.1416
	6510	-.1568*	4.281E-03	.000	-.1778	-.1358
	7510	2.179E-02*	4.194E-03	.022	1.227E-03	4.236E-02
555	550	-5.6154E-02*	4.194E-03	.000	-7.67E-02	-3.56E-02
	552	-6.6667E-03	4.194E-03	1.000	-2.72E-02	1.390E-02
	558	8.974E-03	4.194E-03	.990	-1.16E-02	2.954E-02
	650	-.1907*	4.281E-03	.000	-.2117	-.1697
	652	-1.9487E-02	4.194E-03	.094	-4.01E-02	1.081E-03
	655	.2163*	4.119E-03	.000	.1961	.2365
	658	-.1785*	4.281E-03	.000	-.1995	-.1575
	750	-5.0769E-02*	4.194E-03	.000	-7.13E-02	-3.02E-02
	752	8.205E-03	4.194E-03	.996	-1.24E-02	2.877E-02
	755	2.051E-02	4.194E-03	.052	-5.50E-05	4.108E-02
	758	1.923E-02	4.194E-03	.107	-1.34E-03	3.980E-02
	5510	-.1693*	4.281E-03	.000	-.1903	-.1483
	6510	-.1635*	4.281E-03	.000	-.1845	-.1425
	7510	1.513E-02	4.194E-03	.527	-5.44E-03	3.570E-02

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
558	550	-6.5128E-02*	4.194E-03	.000	-8.57E-02	-4.46E-02
	552	-1.5641E-02	4.194E-03	.459	-3.62E-02	4.927E-03
	555	-8.9744E-03	4.194E-03	.990	-2.95E-02	1.159E-02
	650	-.1997*	4.281E-03	.000	-.2207	-.1787
	652	-2.8462E-02*	4.194E-03	.000	-4.90E-02	-7.89E-03
	655	.2073*	4.119E-03	.000	.1871	.2275
	658	-.1874*	4.281E-03	.000	-.2084	-.1664
	750	-5.9744E-02*	4.194E-03	.000	-8.03E-02	-3.92E-02
	752	-7.6923E-04	4.194E-03	1.000	-2.13E-02	1.980E-02
	755	1.154E-02	4.194E-03	.909	-9.03E-03	3.211E-02
	758	1.026E-02	4.194E-03	.966	-1.03E-02	3.082E-02
	5510	-.1783*	4.281E-03	.000	-.1993	-.1573
	6510	-.1724*	4.281E-03	.000	-.1934	-.1514
	7510	6.154E-03	4.194E-03	1.000	-1.44E-02	2.672E-02
650	550	.1345*	4.281E-03	.000	.1135	.1555
	552	.1840*	4.281E-03	.000	.1630	.2050
	555	.1907*	4.281E-03	.000	.1697	.2117
	558	.1997*	4.281E-03	.000	.1787	.2207
	652	.1712*	4.281E-03	.000	.1502	.1922
	655	.4070*	4.207E-03	.000	.3864	.4276
	658	1.222E-02	4.366E-03	.895	-9.19E-03	3.363E-02
	750	.1399*	4.281E-03	.000	.1189	.1609
	752	.1989*	4.281E-03	.000	.1779	.2199
	755	.2112*	4.281E-03	.000	.1902	.2322
	758	.2099*	4.281E-03	.000	.1889	.2309
	5510	2.139E-02	4.366E-03	.051	-1.88E-05	4.280E-02
	6510	2.722E-02*	4.366E-03	.001	5.815E-03	4.863E-02
	7510	.2058*	4.281E-03	.000	.1848	.2268
652	550	-3.6667E-02*	4.194E-03	.000	-5.72E-02	-1.61E-02
	552	1.282E-02	4.194E-03	.806	-7.75E-03	3.339E-02
	555	1.949E-02	4.194E-03	.094	-1.08E-03	4.006E-02
	558	2.846E-02*	4.194E-03	.000	7.894E-03	4.903E-02
	650	-.1712*	4.281E-03	.000	-.1922	-.1502
	655	.2358*	4.119E-03	.000	.2156	.2560
	658	-.1590*	4.281E-03	.000	-.1800	-.1380
	750	-3.1282E-02*	4.194E-03	.000	-5.18E-02	-1.07E-02
	752	2.769E-02*	4.194E-03	.000	7.124E-03	4.826E-02
	755	4.000E-02*	4.194E-03	.000	1.943E-02	6.057E-02
	758	3.872E-02*	4.194E-03	.000	1.815E-02	5.929E-02
	5510	-.1498*	4.281E-03	.000	-.1708	-.1288
	6510	-.1440*	4.281E-03	.000	-.1650	-.1230
	7510	3.462E-02*	4.194E-03	.000	1.405E-02	5.518E-02

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
655	550	-.2725*	4.119E-03	.000	-.2927	-.2523
	552	-.2230*	4.119E-03	.000	-.2432	-.2028
	555	-.2163*	4.119E-03	.000	-.2365	-.1961
	558	-.2073*	4.119E-03	.000	-.2275	-.1871
	650	-.4070*	4.207E-03	.000	-.4276	-.3864
	652	-.2358*	4.119E-03	.000	-.2560	-.2156
	658	-.3948*	4.207E-03	.000	-.4154	-.3741
	750	-.2671*	4.119E-03	.000	-.2873	-.2469
	752	-.2081*	4.119E-03	.000	-.2283	-.1879
	755	-.1958*	4.119E-03	.000	-.2160	-.1756
	758	-.1971*	4.119E-03	.000	-.2173	-.1769
	5510	-.3856*	4.207E-03	.000	-.4062	-.3650
	6510	-.3798*	4.207E-03	.000	-.4004	-.3591
	7510	-.2012*	4.119E-03	.000	-.2214	-.1810
658	550	.1223*	4.281E-03	.000	.1013	.1433
	552	.1718*	4.281E-03	.000	.1508	.1928
	555	.1785*	4.281E-03	.000	.1575	.1995
	558	.1874*	4.281E-03	.000	.1664	.2084
	650	-1.2222E-02	4.366E-03	.895	-3.36E-02	9.185E-03
	652	.1590*	4.281E-03	.000	.1380	.1800
	655	.3948*	4.207E-03	.000	.3741	.4154
	750	.1277*	4.281E-03	.000	.1067	.1487
	752	.1867*	4.281E-03	.000	.1657	.2077
	755	.1990*	4.281E-03	.000	.1780	.2200
	758	.1977*	4.281E-03	.000	.1767	.2187
	5510	9.167E-03	4.366E-03	.992	-1.22E-02	3.057E-02
	6510	1.500E-02	4.366E-03	.622	-6.41E-03	3.641E-02
	7510	.1936*	4.281E-03	.000	.1726	.2146
750	550	-5.3846E-03	4.194E-03	1.000	-2.60E-02	1.518E-02
	552	4.410E-02*	4.194E-03	.000	2.353E-02	6.467E-02
	555	5.077E-02*	4.194E-03	.000	3.020E-02	7.134E-02
	558	5.974E-02*	4.194E-03	.000	3.918E-02	8.031E-02
	650	-.1399*	4.281E-03	.000	-.1609	-.1189
	652	3.128E-02*	4.194E-03	.000	1.071E-02	5.185E-02
	655	.2671*	4.119E-03	.000	.2469	.2873
	658	-.1277*	4.281E-03	.000	-.1487	-.1067
	752	5.897E-02*	4.194E-03	.000	3.841E-02	7.954E-02
	755	7.128E-02*	4.194E-03	.000	5.071E-02	9.185E-02
	758	7.000E-02*	4.194E-03	.000	4.943E-02	9.057E-02
	5510	-.1185*	4.281E-03	.000	-.1395	-9.75E-02
	6510	-.1127*	4.281E-03	.000	-.1337	-9.17E-02
	7510	6.590E-02*	4.194E-03	.000	4.533E-02	8.647E-02

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
752	550	-6.4359E-02*	4.194E-03	.000	-8.49E-02	-4.38E-02
	552	-1.4872E-02	4.194E-03	.561	-3.54E-02	5.696E-03
	555	-8.2051E-03	4.194E-03	.996	-2.88E-02	1.236E-02
	558	7.692E-04	4.194E-03	1.000	-1.98E-02	2.134E-02
	650	-.1989*	4.281E-03	.000	-.2199	-.1779
	652	-2.7692E-02*	4.194E-03	.000	-4.83E-02	-7.12E-03
	655	.2081*	4.119E-03	.000	.1879	.2283
	658	-.1867*	4.281E-03	.000	-.2077	-.1657
	750	-5.8974E-02*	4.194E-03	.000	-7.95E-02	-3.84E-02
	755	1.231E-02	4.194E-03	.853	-8.26E-03	3.288E-02
	758	1.103E-02	4.194E-03	.936	-9.54E-03	3.159E-02
	5510	-.1775*	4.281E-03	.000	-.1985	-.1565
	6510	-.1717*	4.281E-03	.000	-.1927	-.1507
	7510	6.923E-03	4.194E-03	.999	-1.36E-02	2.749E-02
755	550	-7.6667E-02*	4.194E-03	.000	-9.72E-02	-5.61E-02
	552	-2.7179E-02*	4.194E-03	.000	-4.77E-02	-6.61E-03
	555	-2.0513E-02	4.194E-03	.052	-4.11E-02	5.505E-05
	558	-1.1538E-02	4.194E-03	.909	-3.21E-02	9.029E-03
	650	-.2112*	4.281E-03	.000	-.2322	-.1902
	652	-4.0000E-02*	4.194E-03	.000	-6.06E-02	-1.94E-02
	655	.1958*	4.119E-03	.000	.1756	.2160
	658	-.1990*	4.281E-03	.000	-.2200	-.1780
	750	-7.1282E-02*	4.194E-03	.000	-9.18E-02	-5.07E-02
	752	-1.2308E-02	4.194E-03	.853	-3.29E-02	8.260E-03
	758	-1.2821E-03	4.194E-03	1.000	-2.18E-02	1.929E-02
	5510	-.1898*	4.281E-03	.000	-.2108	-.1688
	6510	-.1840*	4.281E-03	.000	-.2050	-.1630
	7510	-5.3846E-03	4.194E-03	1.000	-2.60E-02	1.518E-02
758	550	-7.5385E-02*	4.194E-03	.000	-9.60E-02	-5.48E-02
	552	-2.5897E-02*	4.194E-03	.001	-4.65E-02	-5.33E-03
	555	-1.9231E-02	4.194E-03	.107	-3.98E-02	1.337E-03
	558	-1.0256E-02	4.194E-03	.966	-3.08E-02	1.031E-02
	650	-.2099*	4.281E-03	.000	-.2309	-.1889
	652	-3.8718E-02*	4.194E-03	.000	-5.93E-02	-1.82E-02
	655	.1971*	4.119E-03	.000	.1769	.2173
	658	-.1977*	4.281E-03	.000	-.2187	-.1767
	750	-7.0000E-02*	4.194E-03	.000	-9.06E-02	-4.94E-02
	752	-1.1026E-02	4.194E-03	.936	-3.16E-02	9.542E-03
	755	1.282E-03	4.194E-03	1.000	-1.93E-02	2.185E-02
	5510	-.1885*	4.281E-03	.000	-.2095	-.1675
	6510	-.1827*	4.281E-03	.000	-.2037	-.1617
	7510	-4.1026E-03	4.194E-03	1.000	-2.47E-02	1.647E-02

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Formula	(J) Formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
5510	550	.1131*	4.281E-03	.000	9.215E-02	.1341
	552	.1626*	4.281E-03	.000	.1416	.1836
	555	.1693*	4.281E-03	.000	.1483	.1903
	558	.1783*	4.281E-03	.000	.1573	.1993
	650	-2.1389E-02	4.366E-03	.051	-4.28E-02	1.883E-05
	652	.1498*	4.281E-03	.000	.1288	.1708
	655	.3856*	4.207E-03	.000	.3650	.4062
	658	-9.1667E-03	4.366E-03	.992	-3.06E-02	1.224E-02
	750	.1185*	4.281E-03	.000	9.753E-02	.1395
	752	.1775*	4.281E-03	.000	.1565	.1985
	755	.1898*	4.281E-03	.000	.1688	.2108
	758	.1885*	4.281E-03	.000	.1675	.2095
	6510	5.833E-03	4.366E-03	1.000	-1.56E-02	2.724E-02
	7510	.1844*	4.281E-03	.000	.1634	.2054
6510	550	.1073*	4.281E-03	.000	8.632E-02	.1283
	552	.1568*	4.281E-03	.000	.1358	.1778
	555	.1635*	4.281E-03	.000	.1425	.1845
	558	.1724*	4.281E-03	.000	.1514	.1934
	650	-2.7222E-02*	4.366E-03	.001	-4.86E-02	-5.81E-03
	652	.1440*	4.281E-03	.000	.1230	.1650
	655	.3798*	4.207E-03	.000	.3591	.4004
	658	-1.5000E-02	4.366E-03	.622	-3.64E-02	6.408E-03
	750	.1127*	4.281E-03	.000	9.170E-02	.1337
	752	.1717*	4.281E-03	.000	.1507	.1927
	755	.1840*	4.281E-03	.000	.1630	.2050
	758	.1827*	4.281E-03	.000	.1617	.2037
	5510	-5.8333E-03	4.366E-03	1.000	-2.72E-02	1.557E-02
	7510	.1786*	4.281E-03	.000	.1576	.1996
7510	550	-7.1282E-02*	4.194E-03	.000	-9.18E-02	-5.07E-02
	552	-2.1795E-02*	4.194E-03	.022	-4.24E-02	-1.23E-03
	555	-1.5128E-02	4.194E-03	.527	-3.57E-02	5.440E-03
	558	-6.1538E-03	4.194E-03	1.000	-2.67E-02	1.441E-02
	650	-.2058*	4.281E-03	.000	-.2268	-.1848
	652	-3.4615E-02*	4.194E-03	.000	-5.52E-02	-1.40E-02
	655	.2012*	4.119E-03	.000	.1810	.2214
	658	-.1936*	4.281E-03	.000	-.2146	-.1726
	750	-6.5897E-02*	4.194E-03	.000	-8.65E-02	-4.53E-02
	752	-6.9231E-03	4.194E-03	.999	-2.75E-02	1.364E-02
	755	5.385E-03	4.194E-03	1.000	-1.52E-02	2.595E-02
	758	4.103E-03	4.194E-03	1.000	-1.65E-02	2.467E-02
	5510	-.1844*	4.281E-03	.000	-.2054	-.1634
	6510	-.1786*	4.281E-03	.000	-.1996	-.1576

Based on observed means.

*. The mean difference is significant at the .05 level.

Table E3 Two-way analysis of variance for degradation rate constant (k) of nifedipine microsphere of varied particle size

Source	df	SS	MS	F cal	F critical value	p-value
Between group	3	2.887	0.962	1145.273	8.53	0.000
Between time	12	99.625	8.302	9878.890	2.30	0.000
group-time interaction	36	1.632	4.534E-02	53.948	1.69	0.000
Error	104	8.740E-02	8.404 E-02			
Total	156	2151.705				

Multiple Comparisons

Dependent Variable: ln C

Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
7.31 mcm	15.61 mcm	-4.897E-02*	6.565E-03	.000	-6.76E-02	-3.03E-02
	26.24 mcm	-.1754*	6.565E-03	.000	-.1940	-.1567
	43.91 mcm	-.3521*	6.565E-03	.000	-.3707	-.3334
15.61 mcm	7.31 mcm	4.897E-02*	6.565E-03	.000	3.032E-02	6.763E-02
	26.24 mcm	-.1264*	6.565E-03	.000	-.1451	-.1078
	43.91 mcm	-.3031*	6.565E-03	.000	-.3217	-.2844
26.24 mcm	7.31 mcm	.1754*	6.565E-03	.000	.1567	.1940
	15.61 mcm	.1264*	6.565E-03	.000	.1078	.1451
	43.91 mcm	-.1767*	6.565E-03	.000	-.1953	-.1580
43.91 mcm	7.31 mcm	.3521*	6.565E-03	.000	.3334	.3707
	15.61 mcm	.3031*	6.565E-03	.000	.2844	.3217
	26.24 mcm	.1767*	6.565E-03	.000	.1580	.1953

Based on observed means.

*. The mean difference is significant at the .05 level.

Table E4 Two-way analysis of variance for degradation rate constant (k) of nifedipine microsphere of varied Eudragit RS100 ratio

Source	df	SS	MS	F cal	F critical value	p-value
Between group	3	6.663E-02	2.221E-02	86.492	8.53	0.000
Between time	12	111.564	9.297	34949.312	2.30	0.000
group-time interaction	35	0.143	4.086E-03	15.361	1.68	0.000
Error	102	2.713E-02				
Total	153	5046.084				

Multiple Comparisons

Dependent Variable: ln C

Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
NP : EU 1 : 1	NP : EU 1 : 3	-1.154E-02*	3.693E-03	.025	-2.20E-02	-1.04E-03
	NP : EU 1 : 5	1.026E-03	3.693E-03	.994	-9.47E-03	1.153E-02
	NP : EU 1 : 10	-.1920*	3.770E-03	.000	-.2027	-.1812
NP : EU 1 : 3	NP : EU 1 : 1	1.154E-02*	3.693E-03	.025	1.039E-03	2.204E-02
	NP : EU 1 : 5	1.256E-02*	3.693E-03	.012	2.065E-03	2.306E-02
	NP : EU 1 : 10	-.1804*	3.770E-03	.000	-.1911	-.1697
NP : EU 1 : 5	NP : EU 1 : 1	-1.026E-03	3.693E-03	.994	-1.15E-02	9.474E-03
	NP : EU 1 : 3	-1.256E-02*	3.693E-03	.012	-2.31E-02	-2.06E-03
	NP : EU 1 : 10	-.1930*	3.770E-03	.000	-.2037	-.1823
NP : EU 1 : 10	NP : EU 1 : 1	.1920*	3.770E-03	.000	.1812	.2027
	NP : EU 1 : 3	.1804*	3.770E-03	.000	.1697	.1911
	NP : EU 1 : 5	.1930*	3.770E-03	.000	.1823	.2037

Based on observed means.

*. The mean difference is significant at the .05 level.

Table E5 Two-way analysis of variance for degradation rate constant (k) of nifedipine microsphere of varied PVP K30 ratio

Source	df	SS	MS	F cal	F critical value	p-value
Between group	3	5.475E-02	1825E-02	67.428	8.53	0.00
Between time	12	106.134	8.845	32676.839	2.30	0.00
group-time interaction	34	0.119	3487E-03	12.884	1.66	0.00
Error	100	2.707E-02	2.707E-04			
Total	150	2030.975				

Multiple Comparisons

Dependent Variable: ln C

Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
NP : PVP 1 : 1	NP : PVP 1 : 3	-.1932*	3.802E-03	.000	-.2040	-.1824
	NP : PVP 1 : 5	-1.795E-02*	3.726E-03	.000	-2.85E-02	-7.35E-03
	NP : PVP 1 : 10	-.1865*	3.802E-03	.000	-.1974	-.1757
NP : PVP 1 : 3	NP : PVP 1 : 1	.1932*	3.802E-03	.000	.1824	.2040
	NP : PVP 1 : 5	.1753*	3.802E-03	.000	.1644	.1861
	NP : PVP 1 : 10	6.667E-03	3.878E-03	.403	-4.36E-03	1.769E-02
NP : PVP 1 : 5	NP : PVP 1 : 1	1.795E-02*	3.726E-03	.000	7.354E-03	2.854E-02
	NP : PVP 1 : 3	-.1753*	3.802E-03	.000	-.1861	-.1644
	NP : PVP 1 : 10	-.1686*	3.802E-03	.000	-.1794	-.1578
NP : PVP 1 : 10	NP : PVP 1 : 1	.1865*	3.802E-03	.000	.1757	.1974
	NP : PVP 1 : 3	-6.667E-03	3.878E-03	.403	-1.77E-02	4.361E-03
	NP : PVP 1 : 5	.1686*	3.802E-03	.000	.1578	.1794

Based on observed means.

*. The mean difference is significant at the .05 level.

Table E6 Two-way analysis of variance for degradation rate constant (k) of nifedipine microsphere exposed to varied light intensities

Source	df	SS	MS	F cal	F critical value	p-value
Between group	3	9.061	3.020	1115.398	8.53	0.00
Between time	14	131.802	9.414	3476.675	2.13	0.00
group-time interaction	37	6.711	0.181	66.982	1.70	0.00
Error	110	0.298	2.708E-03			
Total	165	2184.325				

Multiple Comparisons

Dependent Variable: ln C

Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
400 lux	800 lux	.1891*	1.097E-02	.000	.1580	.2203
	1200 lux	.1399*	1.138E-02	.000	.1075	.1722
	2000 lux	.2912*	1.164E-02	.000	.2581	.3242
800 lux	400 lux	-.1891*	1.097E-02	.000	-.2203	-.1580
	1200 lux	-4.925E-02*	1.138E-02	.001	-8.16E-02	-1.69E-02
	2000 lux	.1021*	1.164E-02	.000	6.902E-02	.1351
1200 lux	400 lux	-.1399*	1.138E-02	.000	-.1722	-.1075
	800 lux	4.925E-02*	1.138E-02	.001	1.692E-02	8.157E-02
	2000 lux	.1513*	1.203E-02	.000	.1172	.1855
2000 lux	400 lux	-.2912*	1.164E-02	.000	-.3242	-.2581
	800 lux	-.1021*	1.164E-02	.000	-.1351	-6.90E-02
	1200 lux	-.1513*	1.203E-02	.000	-.1855	-.1172

Based on observed means.

*. The mean difference is significant at the .05 level.

Table E7 Two-way analysis of variance for degradation rate constant (k) of nifedipine microsphere with and without curcumin

Source	df	SS	MS	F cal	F critical value	p-value
Between group	3	33.678	11.226	11087.805	8.53	0.000
Between time	25	8.171	0.331	326.793	1.71	0.000
group-time interaction	62	23.597	0.381	375.918	1.39	0.000
Error	182	0.184	1.012E-03			
Total	273	5478.407				

Multiple Comparisons

Dependent Variable: ln C

Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
No curcumin, not exposed	No curcumin, exposed	1.0755*	6.240E-03	.000	1.0579	1.0931
	curcumin, not exposed	1.410E-03	5.095E-03	.994	-1.30E-02	1.579E-02
	curcumin, exposed	-5.128E-03	5.095E-03	.798	-1.95E-02	9.249E-03
No curcumin, exposed	No curcumin, not exposed	-1.0755*	6.240E-03	.000	-1.0931	-1.0579
	curcumin, not exposed	-1.0741*	6.240E-03	.000	-1.0917	-1.0565
	curcumin, exposed	-1.0806*	6.240E-03	.000	-1.0982	-1.0630
curcumin, not exposed	No curcumin, not exposed	-1.410E-03	5.095E-03	.994	-1.58E-02	1.297E-02
	No curcumin, exposed	1.0741*	6.240E-03	.000	1.0565	1.0917
	curcumin, exposed	-6.538E-03	5.095E-03	.649	-2.09E-02	7.839E-03
curcumin, exposed	No curcumin, not exposed	5.128E-03	5.095E-03	.798	-9.25E-03	1.951E-02
	No curcumin, exposed	1.0806*	6.240E-03	.000	1.0630	1.0982
	curcumin, not exposed	6.538E-03	5.095E-03	.649	-7.84E-03	2.092E-02

Based on observed means.

*. The mean difference is significant at the .05 level.

Table E8 Two-way analysis of variance for degradation rate constant (k) of nifedipine microsphere with UV absorbers and antioxidant

Source	df	SS	MS	F cal	F critical value	p-value
Between group	20	775.724	38.786	29501.253	1.84	0.000
Between time	20	557.051	27.853	21184.999	1.84	0.000
group-time interaction	355	286.809	0.808	614.507	1.00	0.000
Error	792	1.041	1.315E-03			
Total	1188	15428.728				

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Control	Curcumin 2 mg%	-1.3911*	7.576E-03	.000
	Curcumin 4 mg%	-1.6929*	7.576E-03	.000
	Curcumin 8 mg%	-1.8259*	7.576E-03	.000
	Curcumin Ext 2 mg%	.2498*	7.576E-03	.000
	Curcumin Ext 4 mg%	-.6360*	7.576E-03	.000
	Curcumin Ext 8 mg%	-1.1613*	7.576E-03	.000
	Tartrazine 2 mg%	.1107*	7.644E-03	.000
	Tartrazine 4 mg%	-.4952*	7.576E-03	.000
	Tartrazine 8 mg%	-1.1283*	7.576E-03	.000
	Sunset Yellow 2 mg%	-.2328*	7.802E-03	.000
	Sunset Yellow 4 mg%	-.7025*	7.576E-03	.000
	Sunset Yellow 8 mg%	-1.2057*	7.576E-03	.000
	Sod. Bisulfite 2 mg%	4.139E-02	8.546E-03	.271
	Sod. Bisulfite 4 mg%	-.4161*	8.964E-03	.000
	Sod. Bisulfite 8 mg%	.1927*	8.108E-03	.000
	Curcumin 16 mg%	-1.9203*	7.576E-03	.000
	Curcumin Ext 16 mg%	-1.5878*	7.576E-03	.000
	Tartrazine 16 mg%	-1.4937*	7.576E-03	.000
	Sunset Yellow 16 mg%	-1.6732*	7.576E-03	.000
	Sod. Bisulfite 16 mg%	4.644E-02*	8.108E-03	.038
Curcumin 2 mg%	Control	1.3911*	7.576E-03	.000
	Curcumin 4 mg%	-.3017*	6.460E-03	.000
	Curcumin 8 mg%	-.4348*	6.460E-03	.000
	Curcumin Ext 2 mg%	1.6410*	6.460E-03	.000
	Curcumin Ext 4 mg%	.7551*	6.460E-03	.000
	Curcumin Ext 8 mg%	.2298*	6.460E-03	.000
	Tartrazine 2 mg%	1.5018*	6.541E-03	.000
	Tartrazine 4 mg%	.8959*	6.460E-03	.000
	Tartrazine 8 mg%	.2629*	6.460E-03	.000
	Sunset Yellow 2 mg%	1.1583*	6.724E-03	.000
	Sunset Yellow 4 mg%	.6886*	6.460E-03	.000
	Sunset Yellow 8 mg%	.1854*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.4325*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	.9750*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	1.5838*	7.077E-03	.000
	Curcumin 16 mg%	-.5292*	6.460E-03	.000
	Curcumin Ext 16 mg%	-.1967*	6.460E-03	.000
	Tartrazine 16 mg%	-.1025*	6.460E-03	.000
	Sunset Yellow 16 mg%	-.2821*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.4376*	7.077E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Curcumin 4 mg%	Control	1.6929*	7.576E-03	.000
	Curcumin 2 mg%	.3017*	6.460E-03	.000
	Curcumin 8 mg%	-.1330*	6.460E-03	.000
	Curcumin Ext 2 mg%	1.9427*	6.460E-03	.000
	Curcumin Ext 4 mg%	1.0568*	6.460E-03	.000
	Curcumin Ext 8 mg%	.5316*	6.460E-03	.000
	Tartrazine 2 mg%	1.8036*	6.541E-03	.000
	Tartrazine 4 mg%	1.1976*	6.460E-03	.000
	Tartrazine 8 mg%	.5646*	6.460E-03	.000
	Sunset Yellow 2 mg%	1.4601*	6.724E-03	.000
	Sunset Yellow 4 mg%	.9903*	6.460E-03	.000
	Sunset Yellow 8 mg%	.4871*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.7342*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	1.2767*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	1.8855*	7.077E-03	.000
	Curcumin 16 mg%	-.2275*	6.460E-03	.000
	Curcumin Ext 16 mg%	.1051*	6.460E-03	.000
	Tartrazine 16 mg%	.1992*	6.460E-03	.000
	Sunset Yellow 16 mg%	1.968E-02	6.460E-03	.979
	Sod. Bisulfite 16 mg%	1.7393*	7.077E-03	.000
Curcumin 8 mg%	Control	1.8259*	7.576E-03	.000
	Curcumin 2 mg%	.4348*	6.460E-03	.000
	Curcumin 4 mg%	.1330*	6.460E-03	.000
	Curcumin Ext 2 mg%	2.0757*	6.460E-03	.000
	Curcumin Ext 4 mg%	1.1898*	6.460E-03	.000
	Curcumin Ext 8 mg%	.6646*	6.460E-03	.000
	Tartrazine 2 mg%	1.9366*	6.541E-03	.000
	Tartrazine 4 mg%	1.3306*	6.460E-03	.000
	Tartrazine 8 mg%	.6976*	6.460E-03	.000
	Sunset Yellow 2 mg%	1.5931*	6.724E-03	.000
	Sunset Yellow 4 mg%	1.1233*	6.460E-03	.000
	Sunset Yellow 8 mg%	.6202*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.8673*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	1.4098*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	2.0185*	7.077E-03	.000
	Curcumin 16 mg%	-9.4444E-02*	6.460E-03	.000
	Curcumin Ext 16 mg%	.2381*	6.460E-03	.000
	Tartrazine 16 mg%	.3322*	6.460E-03	.000
	Sunset Yellow 16 mg%	.1527*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.8723*	7.077E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Curcumin Ext 2 mg%	Control	-.2498*	7.576E-03	.000
	Curcumin 2 mg%	-1.6410*	6.460E-03	.000
	Curcumin 4 mg%	-1.9427*	6.460E-03	.000
	Curcumin 8 mg%	-2.0757*	6.460E-03	.000
	Curcumin Ext 4 mg%	-.8859*	6.460E-03	.000
	Curcumin Ext 8 mg%	-1.4111*	6.460E-03	.000
	Tartrazine 2 mg%	-.1391*	6.541E-03	.000
	Tartrazine 4 mg%	-.7451*	6.460E-03	.000
	Tartrazine 8 mg%	-1.3781*	6.460E-03	.000
	Sunset Yellow 2 mg%	-.4826*	6.724E-03	.000
	Sunset Yellow 4 mg%	-.9524*	6.460E-03	.000
	Sunset Yellow 8 mg%	-1.4556*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	-.2085*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	-.6660*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	-5.7175E-02*	7.077E-03	.000
	Curcumin 16 mg%	-2.1702*	6.460E-03	.000
	Curcumin Ext 16 mg%	-1.8376*	6.460E-03	.000
	Tartrazine 16 mg%	-1.7435*	6.460E-03	.000
	Sunset Yellow 16 mg%	-1.9230*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	-.2034*	7.077E-03	.000
Curcumin Ext 4 mg%	Control	.6360*	7.576E-03	.000
	Curcumin 2 mg%	-.7551*	6.460E-03	.000
	Curcumin 4 mg%	-1.0568*	6.460E-03	.000
	Curcumin 8 mg%	-1.1898*	6.460E-03	.000
	Curcumin Ext 2 mg%	.8859*	6.460E-03	.000
	Curcumin Ext 8 mg%	-.5252*	6.460E-03	.000
	Tartrazine 2 mg%	.7468*	6.541E-03	.000
	Tartrazine 4 mg%	.1408*	6.460E-03	.000
	Tartrazine 8 mg%	-.4922*	6.460E-03	.000
	Sunset Yellow 2 mg%	.4033*	6.724E-03	.000
	Sunset Yellow 4 mg%	-6.6508E-02*	6.460E-03	.000
	Sunset Yellow 8 mg%	-.5697*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	.6774*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	.2199*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	.8287*	7.077E-03	.000
	Curcumin 16 mg%	-1.2843*	6.460E-03	.000
	Curcumin Ext 16 mg%	-.9517*	6.460E-03	.000
	Tartrazine 16 mg%	-.8576*	6.460E-03	.000
	Sunset Yellow 16 mg%	-1.0371*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	.6825*	7.077E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Curcumin Ext 8 mg%	Control	1.1613*	7.576E-03	.000
	Curcumin 2 mg%	-.2298*	6.460E-03	.000
	Curcumin 4 mg%	-.5316*	6.460E-03	.000
	Curcumin 8 mg%	-.6646*	6.460E-03	.000
	Curcumin Ext 2 mg%	1.4111*	6.460E-03	.000
	Curcumin Ext 4 mg%	.5252*	6.460E-03	.000
	Tartrazine 2 mg%	1.2720*	6.541E-03	.000
	Tartrazine 4 mg%	.6660*	6.460E-03	.000
	Tartrazine 8 mg%	3.302E-02	6.460E-03	.166
	Sunset Yellow 2 mg%	.9285*	6.724E-03	.000
	Sunset Yellow 4 mg%	.4587*	6.460E-03	.000
	Sunset Yellow 8 mg%	-4.4444E-02*	6.460E-03	.001
	Sod. Bisulfite 2 mg%	1.2027*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	.7452*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	1.3539*	7.077E-03	.000
	Curcumin 16 mg%	-.7590*	6.460E-03	.000
	Curcumin Ext 16 mg%	-.4265*	6.460E-03	.000
	Tartrazine 16 mg%	-.3324*	6.460E-03	.000
	Sunset Yellow 16 mg%	-.5119*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.2077*	7.077E-03	.000
Tartrazine 2 mg%	Control	-.1107*	7.644E-03	.000
	Curcumin 2 mg%	-1.5018*	6.541E-03	.000
	Curcumin 4 mg%	-1.8036*	6.541E-03	.000
	Curcumin 8 mg%	-1.9366*	6.541E-03	.000
	Curcumin Ext 2 mg%	.1391*	6.541E-03	.000
	Curcumin Ext 4 mg%	-.7468*	6.541E-03	.000
	Curcumin Ext 8 mg%	-1.2720*	6.541E-03	.000
	Tartrazine 4 mg%	-.6060*	6.541E-03	.000
	Tartrazine 8 mg%	-1.2390*	6.541E-03	.000
	Sunset Yellow 2 mg%	-.3435*	6.801E-03	.000
	Sunset Yellow 4 mg%	-.8133*	6.541E-03	.000
	Sunset Yellow 8 mg%	-1.3164*	6.541E-03	.000
	Sod. Bisulfite 2 mg%	-6.9333E-02*	7.644E-03	.000
	Sod. Bisulfite 4 mg%	-.5268*	8.108E-03	.000
	Sod. Bisulfite 8 mg%	8.194E-02*	7.150E-03	.000
	Curcumin 16 mg%	-2.0310*	6.541E-03	.000
	Curcumin Ext 16 mg%	-1.6985*	6.541E-03	.000
	Tartrazine 16 mg%	-1.6044*	6.541E-03	.000
	Sunset Yellow 16 mg%	-1.7839*	6.541E-03	.000
	Sod. Bisulfite 16 mg%	-6.4278E-02*	7.150E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Tartrazine 4 mg%	Control	.4952*	7.576E-03	.000
	Curcumin 2 mg%	-.8959*	6.460E-03	.000
	Curcumin 4 mg%	-1.1976*	6.460E-03	.000
	Curcumin 8 mg%	-1.3306*	6.460E-03	.000
	Curcumin Ext 2 mg%	.7451*	6.460E-03	.000
	Curcumin Ext 4 mg%	-.1408*	6.460E-03	.000
	Curcumin Ext 8 mg%	-.6660*	6.460E-03	.000
	Tartrazine 2 mg%	.6060*	6.541E-03	.000
	Tartrazine 8 mg%	-.6330*	6.460E-03	.000
	Sunset Yellow 2 mg%	.2625*	6.724E-03	.000
	Sunset Yellow 4 mg%	-.2073*	6.460E-03	.000
	Sunset Yellow 8 mg%	-.7105*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	.5366*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	7.913E-02*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	.6879*	7.077E-03	.000
	Curcumin 16 mg%	-1.4251*	6.460E-03	.000
	Curcumin Ext 16 mg%	-1.0925*	6.460E-03	.000
	Tartrazine 16 mg%	-.9984*	6.460E-03	.000
	Sunset Yellow 16 mg%	-1.1779*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	.5417*	7.077E-03	.000
Tartrazine 8 mg%	Control	1.1283*	7.576E-03	.000
	Curcumin 2 mg%	-.2629*	6.460E-03	.000
	Curcumin 4 mg%	-.5646*	6.460E-03	.000
	Curcumin 8 mg%	-.6976*	6.460E-03	.000
	Curcumin Ext 2 mg%	1.3781*	6.460E-03	.000
	Curcumin Ext 4 mg%	.4922*	6.460E-03	.000
	Curcumin Ext 8 mg%	-3.3016E-02	6.460E-03	.166
	Tartrazine 2 mg%	1.2390*	6.541E-03	.000
	Tartrazine 4 mg%	.6330*	6.460E-03	.000
	Sunset Yellow 2 mg%	.8955*	6.724E-03	.000
	Sunset Yellow 4 mg%	.4257*	6.460E-03	.000
	Sunset Yellow 8 mg%	-7.7460E-02*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.1696*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	.7121*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	1.3209*	7.077E-03	.000
	Curcumin 16 mg%	-.7921*	6.460E-03	.000
	Curcumin Ext 16 mg%	-.4595*	6.460E-03	.000
	Tartrazine 16 mg%	-.3654*	6.460E-03	.000
	Sunset Yellow 16 mg%	-.5449*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.1747*	7.077E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Sunset Yellow 2 mg%	Control	.2328*	7.802E-03	.000
	Curcumin 2 mg%	-1.1583*	6.724E-03	.000
	Curcumin 4 mg%	-1.4601*	6.724E-03	.000
	Curcumin 8 mg%	-1.5931*	6.724E-03	.000
	Curcumin Ext 2 mg%	.4826*	6.724E-03	.000
	Curcumin Ext 4 mg%	-.4033*	6.724E-03	.000
	Curcumin Ext 8 mg%	-.9285*	6.724E-03	.000
	Tartrazine 2 mg%	.3435*	6.801E-03	.000
	Tartrazine 4 mg%	-.2625*	6.724E-03	.000
	Tartrazine 8 mg%	-.8955*	6.724E-03	.000
	Sunset Yellow 4 mg%	-.4698*	6.724E-03	.000
	Sunset Yellow 8 mg%	-.9729*	6.724E-03	.000
	Sod. Bisulfite 2 mg%	.2742*	7.802E-03	.000
	Sod. Bisulfite 4 mg%	-.1833*	8.257E-03	.000
	Sod. Bisulfite 8 mg%	.4254*	7.319E-03	.000
	Curcumin 16 mg%	-1.6875*	6.724E-03	.000
	Curcumin Ext 16 mg%	-1.3550*	6.724E-03	.000
	Tartrazine 16 mg%	-1.2609*	6.724E-03	.000
	Sunset Yellow 16 mg%	-1.4404*	6.724E-03	.000
	Sod. Bisulfite 16 mg%	.2792*	7.319E-03	.000
Sunset Yellow 4 mg%	Control	.7025*	7.576E-03	.000
	Curcumin 2 mg%	-.6886*	6.460E-03	.000
	Curcumin 4 mg%	-.9903*	6.460E-03	.000
	Curcumin 8 mg%	-1.1233*	6.460E-03	.000
	Curcumin Ext 2 mg%	.9524*	6.460E-03	.000
	Curcumin Ext 4 mg%	6.651E-02*	6.460E-03	.000
	Curcumin Ext 8 mg%	-.4587*	6.460E-03	.000
	Tartrazine 2 mg%	.8133*	6.541E-03	.000
	Tartrazine 4 mg%	.2073*	6.460E-03	.000
	Tartrazine 8 mg%	-.4257*	6.460E-03	.000
	Sunset Yellow 2 mg%	.4698*	6.724E-03	.000
	Sunset Yellow 8 mg%	-.5032*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	.7439*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	.2864*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	.8952*	7.077E-03	.000
	Curcumin 16 mg%	-1.2178*	6.460E-03	.000
	Curcumin Ext 16 mg%	-.8852*	6.460E-03	.000
	Tartrazine 16 mg%	-.7911*	6.460E-03	.000
	Sunset Yellow 16 mg%	-.9706*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	.7490*	7.077E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Sunset Yellow 8 mg%	Control	1.2057*	7.576E-03	.000
	Curcumin 2 mg%	-.1854*	6.460E-03	.000
	Curcumin 4 mg%	-.4871*	6.460E-03	.000
	Curcumin 8 mg%	-.6202*	6.460E-03	.000
	Curcumin Ext 2 mg%	1.4556*	6.460E-03	.000
	Curcumin Ext 4 mg%	.5697*	6.460E-03	.000
	Curcumin Ext 8 mg%	4.444E-02*	6.460E-03	.001
	Tartrazine 2 mg%	1.3164*	6.541E-03	.000
	Tartrazine 4 mg%	.7105*	6.460E-03	.000
	Tartrazine 8 mg%	7.746E-02*	6.460E-03	.000
	Sunset Yellow 2 mg%	.9729*	6.724E-03	.000
	Sunset Yellow 4 mg%	.5032*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.2471*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	.7896*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	1.3984*	7.077E-03	.000
	Curcumin 16 mg%	-.7146*	6.460E-03	.000
	Curcumin Ext 16 mg%	-.3821*	6.460E-03	.000
	Tartrazine 16 mg%	-.2879*	6.460E-03	.000
	Sunset Yellow 16 mg%	-.4675*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.2522*	7.077E-03	.000
Sod. Bisulfite 2 mg%	Control	-4.1389E-02	8.546E-03	.271
	Curcumin 2 mg%	-1.4325*	7.576E-03	.000
	Curcumin 4 mg%	-1.7342*	7.576E-03	.000
	Curcumin 8 mg%	-1.8673*	7.576E-03	.000
	Curcumin Ext 2 mg%	.2085*	7.576E-03	.000
	Curcumin Ext 4 mg%	-.6774*	7.576E-03	.000
	Curcumin Ext 8 mg%	-1.2027*	7.576E-03	.000
	Tartrazine 2 mg%	6.933E-02*	7.644E-03	.000
	Tartrazine 4 mg%	-.5366*	7.576E-03	.000
	Tartrazine 8 mg%	-1.1696*	7.576E-03	.000
	Sunset Yellow 2 mg%	-.2742*	7.802E-03	.000
	Sunset Yellow 4 mg%	-.7439*	7.576E-03	.000
	Sunset Yellow 8 mg%	-1.2471*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	-.4575*	8.964E-03	.000
	Sod. Bisulfite 8 mg%	.1513*	8.108E-03	.000
	Curcumin 16 mg%	-1.9617*	7.576E-03	.000
	Curcumin Ext 16 mg%	-1.6292*	7.576E-03	.000
	Tartrazine 16 mg%	-1.5350*	7.576E-03	.000
	Sunset Yellow 16 mg%	-1.7146*	7.576E-03	.000
	Sod. Bisulfite 16 mg%	5.056E-03	8.108E-03	1.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Sod. Bisulfite 4 mg%	Control	.4161*	8.964E-03	.000
	Curcumin 2 mg%	-.9750*	8.043E-03	.000
	Curcumin 4 mg%	-1.2767*	8.043E-03	.000
	Curcumin 8 mg%	-1.4098*	8.043E-03	.000
	Curcumin Ext 2 mg%	.6660*	8.043E-03	.000
	Curcumin Ext 4 mg%	-.2199*	8.043E-03	.000
	Curcumin Ext 8 mg%	-.7452*	8.043E-03	.000
	Tartrazine 2 mg%	.5268*	8.108E-03	.000
	Tartrazine 4 mg%	-7.9127E-02*	8.043E-03	.000
	Tartrazine 8 mg%	-.7121*	8.043E-03	.000
	Sunset Yellow 2 mg%	.1833*	8.257E-03	.000
	Sunset Yellow 4 mg%	-.2864*	8.043E-03	.000
	Sunset Yellow 8 mg%	-.7896*	8.043E-03	.000
	Sod. Bisulfite 2 mg%	.4575*	8.964E-03	.000
	Sod. Bisulfite 8 mg%	.6088*	8.546E-03	.000
	Curcumin 16 mg%	-1.5042*	8.043E-03	.000
	Curcumin Ext 16 mg%	-1.1717*	8.043E-03	.000
	Tartrazine 16 mg%	-1.0775*	8.043E-03	.000
	Sunset Yellow 16 mg%	-1.2571*	8.043E-03	.000
	Sod. Bisulfite 16 mg%	.4626*	8.546E-03	.000
Sod. Bisulfite 8 mg%	Control	-.1927*	8.108E-03	.000
	Curcumin 2 mg%	-1.5838*	7.077E-03	.000
	Curcumin 4 mg%	-1.8855*	7.077E-03	.000
	Curcumin 8 mg%	-2.0185*	7.077E-03	.000
	Curcumin Ext 2 mg%	5.717E-02*	7.077E-03	.000
	Curcumin Ext 4 mg%	-.8287*	7.077E-03	.000
	Curcumin Ext 8 mg%	-1.3539*	7.077E-03	.000
	Tartrazine 2 mg%	-8.1944E-02*	7.150E-03	.000
	Tartrazine 4 mg%	-.6879*	7.077E-03	.000
	Tartrazine 8 mg%	-1.3209*	7.077E-03	.000
	Sunset Yellow 2 mg%	-.4254*	7.319E-03	.000
	Sunset Yellow 4 mg%	-.8952*	7.077E-03	.000
	Sunset Yellow 8 mg%	-1.3984*	7.077E-03	.000
	Sod. Bisulfite 2 mg%	-.1513*	8.108E-03	.000
	Sod. Bisulfite 4 mg%	-.6088*	8.546E-03	.000
	Curcumin 16 mg%	-2.1130*	7.077E-03	.000
	Curcumin Ext 16 mg%	-1.7804*	7.077E-03	.000
	Tartrazine 16 mg%	-1.6863*	7.077E-03	.000
	Sunset Yellow 16 mg%	-1.8658*	7.077E-03	.000
	Sod. Bisulfite 16 mg%	-.1462*	7.644E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Curcumin 16 mg%	Control	1.9203*	7.576E-03	.000
	Curcumin 2 mg%	.5292*	6.460E-03	.000
	Curcumin 4 mg%	.2275*	6.460E-03	.000
	Curcumin 8 mg%	9.444E-02*	6.460E-03	.000
	Curcumin Ext 2 mg%	2.1702*	6.460E-03	.000
	Curcumin Ext 4 mg%	1.2843*	6.460E-03	.000
	Curcumin Ext 8 mg%	.7590*	6.460E-03	.000
	Tartrazine 2 mg%	2.0310*	6.541E-03	.000
	Tartrazine 4 mg%	1.4251*	6.460E-03	.000
	Tartrazine 8 mg%	.7921*	6.460E-03	.000
	Sunset Yellow 2 mg%	1.6875*	6.724E-03	.000
	Sunset Yellow 4 mg%	1.2178*	6.460E-03	.000
	Sunset Yellow 8 mg%	.7146*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.9617*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	1.5042*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	2.1130*	7.077E-03	.000
	Curcumin Ext 16 mg%	.3325*	6.460E-03	.000
	Tartrazine 16 mg%	.4267*	6.460E-03	.000
	Sunset Yellow 16 mg%	.2471*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.9668*	7.077E-03	.000
Curcumin Ext 16 mg%	Control	1.5878*	7.576E-03	.000
	Curcumin 2 mg%	.1967*	6.460E-03	.000
	Curcumin 4 mg%	-.1051*	6.460E-03	.000
	Curcumin 8 mg%	-.2381*	6.460E-03	.000
	Curcumin Ext 2 mg%	1.8376*	6.460E-03	.000
	Curcumin Ext 4 mg%	.9517*	6.460E-03	.000
	Curcumin Ext 8 mg%	.4265*	6.460E-03	.000
	Tartrazine 2 mg%	1.6985*	6.541E-03	.000
	Tartrazine 4 mg%	1.0925*	6.460E-03	.000
	Tartrazine 8 mg%	.4595*	6.460E-03	.000
	Sunset Yellow 2 mg%	1.3550*	6.724E-03	.000
	Sunset Yellow 4 mg%	.8852*	6.460E-03	.000
	Sunset Yellow 8 mg%	.3821*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.6292*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	1.1717*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	1.7804*	7.077E-03	.000
	Curcumin 16 mg%	-.3325*	6.460E-03	.000
	Tartrazine 16 mg%	9.413E-02*	6.460E-03	.000
	Sunset Yellow 16 mg%	-8.5397E-02*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.6342*	7.077E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Tartrazine 16 mg%	Control	1.4937*	7.576E-03	.000
	Curcumin 2 mg%	.1025*	6.460E-03	.000
	Curcumin 4 mg%	-.1992*	6.460E-03	.000
	Curcumin 8 mg%	-.3322*	6.460E-03	.000
	Curcumin Ext 2 mg%	1.7435*	6.460E-03	.000
	Curcumin Ext 4 mg%	.8576*	6.460E-03	.000
	Curcumin Ext 8 mg%	.3324*	6.460E-03	.000
	Tartrazine 2 mg%	1.6044*	6.541E-03	.000
	Tartrazine 4 mg%	.9984*	6.460E-03	.000
	Tartrazine 8 mg%	.3654*	6.460E-03	.000
	Sunset Yellow 2 mg%	1.2609*	6.724E-03	.000
	Sunset Yellow 4 mg%	.7911*	6.460E-03	.000
	Sunset Yellow 8 mg%	.2879*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.5350*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	1.0775*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	1.6863*	7.077E-03	.000
	Curcumin 16 mg%	-.4267*	6.460E-03	.000
	Curcumin Ext 16 mg%	-9.4127E-02*	6.460E-03	.000
	Sunset Yellow 16 mg%	-.1795*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.5401*	7.077E-03	.000
Sunset Yellow 16 mg%	Control	1.6732*	7.576E-03	.000
	Curcumin 2 mg%	.2821*	6.460E-03	.000
	Curcumin 4 mg%	-1.9683E-02	6.460E-03	.979
	Curcumin 8 mg%	-.1527*	6.460E-03	.000
	Curcumin Ext 2 mg%	1.9230*	6.460E-03	.000
	Curcumin Ext 4 mg%	1.0371*	6.460E-03	.000
	Curcumin Ext 8 mg%	.5119*	6.460E-03	.000
	Tartrazine 2 mg%	1.7839*	6.541E-03	.000
	Tartrazine 4 mg%	1.1779*	6.460E-03	.000
	Tartrazine 8 mg%	.5449*	6.460E-03	.000
	Sunset Yellow 2 mg%	1.4404*	6.724E-03	.000
	Sunset Yellow 4 mg%	.9706*	6.460E-03	.000
	Sunset Yellow 8 mg%	.4675*	6.460E-03	.000
	Sod. Bisulfite 2 mg%	1.7146*	7.576E-03	.000
	Sod. Bisulfite 4 mg%	1.2571*	8.043E-03	.000
	Sod. Bisulfite 8 mg%	1.8658*	7.077E-03	.000
	Curcumin 16 mg%	-.2471*	6.460E-03	.000
	Curcumin Ext 16 mg%	8.540E-02*	6.460E-03	.000
	Tartrazine 16 mg%	.1795*	6.460E-03	.000
	Sod. Bisulfite 16 mg%	1.7196*	7.077E-03	.000

Based on observed means.

Multiple Comparisons

Dependent Variable: ln C
Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Sod. Bisulfite 16 mg%	Control	-4.6444E-02*	8.108E-03	.038
	Curcumin 2 mg%	-1.4376*	7.077E-03	.000
	Curcumin 4 mg%	-1.7393*	7.077E-03	.000
	Curcumin 8 mg%	-1.8723*	7.077E-03	.000
	Curcumin Ext 2 mg%	.2034*	7.077E-03	.000
	Curcumin Ext 4 mg%	-.6825*	7.077E-03	.000
	Curcumin Ext 8 mg%	-1.2077*	7.077E-03	.000
	Tartrazine 2 mg%	6.428E-02*	7.150E-03	.000
	Tartrazine 4 mg%	-.5417*	7.077E-03	.000
	Tartrazine 8 mg%	-1.1747*	7.077E-03	.000
	Sunset Yellow 2 mg%	-.2792*	7.319E-03	.000
	Sunset Yellow 4 mg%	-.7490*	7.077E-03	.000
	Sunset Yellow 8 mg%	-1.2522*	7.077E-03	.000
	Sod. Bisulfite 2 mg%	-5.0556E-03	8.108E-03	1.000
	Sod. Bisulfite 4 mg%	-.4626*	8.546E-03	.000
	Sod. Bisulfite 8 mg%	.1462*	7.644E-03	.000
	Curcumin 16 mg%	-1.9668*	7.077E-03	.000
	Curcumin Ext 16 mg%	-1.6342*	7.077E-03	.000
	Tartrazine 16 mg%	-1.5401*	7.077E-03	.000
	Sunset Yellow 16 mg%	-1.7196*	7.077E-03	.000

Based on observed means.

*. The mean difference is significant at the .05 level.

Table E9 Kruskal-Wallis test for critical relative humidity of nifedipine microspheres

		N	Mean rank
550		1	13.00
552		1	15.00
555		1	14.00
558		1	8.00
5510		1	12.00
650		1	9.00
652		1	6.00
655		1	11.00
658		1	10.00
6510		1	3.00
750		1	5.00
752		1	7.00
755		1	1.00
758		1	4.00
7510		1	2.00
Kruskal-Wallis test	Chi-square	= 14.00	
	Critical Chi-square	= 23.685	
	df	= 14	
	p-value	= 0.450	

Table E10 Friedman test for nifedipine content with exposure to relative humidity

	N	Mean	SD	Mean rank
Control	15	100.0033	1.047E-02	1.70
Experimental	15	99.9960	1.121E-02	1.30
Friedman test	Chi-square = 3.600		p-value = 0.058	
	Critical Chi-square = 3.841		df = 1	

Table E11 Two-way analysis of variance for degradation rate constant (k) of nifedipine microspheres exposed to ambient atmosphere

Source	df	SS	MS	F cal	F critical value	p-value
Between group	3	24.089	8.030	212824.8	8.53	0.000
Between time	25	5.143	0.206	5452.743	1.71	0.000
group-time interaction	62	15.405	0.248	6585.803	1.39	0.000
Error	182	6.8675E-03	3.773E-05			
Total	273	5518.174				

Multiple Comparisons

Dependent Variable: ln C

Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Without, control	Without, exposed	.9115*	1.205E-03	.000	.9081	.9149
	Curcumin, control	.0000	9.836E-04	1.000	-2.78E-03	2.775E-03
	Curcumin, exposed	1.231E-02*	9.836E-04	.000	9.532E-03	1.508E-02
Without, exposed	Without, control	-.9115*	1.205E-03	.000	-.9149	-.9081
	Curcumin, control	-.9115*	1.205E-03	.000	-.9149	-.9081
	Curcumin, exposed	-.8992*	1.205E-03	.000	-.9026	-.8958
Curcumin, control	Without, control	.0000	9.836E-04	1.000	-2.78E-03	2.775E-03
	Without, exposed	.9115*	1.205E-03	.000	.9081	.9149
	Curcumin, exposed	1.231E-02*	9.836E-04	.000	9.532E-03	1.508E-02
Curcumin, exposed	Without, control	-1.231E-02*	9.836E-04	.000	-1.51E-02	-9.53E-03
	Without, exposed	.8992*	1.205E-03	.000	.8958	.9026
	Curcumin, control	-1.231E-02*	9.836E-04	.000	-1.51E-02	-9.53E-03

Based on observed means.

* The mean difference is significant at the .05 level.

Table E12 Two-way analysis of variance for dissolution rate constant (k_H) of nifedipine microsphere.

Source	df	SS	MS	F cal	F critical value	p-value
Between group	1	3.842E-04	3.842 E-04	0.688	5.32	0.431
Between time	1	2.643 E-03	2.643 E-03	4.735	5.32	0.061
group-time interaction	1	2.305 E-03	2.305 E-03	4.128	5.32	0.077
Error	8	4.466 E-03	5.582 E-04			
Total	12	44.316				

VITA

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