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**APPENDIX A**  
Experimental Data

## Experiment 1

### Effects of Processing on Antioxidants in Dietary Fiber Powder from Cabbage Outer Leaves

**Table A.1** Proximate compositions of cabbage outer leaves

Sample	Composition (g/100 dry mass)				
	Replication	Protein	Lipid	Ash	Carbohydrates
Fresh	1	18.87	1.10	9.66	31.34
	2	17.98	0.94	8.39	29.94
	Avg.	18.43	1.02	9.02	30.64
	SD	0.63	0.11	0.90	0.99
Slicing/water blanching	1	22.43	1.63	5.97	32.09
	2	21.69	1.45	5.15	33.15
	Avg.	22.06	1.54	5.56	32.62
	SD	0.52	0.13	0.58	0.75
Slicing/steam blanching	1	18.89	1.08	8.53	33.97
	2	19.43	1.45	7.97	32.25
	Avg.	19.16	1.27	8.25	33.11
	SD	0.38	0.26	0.39	1.21
Water blanching/slicing	1	20.67	1.62	6.80	32.91
	2	21.37	1.22	5.78	31.75
	Avg.	21.02	1.42	6.29	32.33
	SD	0.49	0.28	0.72	0.82
Steam blanching/slicing	1	18.17	1.51	7.59	34.88
	2	19.11	0.84	8.27	33.98
	Avg.	18.43	1.18	7.93	34.43
	SD	0.63	0.47	0.48	0.64



**Table A.2** Dietary fiber content of cabbage outer leaves

Sample	Composition (g/100 dry mass)			
	Replication	IDF	SDF	TDF
Fresh	1	34.56	8.19	42.75
	2	32.52	6.51	39.03
	Avg.	33.54	7.35	40.89
	SD	1.44	0.81	2.63
Slicing/water blanching	1	31.92	6.96	38.88
	2	30.7	8.86	39.56
	Avg.	31.31	7.91	39.22
	SD	1.44	1.34	0.48
Slicing/steam blanching	1	31.35	7.18	38.53
	2	32.79	7.11	39.90
	Avg.	32.07	7.14	39.22
	SD	1.02	0.58	1.13
Water blanching/slicing	1	32.11	9.14	41.25
	2	31.17	7.46	38.63
	Avg.	31.64	8.30	39.94
	SD	0.67	1.87	1.86
Steam blanching/slicing	1	33.78	7.85	41.65
	2	32.04	6.75	38.79
	Avg.	32.91	7.31	40.22
	SD	1.23	0.67	2.02

**Table A.3** Antioxidants in fresh cabbage outer leaves

Antioxidants	Rep. 1	Rep.2	Rep.3	Avg.	SD
Total phenolics (mg GAE/100 g dry weight)	701.50	764.77	751.45	739.24	37.25
Vitamin C (mg/100 g dry weight)	659.60	641.70	617.33	639.55	21.21
$\beta$ -carotene (mg/100 g dry weight)	9.37	9.59	9.35	9.44	0.13
$\alpha$ -tocopherol (mg/100 g dry weight)	5.44	5.53	5.36	5.45	0.09
Glucosinolates ( $\mu$ mol/100 g dry weight)	1648.09	1590.94	1510.62	1583.22	69.06

**Table A.4** Effect of preparation on retention of TPC

Sample	Rep. 1	Rep.2	Rep.3	Avg.	SD
Fresh	701.50	764.77	751.45	739.24	37.25
Slicing/water blanching	477.88	516.25	497.06	496.92	22.66
Slicing/steam blanching	618.36	691.57	647.36	652.43	38.55
Water blanching/slicing	458.70	511.45	545.02	505.06	43.51
Steam blanching/slicing	708.20	713.13	737.78	719.70	15.84

**Table A.5** Effect of preparation on retention of vitamin C

Sample	Rep. 1	Rep.2	Rep.3	Avg.	SD
Fresh	659.6	641.70	617.33	639.55	21.21
Slicing/water blanching	418.55	432.34	447.70	432.89	14.58
Slicing/steam blanching	565.04	550.83	579.48	565.12	17.80
Water blanching/slicing	520.49	493.33	521.72	511.84	17.80
Steam blanching/slicing	649.66	615.50	620.80	628.66	13.64

**Table A.6** Effect of preparation on retention of  $\beta$ -carotene

Sample	Rep. 1	Rep.2	Rep.3	Avg.	SD
Fresh	9.37	9.59	9.35	9.44	0.13
Slicing/water blanching	9.54	9.35	9.10	9.33	0.39
Slicing/steam blanching	9.35	9.94	9.09	9.46	0.48
Water blanching/slicing	9.84	9.52	9.72	9.70	0.16
Steam blanching/slicing	10.02	9.88	9.22	9.71	0.43



**Table A.7** Effect of preparation on retention of  $\alpha$ -tocopherol

Sample	Rep. 1	Rep.2	Rep.3	Avg.	SD
Fresh	5.44	5.53	5.36	5.45	0.09
Slicing/water blanching	5.39	5.58	5.24	5.41	0.17
Slicing/steam blanching	5.16	5.45	5.48	5.36	0.17
Water blanching/slicing	5.43	5.46	5.26	5.39	0.11
Steam blanching/slicing	5.31	5.40	5.35	5.36	0.05

**Table A.8** Effect of preparation on total antioxidant activity using DPPH radical scavenging activity assay

Sample	Rep. 1	Rep.2	Rep.3	Avg.	SD
Fresh	81.49	84.52	82.82	82.94	1.52
Slicing/water blanching	76.64	76.02	76.92	76.52	0.46
Slicing/steam blanching	79.36	79.68	78.11	79.05	0.83
Water blanching/slicing	76.61	77.89	75.53	76.68	1.18
Steam blanching/slicing	79.66	82.15	80.65	80.82	1.25

**Table A.9** Effect of preparation on total antioxidant activity using  $\beta$ -carotene bleaching assay

Sample	Rep. 1	Rep.2	Rep.3	Avg.	SD
Fresh	81.36	79.11	77.13	79.20	2.12
Slicing/water blanching	76.50	74.25	73.82	74.86	1.44
Slicing/steam blanching	77.43	77.43	77.57	78.62	0.65
Water blanching/slicing	76.32	74.75	75.19	75.42	0.81
Steam blanching/slicing	78.58	77.74	78.80	78.38	0.56

**Table A.10** Moisture content (g/g dry weight) of steam blanched cabbages undergoing hot air drying at 60 °C

Time (min)	Rep. 1	Rep.2	Avg.	SD
0	11.536	10.336	10.936	0.848
15	10.105	10.098	10.102	0.005
30	8.489	8.391	8.440	0.069
45	6.123	6.091	6.107	0.022
60	4.728	4.626	4.677	0.071
75	3.104	3.084	3.094	0.014
90	2.234	2.201	2.217	0.023
105	1.471	1.421	1.446	0.035

**Table A.10** Moisture content (g/g dry weight) of steam blanched cabbages undergoing hot air drying at 60 °C (continued)

Time (min)	Rep. 1	Rep.2	Avg.	SD
120	0.682	0.633	0.657	0.034
135	0.114	0.071	0.099	0.040
150	0.127	0.069	0.091	0.031
165	0.115	0.077	0.096	0.026
180	0.120	0.079	0.099	0.028
210	0.104	0.070	0.087	0.023
240	0.093	0.067	0.080	0.018
270	0.099	0.076	0.087	0.016
300	0.101	0.074	0.087	0.018
360	0.103	0.078	0.090	0.017
420	0.093	0.070	0.081	0.016
480	0.085	0.079	0.082	0.004
540	0.080	0.075	0.077	0.003
600	0.081	0.064	0.073	0.011

**Table A.11** Moisture content (g/g dry weight) of steam blanched cabbages undergoing hot air drying at 70 °C

Time (min)	Rep. 1	Rep.2	Avg.	SD
0	11.015	10.215	10.61575	0.565685
15	9.267	9.247	9.257311	0.014258
30	6.859	6.806	6.832985	0.037921
45	4.256	4.204	4.230563	0.036352
60	2.865	2.768	2.816871	0.06851
75	1.845	1.797	1.82125	0.033856
90	0.895	0.884	0.890019	0.007633
105	0.238	0.237	0.238184	0.000385
120	0.156	0.123	0.140361	0.023278
135	0.155	0.060	0.108195	0.067247
150	0.118	0.053	0.086004	0.045319
165	0.132	0.047	0.089774	0.059771
180	0.123	0.041	0.082541	0.058608
210	0.116	0.062	0.089341	0.037873
240	0.102	0.050	0.076433	0.036245
270	0.108	0.061	0.085069	0.033503
300	0.091	0.046	0.069138	0.031442
360	0.108	0.047	0.07807	0.043279
420	0.085	0.072	0.079037	0.009766
480	0.092	0.063	0.077899	0.02077
540	0.086	0.065	0.075691	0.014973
600	0.111	0.040	0.076096	0.049901

**Table A.12** Moisture content (g/g dry weight) of steam blanched cabbages undergoing hot air drying at 80 °C

Time (min)	Rep. 1	Rep.2	Avg.	SD
0	10.936	9.856	10.615	10.396
15	8.364	8.239	9.257	8.301
30	4.775	4.701	6.832	4.738
45	1.604	1.506	4.230	1.555
60	0.399	0.284	2.816	0.342
75	0.269	0.152	1.821	0.211
90	0.109	0.095	0.890	0.102
105	0.086	0.083	0.238	0.084
120	0.089	0.063	0.140	0.076
135	0.066	0.048	0.108	0.057
150	0.073	0.035	0.086	0.054
165	0.069	0.046	0.089	0.058
180	0.065	0.038	0.082	0.052
210	0.067	0.036	0.089	0.051
240	0.061	0.036	0.076	0.048
270	0.051	0.042	0.085	0.047
300	0.049	0.041	0.069	0.045
360	0.055	0.041	0.078	0.048
420	0.049	0.044	0.079	0.046
480	0.047	0.047	0.077	0.047
540	0.051	0.047	0.075	0.049
600	0.053	0.039	0.076	0.046

**Table A.13** Moisture content (g/g dry weight) of steam blanched cabbages undergoing vacuum drying at 60 °C

Time (min)	Rep. 1	Rep.2	Avg.	SD
0	12.627	5.969	9.298	4.707
15	6.500	3.217	4.858	2.321
30	3.881	1.989	2.935	1.337
45	2.720	1.498	2.109	0.864
60	1.515	0.827	1.171	0.486
75	0.957	0.500	0.729	0.323
90	0.431	0.263	0.347	0.119
105	0.208	0.232	0.220	0.017
120	0.171	0.193	0.182	0.015
135	0.146	0.151	0.149	0.003
150	0.096	0.097	0.096	0.001
165	0.084	0.087	0.086	0.001
180	0.072	0.074	0.073	0.001
195	0.064	0.074	0.069	0.006
210	0.064	0.066	0.065	0.001
225	0.064	0.066	0.065	0.001
240	0.064	0.066	0.065	0.001

**Table A.14** Moisture content (g/g dry weight) of steam blanched cabbages undergoing vacuum drying at 70 °C

Time (min)	Rep. 1	Rep.2	Avg.	SD
0	12.052	14.286	13.169	1.580
15	5.924	6.707	6.316	0.553
30	2.442	2.268	2.355	0.122
45	1.260	1.403	1.331	0.101
60	0.583	0.741	0.662	0.111
75	0.417	0.515	0.466	0.069
90	0.280	0.346	0.313	0.046
105	0.203	0.236	0.220	0.023
120	0.104	0.128	0.116	0.016
135	0.086	0.084	0.085	0.001
150	0.078	0.076	0.077	0.001
165	0.066	0.066	0.066	0.001
180	0.062	0.060	0.061	0.001
195	0.062	0.061	0.062	0.001
210	0.062	0.061	0.062	0.001
225	0.062	0.061	0.062	0.001
240	0.062	0.061	0.062	0.001

**Table A.15** Moisture content (g/g dry weight) of steam blanched cabbages undergoing vacuum drying at 80 °C

Time (min)	Rep. 1	Rep.2	Avg.	SD
0	10.479	12.855	11.667	1.679
15	4.534	5.122	4.828	0.415
30	1.958	1.855	1.906	0.073
45	0.864	0.694	0.779	0.120
60	0.582	0.457	0.520	0.088
75	0.264	0.401	0.333	0.097
90	0.224	0.216	0.220	0.005
105	0.173	0.116	0.144	0.040
120	0.097	0.092	0.094	0.003
135	0.058	0.064	0.061	0.004
150	0.053	0.056	0.054	0.002
165	0.047	0.0506	0.049	0.002
180	0.047	0.0506	0.049	0.002
195	0.047	0.0506	0.049	0.002
210	0.047	0.0506	0.049	0.002
225	0.047	0.0506	0.049	0.002
240	0.047	0.0506	0.049	0.002

**Table A.16** Total phenolic content during hot air drying at 60 °C

Time	Total phenolic content (mg GAE/100 g dry weight)			
	Rep.1	Rep.2	Avg.	SD
0	720.71	650.33	685.52	35.61
15	698.08	648.60	673.34	34.98
30	658.70	612.01	635.35	33.01
45	630.86	586.15	608.50	31.61
60	614.07	570.55	592.31	30.77
90	535.54	497.58	516.56	26.84
120	489.03	454.37	471.70	24.50
150	443.90	412.44	428.17	22.24
180	424.81	394.708	409.76	21.29
240	402.39	373.873	388.13	20.16

**Table A.17** Total phenolic content during hot air drying at 70 °C

Time	Total phenolic content (mg GAE/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	652.58	704.27	678.42	43.62
15	611.89	670.63	641.26	41.53
30	582.70	638.65	610.67	39.55
45	557.53	611.06	584.30	37.84
60	529.51	580.34	554.92	35.94
90	464.92	509.56	487.24	31.56
120	429.30	470.52	449.91	29.14
150	394.92	432.84	413.88	26.80
180	364.81	399.84	382.33	24.76
240	331.69	363.53	347.61	22.51

**Table A.18** Total phenolic content during hot air drying at 80 °C

Time	Total phenolic content (mg GAE/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	714.85	677.09	695.97	40.84
15	683.13	628.69	655.91	38.49
30	639.84	588.85	614.34	36.05
45	618.36	569.08	593.72	34.84
60	569.42	524.04	546.73	32.08
90	499.76	459.94	479.85	28.16
120	468.64	431.30	449.97	26.40
150	416.88	383.66	400.27	23.49
180	376.77	346.75	361.76	21.23
240	328.07	301.93	315.01	18.48

**Table A.19** Vitamin C content during hot air drying at 60 °C

Time	Vitamin C (mg/100 g dry weight)			
	Rep.1	Rep.2	Avg.	SD
0	638.50	660.16	649.33	29.46
15	625.88	667.37	646.63	29.33
30	582.09	620.68	601.39	27.28
45	549.22	585.63	567.43	25.74
60	518.70	553.09	535.90	24.31
90	437.57	466.57	452.07	20.51
120	401.99	428.64	415.31	18.84
150	360.73	384.64	372.68	16.90
180	345.47	368.37	356.92	16.19
240	331.69	353.68	342.68	15.54

**Table A.20** Vitamin C content during hot air drying at 70 °C

Time	Vitamin C (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	703.92	635.60	669.76	62.45
15	675.63	592.04	633.84	59.10
30	623.93	546.74	585.34	54.57
45	584.61	512.29	548.45	51.13
60	546.85	479.20	513.03	47.83
90	465.01	407.48	436.25	40.67
120	431.86	378.44	405.15	37.77
150	399.71	350.26	374.98	34.96
180	379.29	332.37	355.83	33.17
240	366.58	321.23	343.90	32.06

**Table A.21** Vitamin C content during hot air drying at 80 °C

Time	Vitamin C (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	737.10	688.07	712.59	20.52
15	638.50	613.01	625.75	18.02
30	584.90	561.55	573.22	16.51
45	543.63	521.93	532.78	15.34
60	502.79	482.72	492.75	14.19
90	431.60	414.37	422.98	12.18
120	405.91	389.70	397.81	11.45
150	388.79	373.27	381.03	10.97
180	365.26	350.68	357.97	10.31
240	355.57	341.38	348.48	10.03

**Table A.22**  $\beta$ -carotene content during hot air drying at 60 °C

Time	$\beta$ -carotene content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	9.82	8.45	9.13	1.11
15	9.56	8.04	8.80	1.07
30	9.04	7.61	8.33	1.01
45	8.47	7.13	7.80	0.95
60	7.83	6.59	7.21	0.87
90	6.77	5.70	6.23	0.76
120	6.18	5.20	5.69	0.69
150	5.38	4.52	4.95	0.60
180	5.14	4.33	4.73	0.57
240	4.89	4.12	4.50	0.54

**Table A.23**  $\beta$ -carotene content during hot air drying at 70 °C

Time	$\beta$ -carotene content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	9.65	8.63	9.14	0.57
15	9.01	8.24	8.63	0.54
30	8.53	7.80	8.16	0.51
45	7.99	7.31	7.65	0.48
60	7.38	6.75	7.07	0.44
90	6.39	5.84	6.11	0.38
120	5.73	5.24	5.48	0.34
150	4.96	4.54	4.75	0.29
180	4.66	4.26	4.46	0.28
240	4.43	4.05	4.24	0.267

**Table A.24**  $\beta$ -carotene content during hot air drying at 80 °C

Time	$\beta$ -carotene content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	8.83	9.27	9.05	0.45
15	8.08	8.67	8.38	0.41
30	7.65	8.21	7.93	0.39
45	7.17	7.69	7.43	0.37
60	6.62	7.11	6.86	0.34
90	5.73	6.15	5.94	0.29
120	5.05	5.42	5.23	0.26
150	4.37	4.69	4.53	0.22
180	4.18	4.48	4.33	0.21
240	3.97	4.27	4.12	0.20

**Table A.25**  $\alpha$ -tochopherol content during hot air drying at 60 °C

Time	$\alpha$ -tochopherol content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	5.82	5.76	5.79	0.18
15	5.12	4.90	5.01	0.15
30	4.68	4.47	4.57	0.14
45	4.32	4.14	4.23	0.13
60	4.03	3.85	3.94	0.12
90	3.55	3.39	3.47	0.10
120	3.20	3.06	3.13	0.09
150	2.91	2.79	2.85	0.08
180	2.63	2.52	2.57	0.08
240	2.22	2.12	2.17	0.06

**Table A.26**  $\alpha$ -tocopherol content during hot air drying at 70 °C

Time	$\alpha$ -tocopherol content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	5.31	4.94	5.13	0.40
15	4.58	4.10	4.34	0.34
30	4.18	3.74	3.96	0.31
45	3.87	3.46	3.66	0.28
60	3.60	3.22	3.41	0.27
90	3.12	2.79	2.95	0.23
120	2.81	2.51	2.66	0.21
150	2.55	2.28	2.41	0.19
180	2.30	2.05	2.17	0.17
240	1.93	1.72	1.82	0.14

**Table A.27**  $\alpha$ -tocopherol content during hot air drying at 80 °C

Time	$\alpha$ -tocopherol content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	5.67	5.13	5.40	0.24
15	4.72	4.43	4.58	0.20
30	4.03	3.78	3.91	0.17
45	3.42	3.21	3.31	0.14
60	2.90	2.73	2.81	0.12
90	2.21	2.08	2.15	0.09
120	1.86	1.75	1.81	0.08
150	1.78	1.67	1.72	0.076
180	1.56	1.46	1.51	0.06
240	1.33	1.25	1.29	0.057

**Table A.28** Total antioxidant activity using DPPH radical scavenging activity assay during hot air drying at 60 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	82.94	80.46	81.65	1.82
15	82.19	79.64	80.91	1.80
30	81.20	78.68	79.94	1.78
45	77.62	75.21	76.41	1.70
60	76.16	73.80	74.98	1.67
90	72.59	70.33	71.46	1.59
120	68.65	66.52	67.58	1.50
150	64.96	62.94	63.95	1.42
180	61.47	59.56	60.51	1.34
240	57.35	55.57	56.46	1.25

**Table A.29** Total antioxidant activity using DPPH radical scavenging activity assay during hot air drying at 70 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	79.15	81.97	80.56	2.14
15	77.56	80.53	79.04	2.10
30	76.62	79.55	78.09	2.07
45	73.24	76.05	74.65	1.98
60	71.87	74.62	73.24	1.94
90	67.16	69.74	68.45	1.81
120	63.52	65.95	64.743	1.72
150	60.10	62.41	61.25	1.62
180	56.33	58.49	57.41	1.52
240	53.06	55.09	54.08	1.43

**Table A.30** Total antioxidant activity using DPPH radical scavenging activity assay during hot air drying at 80 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	77.42	80.03	78.73	1.56
15	74.67	76.79	75.73	1.50
30	73.05	75.13	74.09	1.46
45	71.21	73.24	72.23	1.43
60	69.19	71.16	70.17	1.39
90	64.66	66.50	65.58	1.29
120	61.16	62.90	62.03	1.22
150	57.87	59.51	58.69	1.16
180	52.15	53.64	52.89	1.04
240	49.81863	51.23486	50.52	1.00

**Table A.31** Total antioxidant activity using  $\beta$ -carotene bleaching assay during hot air drying at 60 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	77.32	81.15	79.24	2.99
15	76.31	80.50	78.40	2.96
30	75.33	79.46	77.39	2.92
45	73.35	77.38	75.37	2.84
60	71.88	75.83	73.85	2.79
90	66.97	70.65	68.81	2.59
120	61.94	65.34	63.64	2.40
150	57.76	60.93	59.34	2.24
180	54.76	57.76	56.26	2.12
240	53.65	56.59	55.12	2.08

**Table A.32** Total antioxidant activity using  $\beta$ -carotene bleaching assay during hot air drying at 70 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	78.32	75.55	76.93	2.38
15	77.02	73.72	75.37	2.33
30	75.28	72.05	73.67	2.28
45	73.31	70.17	71.74	2.22
60	71.14	68.09	69.62	2.15
90	66.28	63.44	64.86	2.01
120	62.52	59.84	61.18	1.89
150	58.30	55.79	57.05	1.76
180	56.05	53.64	54.85	1.70
240	53.60	51.30	52.45	1.62

**Table A.33** Total antioxidant activity using  $\beta$ -carotene bleaching assay during hot air drying at 80 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	80.12	77.08	78.60	2.00
15	76.85	74.13	75.49	1.92
30	75.12	72.46	73.79	1.88
45	73.16	70.56	71.86	1.83
60	70.99	68.47	69.73	1.78
90	66.14	63.80	64.97	1.65
120	62.39	60.17	61.28	1.56
150	58.17	56.11	57.14	1.45
180	55.93	53.94	54.94	1.40
240	52.67	50.80	51.74	1.32

**Table A.34** Total phenolic content during vacuum drying at 60 °C

Time	Total phenolic content (mg GAE/100 g dry weight)			
	Rep.1	Rep.2	Avg.	SD
0	710.37	672.54	691.46	26.75
15	687.38	644.85	666.12	30.07
30	654.55	628.91	641.73	18.12
45	635.54	591.63	613.58	31.04
60	595.40	567.13	581.27	19.98
90	555.32	519.36	537.34	25.42
120	511.22	492.53	501.87	13.21
150	449.90	436.70	443.30	9.32
180	427.72	396.45	412.08	22.10
240	407.5178	369.76	388.64	26.69

**Table A.35** Total phenolic content during vacuum drying at 70 °C

Time	Total phenolic content (mg GAE/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	615.32	642.35	628.84	19.11
15	595.31	588.48	591.89	4.83
30	572.97	579.98	576.48	4.96
45	518.77	521.71	520.24	2.07
60	499.99	486.93	493.46	9.23
90	481.98	465.69	473.83	11.51
120	416.12	415.24	415.68	0.62
150	420.86	477.43	449.15	39.99
180	407.40	414.16	410.78	4.78
240	341.47	346.55	344.01	3.58

**Table A.36** Total phenolic content during vacuum drying at 80 °C

Time	Total phenolic content (mg GAE/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	625.03	584.59	604.81	28.60
15	551.42	523.66	537.54	19.62
30	542.56	494.22	518.39	34.18
45	493.20	451.32	472.26	29.61
60	433.65	412.60	423.13	14.88
90	393.92	381.33	387.63	8.90
120	381.83	346.63	364.23	24.89
150	328.64	329.58	329.11	0.66
180	290.82	308.18	299.50	12.27
240	262.40	223.47	242.93	27.53

**Table A.37** Vitamin C content during vacuum drying at 60 °C

Time	Vitamin C content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	615.32	642.35	628.84	19.11
15	595.31	588.48	591.89	4.83
30	572.97	579.98	576.48	4.96
45	518.77	521.71	520.24	2.07
60	499.99	486.93	493.46	9.23
90	481.98	465.69	473.83	11.51
120	416.12	415.24	415.68	0.62
150	377.61	367.12	372.37	7.42
180	358.55	360.41	359.48	1.31
240	311.84	347.04	329.44	24.89

**Table A.38** Vitamin C content during vacuum drying at 70 °C

Time	Vitamin C content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	642.13	650.15	646.14	5.67
15	607.30	576.93	592.11	21.47
30	579.22	570.37	574.80	6.25
45	521.60	515.01	518.30	4.66
60	499.07	476.94	488.01	15.64
90	460.09	424.25	442.17	25.34
120	436.69	407.53	422.11	20.62
150	398.55	369.48	384.02	20.55
180	341.33	336.39	338.86	3.49
240	266.07	305.11	285.59	27.60

**Table A.39** Vitamin C content during vacuum drying at 80 °C

Time	Vitamin C content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	625.03	584.59	604.81	28.60
15	551.42	523.66	537.54	19.62
30	542.56	494.22	518.39	34.18
45	493.20	451.32	472.26	29.61
60	433.65	412.60	423.13	14.88
90	393.92	381.33	387.63	8.90
120	381.83	346.63	364.23	24.89
150	328.64	329.58	329.11	0.66
180	290.82	308.18	299.50	12.27
240	262.40	223.47	242.93	27.53

**Table A.39**  $\beta$ -carotene content during vacuum drying at 60 °C

Time	$\beta$ -carotene content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	9.46	9.59	9.53	0.09
15	8.93	9.12	9.03	0.13
30	8.51	8.47	8.49	0.02
45	7.98	7.94	7.96	0.02
60	7.11	7.41	7.26	0.21
90	6.50	6.46	6.48	0.02
120	6.02	5.96	5.99	0.04
150	5.48	5.38	5.43	0.06
180	4.87	5.11	4.99	0.16
240	4.57	4.89	4.73	0.22

**Table A.40**  $\beta$ -carotene content during vacuum drying at 70 °C

Time	$\beta$ -carotene content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	9.70	9.45	9.58	0.17
15	8.96	8.58	8.77	0.27
30	8.42	8.04	8.23	0.26
45	7.86	7.55	7.70	0.21
60	7.32	6.99	7.15	0.23
90	6.52	6.19	6.36	0.23
120	5.61	5.66	5.64	0.04
150	5.32	5.29	5.30	0.01
180	4.70	4.94	4.82	0.16
240	4.29	4.41	4.35	0.08



**Table A.41**  $\beta$ -carotene content during vacuum drying at 80 °C

Time	$\beta$ -carotene content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	9.82	9.64	9.73	0.12
15	8.51	8.55	8.53	0.03
30	7.90	8.14	8.02	0.17
45	7.32	7.35	7.33	0.02
60	6.57	6.73	6.65	0.11
90	6.18	6.10	6.14	0.05
120	5.72	5.92	5.82	0.13
150	5.31	5.01	5.16	0.21
180	4.50	4.70	4.60	0.14
240	3.80	4.13	3.97	0.23

**Table A.42**  $\alpha$ -tochopherol content during vacuum drying at 60 °C

Time	$\alpha$ -tochopherol content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	5.658769	5.473608	5.566189	0.130929
15	5.158792	5.1035	5.131146	0.039098
30	4.824461	4.961155	4.892808	0.096657
45	4.647224	4.624903	4.636063	0.015783
60	4.378794	4.367307	4.373051	0.008122
90	4.146761	3.863987	4.005374	0.199951
120	3.69176	3.535338	3.613549	0.110607
150	3.208733	3.202367	3.20555	0.004501
180	3.145409	2.879955	3.012682	0.187704
240	2.572355	2.332376	2.452365	0.169691

**Table A.43**  $\alpha$ -tocopherol content during vacuum drying at 70 °C

Time	$\alpha$ -tocopherol content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	5.38	5.59	5.49	0.14
15	4.90	5.14	5.02	0.17
30	4.69	4.77	4.73	0.05
45	4.45	4.57	4.51	0.08
60	4.14	4.10	4.12	0.01
90	3.76	3.98	3.87	0.15
120	3.24	3.51	3.37	0.19
150	2.96	3.21	3.09	0.17
180	2.60	2.54	2.57	0.04
240	2.24	2.06	2.15	0.12

**Table A.44**  $\alpha$ -tocopherol content during vacuum drying at 80 °C

Time	$\alpha$ -tocopherol content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	5.45	5.60	5.53	0.10
15	4.87	4.86	4.86	0.01
30	4.47	4.43	4.45	0.02
45	4.28	4.26	4.27	0.01
60	4.02	3.97	3.99	0.03
90	3.61	3.55	3.58	0.04
120	3.30	3.35	3.32	0.03
150	2.92	2.79	2.85	0.09
180	2.45	2.50	2.47	0.02
240	2.08	2.16	2.12	0.05

**Table A.45** Total antioxidant activity using DPPH radical scavenging activity assay during vacuum drying at 60 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	76.67	80.36	78.51	2.60
15	75.33	76.35	75.84	0.72
30	74.96	77.13	76.05	1.53
45	72.70	72.08	72.39	0.43
60	71.22	72.57	71.90	0.95
90	68.46	69.79	69.13	0.94
120	67.24	66.19	66.72	0.74
150	64.38	63.47	63.93	0.64
180	63.49	61.82	62.65	1.18
240	60.48	59.49	59.99	0.69

**Table A.46** Total antioxidant activity using DPPH radical scavenging activity assay during vacuum drying at 70 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	80.81	79.95	80.38	0.60
15	79.86	76.82	78.34	2.15
30	78.33	77.53	77.93	0.56
45	75.95	72.81	74.38	2.21
60	73.93	72.37	73.159	1.10
90	72.14	70.11	71.13	1.43
120	69.33	67.11	68.22	1.57
150	68.51	66.34	67.43	1.53
180	67.71	64.23	65.97	2.46
240	62.17	63.34	62.75	0.83

**Table A.47** Total antioxidant activity using DPPH radical scavenging activity assay during vacuum drying at 80 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	79.91	79.17	79.54	0.52
15	77.64	76.31	76.97	0.93
30	76.23	73.16	74.69	2.16
45	74.07	72.78	73.42	0.91
60	72.30	70.41	71.36	1.33
90	70.00	67.04	68.52	2.08
120	67.83	66.55	67.19	0.90
150	66.13	63.87	65.00	1.59
180	63.26	64.49	63.87	0.869
240	60.59	58.58	59.59	1.42

**Table A.48** Total antioxidant activity using  $\beta$ -carotene bleaching assay during vacuum drying at 60 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	77.74	78.58	78.16	0.59
15	75.38	77.75	76.56	1.67
30	74.41	76.75	75.58	1.65
45	72.46	74.74	73.60	1.61
60	71.01	73.24	72.12	1.58
90	66.15	68.24	67.20	1.47
120	64.01	66.03	65.02	1.42
150	61.19	63.11	62.15	1.36
180	60.20	62.09	61.14	1.340
240	57.05	58.85	57.95	1.270

**Table A.49** Total antioxidant activity using  $\beta$ -carotene bleaching assay during vacuum drying at 70 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	76.31	79.11	77.71	1.97
15	74.01	77.50	75.75	2.46
30	72.34	75.75	74.05	2.40
45	70.45	73.77	72.11	2.34
60	68.36	71.58	69.97	2.27
90	62.24	65.17	63.70	2.07
120	60.08	62.91	61.49	1.99
150	58.53	61.28	59.90	1.94
180	56.02	58.66	57.34	1.86
240	62.24	65.17	63.70	2.07

**Table A.50** Total antioxidant activity using  $\beta$ -carotene bleaching assay during vacuum drying at 80 °C

Time	Total antioxidant activity (%)			
	Rep. 1	Rep. 2	Avg.	SD
0	82.33	76.50	79.41	4.12
15	77.49	73.47	75.48	2.83
30	76.51	71.81	74.16	3.32
45	73.76	69.94	71.85	2.70
60	71.57	67.87	69.72	2.62
90	66.69	63.23	64.96	2.44
120	65.16	61.78	63.47	2.38
150	62.90	59.64	61.27	2.30
180	61.28	58.10	59.69	2.24
240	58.65	55.61	57.13	2.14

## Experiment 2

### Effects of Processing on Total glucosinolates in Dietary Fiber Powder from Cabbage Outer Leaves

**Table A.51** Effect of preparation on retention of total glucosinolates

Sample	Rep. 1	Rep.2	Rep.3	Avg.	SD
Fresh	1454.56	1577.65	1414.53	1481.91	85.41
Slicing/water blanching	769.90	842.32	741.31	784.51	52.06
Slicing/steam blanching	1371.32	1430.16	1304.38	1368.62	62.93
Water blanching/slicing	1225.68	1275.24	1301.93	1267.62	38.69
Steam blanching/slicing	1449.20	1553.13	1449.20	1484.50	60.09

**Table A.52** Total glucosinolates during hot air drying at 60 °C

Time	Total glucosinolates ( $\mu\text{mol}/100$ dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1490.10	1434.26	1462.18	39.48
15	1436.37	1446.02	1441.19	6.82
30	1411.50	1444.07	1427.78	23.03
45	1360.97	1435.35	1398.16	52.59
60	1336.85	1437.11	1386.98	70.89
90	1304.83	1420.28	1362.56	81.63
120	1271.65	1413.93	1342.79	100.61
150	1260.40	1397.91	1329.16	97.23
180	1229.84	1368.20	1299.02	97.83
240	1207.90	1346.76	1277.33	98.19

**Table A.53** Total glucosinolates during hot air drying at 70 °C

Time	Total glucosinolates ( $\mu\text{mol}/100$ dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1478.75	1418.23	1448.49	42.79
15	1490.87	1442.13	1466.50	34.46
30	1488.86	1420.07	1454.47	48.64
45	1479.88	1423.63	1451.75	39.77
60	1481.69	1415.26	1448.48	46.97
90	1464.34	1377.78	1421.06	61.20
120	1457.79	1370.07	1413.93	62.03
150	1441.27	1339.01	1390.14	72.31
180	1410.64	1314.15	1362.39	68.22
240	1388.54	1300.04	1344.29	62.58

**Table A.54** Total glucosinolates during hot air drying at 80 °C

Time	Total glucosinolates ( $\mu\text{mol}/100$ dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1415.32	1474.44	1444.88	41.80
15	1420.58	1479.93	1450.25	41.96
30	1412.35	1471.35	1441.85	41.71
45	1402.52	1461.11	1431.81	41.42
60	1367.53	1424.66	1396.10	40.39
90	1345.35	1401.56	1373.46	39.73
120	1316.92	1371.94	1344.43	38.89
150	1286.46	1340.20	1313.33	37.99
180	1266.97	1319.89	1293.43	37.42
240	1244.19	1296.17	1270.18	36.75

**Table A.55** Total glucosinolates during vacuum drying at 60 °C

Time	Total glucosinolates ( $\mu\text{mol}/100$ dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1428.32	1479.59	1453.95	36.25
15	1439.77	1426.62	1433.20	9.29
30	1437.84	1416.82	1427.33	14.86
45	1443.39	1396.44	1419.92	33.19
60	1398.47	1372.74	1385.61	18.19
90	1384.87	1361.36	1373.11	16.62
120	1343.69	1341.26	1342.48	1.72
150	1340.91	1308.64	1324.77	22.81
180	1306.48	1262.66	1284.57	30.98
240	1271.21	1250.03	1260.62	14.97

**Table A.56** Total glucosinolates during vacuum drying at 70 °C

Time	Total glucosinolates ( $\mu\text{mol}/100$ dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1491.24	1486.65	1488.95	3.24
15	1501.20	1484.89	1493.05	11.53
30	1478.24	1458.84	1468.54	13.71
45	1451.79	1430.94	1441.36	14.74
60	1443.71	1396.09	1419.90	33.66
90	1414.75	1380.58	1397.67	24.15
120	1389.93	1363.83	1376.88	18.45
150	1381.90	1339.16	1360.53	30.22
180	1338.45	1328.63	1333.54	6.94
240	1307.24	1283.59	1295.41	16.71



**Table A.57** Total glucosinolates during vacuum drying at 80 °C

Time	Total glucosinolates ( $\mu\text{mol}/100$ dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1461.46	1493.22	1477.34	22.46
15	1466.69	1473.17	1469.93	4.58
30	1443.81	1433.17	1438.49	7.52
45	1433.76	1382.06	1407.91	36.55
60	1390.76	1339.45	1365.10	36.28
90	1373.48	1327.28	1350.38	32.66
120	1331.91	1309.28	1320.60	16.00
150	1317.32	1280.87	1299.09	25.77
180	1251.78	1267.03	1259.41	10.78
240	1222.11	1228.34	1225.23	4.40

**Table A.58** Cabbage temperature during hot air drying at 60 °C

Time	Cabbage temperature ( $^{\circ}\text{C}$ )			
	Rep. 1	Rep. 2	Avg.	SD
0	25.4	24.9	25.1	0.3
15	34.9	33.3	34.1	1.1
30	41.5	42.7	42.1	0.8
45	47.5	49.6	48.5	1.4
60	52.6	53.5	53.0	0.6
90	57.2	58	57.6	0.5
120	59.6	60.8	60.2	0.8
150	60.2	60.4	60.3	0.1
180	60.6	60.9	60.7	0.2
240	60.5	60.4	60.4	0.1

**Table A.59** Cabbage temperature during hot air drying at 70 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	25.7	26.1	25.9	0.2
15	40.8	38.9	39.8	1.3
30	52.5	51.2	51.8	0.9
45	57.7	56.5	57.1	0.8
60	60.3	59.7	60.0	0.4
90	65.3	63.6	64.4	1.2
120	67.4	68.8	68.1	0.9
150	69.2	70.1	69.6	0.6
180	70.5	70.3	70.4	0.1
240	70.9	70.7	70.8	0.1

**Table A.60** Cabbage temperature during hot air drying at 80 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	25.3	25.8	25.5	0.3
15	45.6	44.2	44.9	0.9
30	56.7	56.8	56.7	0.1
45	63.9	61.9	62.9	1.4
60	69.5	67.7	68.6	1.2
90	74.7	72.4	73.5	1.6
120	78.2	79.6	78.9	0.9
150	81.3	80.2	80.7	0.7
180	80.6	80.5	80.5	0.1
240	80.2	80.9	80.5	0.5

**Table A.61** Cabbage temperature during vacuum drying at 60 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	26.9	26.1	26.5	0.5
15	29.8	35.3	32.5	3.9
30	37.2	41.8	39.5	3.2
45	41.9	46.2	44	3.0
60	48.5	55.6	52	5.0
90	57.9	60.3	59.1	1.7
120	59.7	60.6	60.1	0.6
150	60.6	60.2	60.4	0.2
180	60.5	60.8	60.6	0.2
240	60.7	61.3	61	0.4

**Table A.62** Cabbage temperature during vacuum drying at 70 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	27.3	26.9	27.1	0.2
15	34.8	41.2	38	4.5
30	49.1	52.5	50.8	2.4
45	61.8	59.6	60.7	1.5
60	64.2	67.8	66	2.5
90	68.5	70.1	69.3	1.1
120	70.2	70.5	70.35	0.2
150	70.4	70.8	70.6	0.2
180	71.8	70.7	71.2	0.7
240	70.7	70.5	70.6	0.1

**Table A.63** Cabbage temperature during vacuum drying at 80 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	26.5	27.5	27	0.7
15	46.1	54.2	50.1	5.7
30	57.4	63.1	60.2	4.0
45	65.7	69.4	67.5	2.6
60	70.5	76.2	73.3	4.0
90	77.8	79.5	78.6	1.2
120	80.4	81.3	80.8	0.6
150	81.1	80.8	80.9	0.2
180	80.4	81.1	80.7	0.4
240	80.8	80.6	80.7	0.1

**Table A.64** Color of dietary fiber powder

Sample	Temperature	Color	Rep 1	Rep 2	Rep 3	Avg.	SD
Fresh		<i>L</i>	41.09	40.07	40.57	40.58	0.51
		<i>a</i>	-7.63	-7.46	-7.37	-4.49	0.13
		<i>b</i>	16.77	16.29	16.50	16.52	0.23
Hot air	60	<i>L</i>	35.28	33.77	28.35	32.46	2.97
		<i>a</i>	-4.78	-4.73	-4.09	-4.53	0.31
		<i>b</i>	18.31	18.74	17.36	18.13	0.57
	70	<i>L</i>	33.92	27.49	27.53	29.64	3.02
		<i>a</i>	-6.36	-5.77	-6.14	-6.09	0.24
		<i>b</i>	19.75	15.1	17.36	17.40	1.89
	80	<i>L</i>	35.28	33.77	28.35	32.46	2.97
		<i>a</i>	-4.78	-4.73	-4.09	-4.53	0.31
		<i>b</i>	18.31	18.74	17.36	18.13	0.57
Vacuum	60	<i>L</i>	31.54	32.56	31.93	32.01	0.42
		<i>a</i>	-5.00	-5.82	-5.92	-5.58	0.41
		<i>b</i>	17.51	17.21	17.27	17.33	0.12
	70	<i>L</i>	32.62	31.33	32.89	32.28	0.68
		<i>a</i>	-5.69	-5.96	-6.11	-5.92	0.17
		<i>b</i>	17.39	16.89	17.68	17.32	0.32
	80	<i>L</i>	34.92	34.87	34.17	34.65	0.34
		<i>a</i>	-5.42	-6.34	-5.52	-5.76	0.41
		<i>b</i>	18.11	18.1	18.37	18.19	0.12

### Experiment 3

#### Effects of Processing on Sulforaphane in Dietary Fiber Powder from Cabbage Outer Leaves

**Table A.65** Moisture content (g/g dry weight) of cabbage during hot air drying at 40 °C

Time	moisture content (g/g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	13.098	12.879	12.989	0.154
30	12.065	11.991	12.028	0.051
60	11.540	11.395	11.467	0.103
90	11.247	10.991	11.119	0.181
120	11.008	10.863	10.936	0.102
150	9.967	9.763	9.865	0.144
240	9.036	8.871	8.954	0.117
300	7.884	7.616	7.750	0.189
360	6.717	6.418	6.568	0.211
420	5.276	5.013	5.145	0.185
480	3.988	3.698	3.843	0.204
540	2.008	1.805	1.906	0.143
600	1.064	0.825	0.944	0.169

**Table A.66** Moisture content (g/g dry weight) of cabbage during hot air drying at 50 °C

Time	moisture content (g/g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	12.671	14.129	13.400	1.031
30	12.010	12.588	12.299	0.408
60	10.328	11.800	11.064	1.04
90	8.348	8.832	8.590	0.341
120	7.005	7.641	7.323	0.449
180	5.050	4.760	4.905	0.204
240	2.776	2.415	2.596	0.255
300	0.478	0.652	0.565	0.123
360	0.286	0.300	0.293	0.009
420	0.182	0.109	0.146	0.052
480	0.096	0.094	0.095	0.001
540	0.094	0.096	0.095	0.001
600	0.102	0.089	0.095	0.009

**Table A.67** Moisture content (g/g dry weight) of cabbage during hot air drying at 60 °C

Time	moisture content (g/g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	14.129	14.290	14.209	0.113
30	10.425	10.430	10.427	0.003
60	8.393	9.435	8.914	0.736
90	7.033	6.260	6.646	0.546
120	4.714	5.090	4.902	0.265
180	1.407	1.658	1.532	0.177
240	0.522	0.595	0.559	0.052
300	0.149	0.174	0.161	0.017
360	0.103	0.102	0.103	0.001

**Table A.67** Moisture content (g/g dry weight) of cabbage during hot air drying at 60 °C (continued)

Time	moisture content (g/g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
420	0.098	0.096	0.097	0.001
480	0.097	0.091	0.094	0.004
540	0.096	0.095	0.095	0.001
600	0.097	0.099	0.098	0.001

**Table A.68** Moisture content (g/g dry weight) of cabbage during hot air drying at 70 °C

Time	moisture content (g/g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	13.577	12.870	13.223	0.499
30	9.804	9.710	9.757	0.066
60	7.275	7.675	7.475	0.283
90	3.739	4.094	3.917	0.251
120	2.788	2.948	2.868	0.112
180	0.531	0.651	0.591	0.084
240	0.126	0.123	0.124	0.002
300	0.115	0.107	0.111	0.005
360	0.098	0.098	0.098	0.000
420	0.093	0.092	0.093	0.001
480	0.093	0.104	0.098	0.007
540	0.094	0.092	0.093	0.001
600	0.095	0.096	0.095	0.001

**Table A.69** Cabbage temperature during hot air drying at 40 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	25.3	25.8	25.6	0.3
30	29.5	30.1	29.8	0.4
60	34.2	35.7	34.9	1.0
90	37.5	39.2	38.3	1.2
120	39.8	40.7	40.2	0.6
180	40.3	41.1	40.7	0.5
240	39.8	40.5	40.2	0.5
300	39.8	40.3	40.1	0.3
360	39.2	40	39.6	0.6
420	39.8	40.5	40.1	0.4
480	39.9	40.7	40.3	0.5
540	39.7	40.4	40.0	0.4
600	39.7	40.8	40.2	0.7

**Table A.70** Cabbage temperature during hot air drying at 50 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	25.2	25.5	25.3	0.2
30	29.6	30.9	30.2	0.9
60	38.2	39.6	38.9	0.9
90	44.5	47.9	46.2	2.4
120	50.5	51.9	51.2	0.9
180	51.3	50.6	50.9	0.4
240	50.8	51.3	51.0	0.3
300	50.9	51.2	51.0	0.2
360	51.2	50.7	50.9	0.3
420	50.5	51.3	50.9	0.5
480	51.4	50.9	51.1	0.3
540	50.7	51.5	51.1	0.5
600	50.7	50.2	50.4	0.3

**Table A.71** Cabbage temperature during hot air drying at 60 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	25.4	24.9	25.1	0.3
30	41.5	42.3	41.9	0.5
60	52.6	53.6	53.1	0.7
90	58.6	59.7	59.15	0.7
120	59.8	61	60.4	0.8
180	59.5	61.1	60.3	1.1
240	59.7	60.8	60.2	0.7
300	60.5	60.7	60.6	0.1
360	60.7	60.6	60.6	0.07
420	60.7	60.9	60.8	0.1
480	60.4	61.6	61	0.8
540	60.6	60.8	60.7	0.1
600	61	62.2	61.6	0.8

**Table A.72** Cabbage temperature during hot air drying at 70 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	25.7	26.2	25.9	0.3
30	52.5	55.5	54	2.1
60	57.3	59.5	58.4	1.5
90	67.4	69.7	68.5	1.6
120	69.2	70.5	69.8	0.9
180	70.9	71.3	71.1	0.2
240	70.3	71.7	71	0.9
300	71.2	70.6	70.9	0.4
360	70.5	71.9	71.2	0.9
420	69.8	72.1	70.9	1.6
480	70.4	69.8	70.1	0.4
540	70.2	70.6	70.4	0.2
600	70.1	71.5	70.8	0.9

**Table A.73** Sulforaphane content during hot air drying at 40 °C

Time	sulforaphane content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1.566	1.712	1.639	1.03
30	1.797	1.769	1.783	0.19
60	1.910	1.880	1.895	0.21
90	2.013	1.981	1.997	0.22
120	2.055	2.023	2.039	0.22
180	2.128	2.094	2.111	0.23
240	2.135	2.102	2.118	0.23
300	2.122	2.066	2.094	0.39
360	2.144	1.853	1.999	2.06
420	2.118	2.155	2.136	0.26
480	2.131	2.237	2.184	0.75
540	2.128	2.071	2.099	0.40
600	2.113	2.127	2.120	0.09

**Table A.74** Sulforaphane content during hot air drying at 50 °C

Time	sulforaphane content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1.832	1.610	1.721	0.156
30	1.962	1.759	1.861	0.143
60	2.198	1.990	2.094	0.147
90	2.388	2.014	2.201	0.263
120	2.549	2.196	2.372	0.250
180	2.057	1.862	1.959	0.137
240	1.781	1.613	1.697	0.119
300	1.331	1.205	1.268	0.089
360	0.854	0.773	0.813	0.057
420	0.682	0.618	0.650	0.045
480	0.529	0.479	0.504	0.035
540	0.354	0.311	0.332	0.030
600	0.318	0.280	0.299	0.027

**Table A.75** Sulforaphane content during hot air drying at 60 °C

Time	sulforaphane content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1.685	1.693	1.689	0.005
30	2.017	2.107	2.062	0.064
60	2.427	2.487	2.457	0.042
90	2.241	2.274	2.257	0.023
120	1.990	2.040	2.015	0.034
180	1.068	1.116	1.092	0.033
240	0.639	0.667	0.653	0.020
300	0.297	0.311	0.304	0.009
360	0.190	0.199	0.194	0.006
420	0.139	0.146	0.142	0.004
480	0.072	0.075	0.074	0.002
540	0.052	0.054	0.053	0.001
600	0.055	0.057	0.056	0.001

**Table A.76** Sulforaphane content during hot air drying at 70 °C

Time	sulforaphane content (mg/100 g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	1.656	1.799	1.727	0.101
30	2.347	2.601	2.474	0.179
60	2.177	2.412	2.295	0.166
90	1.421	1.482	1.452	0.042
120	0.906	0.944	0.925	0.027
180	0.270	0.281	0.276	0.008
240	0.177	0.184	0.181	0.005
300	0.121	0.126	0.124	0.004
360	0.118	0.123	0.120	0.003
420	0.095	0.099	0.097	0.003
480	0.085	0.089	0.087	0.003
540	0.070	0.073	0.072	0.002
600	0.085	0.089	0.087	0.002

**Experiment 4**  
**Microwave extraction of sulforaphane**

**Table A.77** Moisture content during hot air drying at 60 °C

Time	Moisture content (g/g dry weight)			
	Rep. 1	Rep. 2	Avg.	SD
0	13.28	13.85	13.57	0.40
5	12.33	12.80	12.57	0.33
10	11.73	11.97	11.85	0.16
15	11.26	10.66	10.96	0.42
20	10.54	9.35	9.95	0.84
25	9.95	9.01	9.47	0.67
30	9.23	8.04	8.64	0.84
40	8.16	8.52	8.34	0.25
50	7.21	6.61	6.91	0.42
60	6.02	5.19	5.60	0.58
90	3.76	4.35	4.05	0.42
120	1.85	1.26	1.55	0.42
150	1.14	0.07	0.60	0.75
180	0.78	1.73	1.26	0.67
210	0.30	1.38	0.84	0.75
240	0.19	0.66	0.42	0.33
270	0.07	0.42	0.25	0.25
300	0.07	0.78	0.42	0.50

**Table A.78** Cabbage temperature during hot air drying at 60 °C

Time	Cabbage temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	22.7	20.7	21.7	1.4
5	32.7	29.9	31.3	1.9
10	35	33.6	34.3	0.9
15	38.1	34.5	36.3	2.5
20	39.4	36.6	38	1.9
25	41.1	37.1	39.1	2.8
30	42.2	38.7	40.45	2.4
40	42.6	40.9	41.75	1.2
50	43.2	42.5	42.85	0.4
60	45.3	47.3	46.3	1.4
90	48.4	49.7	49.05	0.9
120	51.1	51.2	51.15	0.1
150	56	55.6	55.8	0.2
180	58.9	59.5	59.2	0.4
210	58.8	60.2	59.5	0.9
240	59.1	59.3	59.2	0.1
270	59.6	60.3	59.95	0.4
300	59.5	60.5	60	0.7

**Table A.79** Temperature of mixture between dichloromethane and fresh cabbage during microwave extraction at 130 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	22.4	21.7	22	0.5
0.5	31.1	26.9	29	2.9
1	34.8	31.8	33.3	2.1
1.5	32.8	32.7	32.7	0.1
2	34.8	34.4	34.6	0.2
3	36.2	36	36.1	0.1
4	35.7	35.2	35.4	0.3
5	36.3	37.1	36.7	0.5
6	37.8	37.6	37.7	0.1
7	37.5	36.9	37.2	0.4
8	37.2	37.5	37.3	0.2
9	36.8	36.9	36.8	0.1
10	37.2	37.1	37.1	0.1

**Table A.80** Temperature of mixture between dichloromethane and fresh cabbage during microwave extraction at 260 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	21.6	21.1	21.3	0.3
0.5	27.9	26.2	27.0	1.2
1	31.5	30.9	31.2	0.4
1.5	33.7	32.5	33.1	0.8
2	34.7	33.9	34.3	0.5
3	36.6	35.1	35.8	1.1
4	37.5	36.3	36.9	0.8
5	36.4	37.4	36.9	0.7
6	37.2	36.3	36.7	0.6
7	36.7	37.1	36.9	0.2
8	37.8	36.5	37.1	0.9
9	36.5	36.9	36.7	0.2
10	37.1	37.7	37.4	0.4

**Table A.81** Temperature of mixture between dichloromethane and fresh cabbage during microwave extraction at 390 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	23	22.5	22.7	0.3
0.5	30.1	30.3	30.2	0.1
1	34.8	34.6	34.7	0.1
1.5	31.2	35.9	33.5	3.3
2	35.7	36.5	36.1	0.5
3	37.8	37.1	37.4	0.4
4	37.7	37.3	37.5	0.2
5	37.5	36.9	37.2	0.4
6	36.4	37.2	36.8	0.5
7	37.1	36.8	36.9	0.2
8	36.8	37.3	37	0.3
9	37.1	37.4	37.2	0.2
10	36.5	37.3	36.9	0.5

**Table A.82** Temperature of mixture between dichloromethane and semi-dried cabbage during microwave extraction at 130 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	22.4	21.7	22.05	0.4
0.5	30.6	31.2	30.9	0.4
1	32.3	31.9	32.1	0.2
1.5	33.1	34.4	33.75	0.9
2	35.4	35.5	35.45	0.1
3	36.2	36.8	36.5	0.4
4	36.7	35.2	35.95	1.1
5	37.4	37.1	37.25	0.2
6	36.2	36.4	36.3	0.1
7	37.2	37	37.1	0.1
8	37.7	36.8	37.25	0.6
9	37.3	36.9	37.1	0.2
10	37.6	36.1	36.85	1.1

**Table A.83** Temperature of mixture between dichloromethane and semi-dried cabbage during microwave extraction at 260 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	22.4	21.7	22.05	0.4
0.5	28.9	30.4	29.65	1.0
1	31.4	32.5	31.95	0.7
1.5	32.8	33.7	33.25	0.6
2	36.3	34.2	35.25	1.4
3	36.1	35.9	36	0.1
4	37	36.4	36.7	0.4
5	37.5	36.9	37.2	0.4
6	37.1	37.4	37.25	0.2
7	37.3	36.8	37.05	0.3
8	36.8	38.2	37.5	0.9
9	37.7	36.9	37.3	0.5
10	37.4	37.3	37.35	0.1

**Table A.84** Temperature of mixture between dichloromethane and semi-dried cabbage during microwave extraction at 390 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	22.4	21.7	22.05	0.4
0.5	31.2	31.3	31.25	0.1
1	33.8	34.6	34.2	0.5
1.5	35.3	36.1	35.7	0.5
2	36.8	36.7	36.75	0.1
3	37.4	37.8	37.6	0.2
4	37.7	37.9	37.8	0.1
5	36.6	37.2	36.9	0.4
6	37.5	37.6	37.55	0.1
7	37.9	38.4	38.15	0.3
8	38.2	37.3	37.75	0.6
9	37.9	36.8	37.35	0.7
10	37.4	37.1	37.25	0.2

**Table A.85** Temperature of mixture between water and fresh cabbage during microwave extraction at 130 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	24.9	24.7	21.7	1.4
0.5	29.1	30.3	31.3	1.9
1	31.7	34.8	34.3	0.9
1.5	38.9	39.3	36.3	2.5
2	42.1	44.3	38	1.9
3	50.8	50.6	39.1	2.8
4	61.3	60.3	40.45	2.4
5	66.4	65.9	41.75	1.2
6	71.6	70.5	42.85	0.4
7	77.1	76.8	46.3	1.4
8	82.4	81.2	49.05	0.9
9	86.2	86.3	51.15	0.1
10	90.8	90.3	55.8	0.2
11	92.3	92.4	59.2	0.4
12	93.6	93.9	59.5	0.9
13	95.4	95.6	59.2	0.1
14	95.6	95.3	59.95	0.4
15	95.1	95.5	60	0.7



**Table A.86** Temperature of mixture between water and fresh cabbage during microwave extraction at 260 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	23.7	23.5	23.6	0.1
0.5	36.6	36.3	36.4	0.2
1	44.1	45.8	44.9	1.2
1.5	52.5	51.3	51.9	0.8
2	64.2	66	65.1	1.2
3	75.6	75.1	75.3	0.3
4	85.7	86.7	86.2	0.7
5	91.6	91.5	91.5	0.1
6	95.4	96.1	95.7	0.4
7	96.3	95.9	96.1	0.2
8	96.7	96.8	96.7	0.1
9	96.1	96.5	96.3	0.2
10	95.9	96.1	96	0.1

**Table A.87** Temperature of mixture between water and fresh cabbage during microwave extraction at 390 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	23.2	23.6	23.4	0.1
0.5	42.3	43.1	42.7	0.5
1	60.7	61.6	61.15	0.6
1.5	76.2	77	76.6	0.5
2	92.3	92.9	92.6	0.4
3	94.5	94.7	94.6	0.1
4	95.2	95.8	95.5	0.4
5	96.9	96.2	96.5	0.4
6	97.3	97.1	97.2	0.1

**Table A.88** Temperature of mixture between water and semi-dried cabbage during microwave extraction at 130 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	24.9	24.7	24.8	0.141421
0.5	28.3	29.4	28.85	0.777817
1	34.4	34.7	34.55	0.212132
1.5	38.5	38.8	38.65	0.212132
2	47.1	45.6	46.35	1.06066
3	59.6	55.6	57.6	2.828427
4	67.5	65.8	66.65	1.202082
5	79.6	73.5	76.55	4.313351
6	81.3	76.9	79.1	3.11127
7	85.5	79.4	82.45	4.313351
8	87.4	85.6	86.5	1.272792
9	91.2	88.5	89.85	1.909188
10	93.5	91.4	92.45	1.484924
11	92.3	91.8	92.05	0.353553
12	94.1	94.1	94.1	0.141421
13	97.4	95.8	96.6	1.131371
14	96.2	94.9	95.55	0.919239
15	97.4	96.7	97.05	0.494975

**Table A.89** Temperature of mixture between water and semi-dried cabbage during microwave extraction at 260 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	23.7	23.5	23.6	0.1
0.5	39.9	36.1	38	2.6
1	48.5	47.9	48.2	0.4
1.5	51.7	52.7	52.2	0.7
2	59.6	61.4	60.5	1.2
3	70.7	73.7	72.2	2.1
4	79.5	81.6	80.5	1.4
5	92.5	90.3	91.4	1.5
6	94.9	94.2	94.5	0.4
7	96.1	95.3	95.7	0.5
8	95.8	97.1	96.4	0.9
9	97.3	96.5	96.9	0.5
10	95.2	97.2	96.2	1.4

**Table A.90** Temperature of mixture between water and semi-dried cabbage during microwave extraction at 390 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	23.4	25.3	24.3	1.3
0.5	40.4	44.6	42.5	2.9
1	61.2	63.2	62.2	1.4
1.5	75.8	76.2	76	0.2
2	88.5	89.4	88.9	0.6
3	93.6	92.1	92.8	1.1
4	95.9	95.3	95.6	0.4
5	96.5	97.2	96.8	0.4
6	97.7	96.8	97.2	0.6

**Table A.91** Sulforaphane in fresh cabbage during microwave extraction by using dichloromethane as solvent at 130 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	12.16	12.18	12.17	0.01
0.5	14.16	13.87	14.02	0.20
1	18.59	16.08	17.33	1.77
1.5	22.51	21.28	21.89	0.86
2	25.39	24.42	24.90	0.68
3	28.24	27.61	27.92	0.44
4	27.79	27.17	27.48	0.44
5	27.51	27.21	27.36	0.20

**Table A.92** Sulforaphane in fresh cabbage during microwave extraction by using dichloromethane as solvent at 260 W

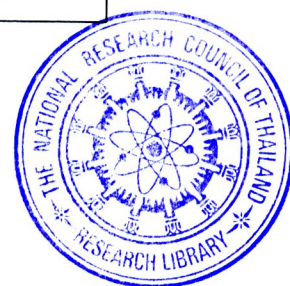
Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	12.36	11.54	11.95	0.58
0.5	16.29	15.82	16.05	0.32
1	19.80	20.79	20.29	0.70
1.5	23.83	25.05	24.44	0.85
2	26.44	27.42	26.93	0.69
3	27.76	27.70	27.73	0.04
4	27.99	27.45	27.72	0.38
5	27.72	28.07	27.89	0.25

**Table A.93** Sulforaphane in fresh cabbage during microwave extraction by using dichloromethane as solvent at 390 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	12.29	11.87	12.08	0.29
0.5	17.28	17.68	17.48	0.28
1	21.84	22.78	22.31	0.66
1.5	26.11	25.51	25.81	0.42
2	28.04	27.73	27.88	0.21
3	28.13	27.46	27.79	0.47
4	27.55	28.19	27.87	0.45
5	28.20	28.36	28.28	0.11

**Table A.94** Sulforaphane in fresh cabbage during microwave extraction by using water as solvent at 130 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	11.35	11.53	11.44	0.13
0.5	12.73	14.30	13.52	1.10
1	15.06	15.83	15.44	0.54
1.5	17.29	17.81	17.55	0.36
2	20.50	20.02	20.26	0.33
3	22.43	24.38	23.40	1.38
4	20.13	21.53	20.83	0.98
5	12.86	14.07	13.46	0.85



**Table A.95** Sulforaphane in fresh cabbage during microwave extraction by using water as solvent at 260 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	11.64	11.68	11.66	0.02
0.5	13.22	14.73	13.98	1.06
1	20.03	18.87	19.45	0.82
1.5	22.81	24.77	23.79	1.38
2	19.170	21.19	20.18	1.43
3	17.24	15.69	16.47	1.09
4	14.03	14.82	14.43	0.55
5	11.59	12.13	11.86	0.38

**Table A.96** Sulforaphane in fresh cabbage during microwave extraction by using dichloromethane as solvent at 390 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	11.61	11.07	11.34	0.38
0.5	15.69	15.50	15.59	0.13
1	23.15	24.21	23.68	0.75
1.5	20.12	21.21	20.67	0.77
2	16.16	16.32	16.24	0.11
3	14.65	14.11	14.38	0.37
4	12.40	12.42	12.41	0.01
5	11.38	10.69	11.04	0.49

**Table A.97** Sulforaphane in semi-dried cabbage during microwave extraction by using dichloromethane as solvent at 130 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	21.46	21.72	21.59	0.18
0.5	21.59	22.53	22.06	0.66
1	24.02	22.59	23.31	1.01
1.5	24.26	23.35	23.81	0.64
2	24.97	25.18	25.08	0.14
3	26.89	26.57	26.73	0.23
4	26.82	27.11	26.96	0.20
5	26.73	26.60	26.66	0.08

**Table A.98** Sulforaphane in semi-dried cabbage during microwave extraction by using dichloromethane as solvent at 260 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	21.03	21.02	21.02	0.01
0.5	21.18	21.54	21.36	0.25
1	22.47	23.10	22.78	0.44
1.5	25.70	23.97	24.83	1.22
2	27.08	26.63	26.85	0.32
3	27.11	26.45	26.78	0.46
4	25.56	26.97	26.26	0.99
5	27.27	26.51	26.89	0.53

**Table A.99** Sulforaphane in semi-dried cabbage during microwave extraction by using dichloromethane as solvent at 390 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	21.61	20.55	21.08	0.74
0.5	22.21	20.89	21.55	0.92
1	23.64	24.77	24.20	0.79
1.5	25.57	27.37	26.47	1.27
2	27.24	26.64	26.94	0.42
3	25.86	26.81	26.341	0.67
4	27.22	28.31	27.76	0.77
5	26.15	27.32	26.73	0.82

**Table A.100** Sulforaphane in semi-dried cabbage during microwave extraction by using water as solvent at 130 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	15.59	14.74	15.16	0.60
0.5	17.21	16.56	16.88	0.46
1	18.87	17.64	18.25	0.87
1.5	19.24	19.14	19.19	0.07
2	19.35	20.31	19.83	0.67
3	20.72	21.96	21.34	0.87
4	15.20	17.44	16.32	1.58
5	12.03423	13.15	12.59	0.79

**Table A.101** Sulforaphane in semi-dried cabbage during microwave extraction  
by using water as solvent at 260 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	14.81	14.46	14.63	0.24
0.5	17.99	15.42	16.71	1.81
1	19.33	18.87	19.10	0.33
1.5	21.96	20.87	21.41	0.76
2	18.87	16.58	17.73	1.61
3	15.20	14.40	14.80	0.56
4	12.17	11.75	11.96	0.29
5	9.38	8.24	8.81	0.81

**Table A.102** Sulforaphane in semi-dried cabbage during microwave extraction  
by using water as solvent at 390 W

Time (min)	Temperature (°C)			
	Rep. 1	Rep. 2	Avg.	SD
0	14.05	14.81	14.43	0.53
0.5	15.71	17.25	16.48	1.08
1	20.80	22.65	21.72	1.30
1.5	16.16	19.87	18.01	2.62
2	14.53	14.61	14.57	0.05
3	11.76	12.17	11.96	0.29
4	8.46	9.97	9.22	1.06
5	6.59	7.30	6.94	0.49

## **APPENDIX B**

### **Statistical Analysis**

**Table B.1** Analysis of variance for the effect of preparation and blanching methods on composition of cabbage outer leaves

## ANOVA

	Source	Sum of Squares	df	Mean Square	F	Sig.
Protein	Between Groups	20.446	4	5.112	17.011	0.004
	Within Groups	1.502	5	0.300		
	Total	21.949	9			
Lipid	Between Groups	0.332	4	0.083	1.032	0.473
	Within Groups	0.402	5	0.080		
	Total	0.734	9			
Ash	Between Groups	16.522	4	4.131	10.070	0.013
	Within Groups	2.051	5	0.410		
	Total	18.573	9			
Carbohydrates	Between Groups	15.041	4	3.760	4.587	0.063
	Within Groups	4.099	5	0.820		
	Total	19.140	9			

**Table B.2** Analysis of variance for the effect of preparation and blanching methods on composition of cabbage outer leaves

**ANOVA**

	Source	Sum of Squares	df	Mean Square	F	Sig.
IDF	Between Groups	6.756	4	1.689	1.452	0.341
	Within Groups	5.817	5	1.163		
	Total	12.574	9			
SDF	Between Groups	1.891	4	0.473	0.452	0.769
	Within Groups	5.235	5	1.047		
	Total	7.126	9			
TDF	Between Groups	4.031	4	1.008	0.323	0.852
	Within Groups	15.611	5	3.122		
	Total	19.642	9			

**Table B.3** Analysis of variance for the effect of preparation and blanching methods on TPC in cabbage outer leaves

**ANOVA**

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	160498.851	4	40124.713	40.250	.000
Within Groups	9968.895	10	996.890		
Total	170467.746	14			

**Table B.4** Analysis of variance for the effect of preparation and blanching methods on vitamin C in cabbage outer leaves

**ANOVA**

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	88357.449	4	22089.362	75.466	.000
Within Groups	2927.067	10	292.707		
Total	91284.517	14			

**Table B.5** Analysis of variance for the effect of preparation and blanching methods on  $\beta$ -carotene in cabbage outer leaves

## ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.334	4	0.084	0.899	0.500
Within Groups	0.930	10	0.093		
Total	1.264	14			

**Table B.6** Analysis of variance for the effect of preparation and blanching methods on  $\alpha$ -tocopherol in cabbage outer leaves

## ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.015	4	0.004	0.237	0.911
Within Groups	0.162	10	0.016		
Total	0.178	14			

**Table B.7** Analysis of variance for the effect of preparation and blanching methods on antioxidant activity using DPPH radical scavenging and  $\beta$ -carotene bleaching assay in cabbage outer leaves

## ANOVA

	Source	Sum of Squares	df	Mean Square	F	Sig.
DPPH	Between Groups	90.520	4	22.630	18.325	0.000
	Within Groups	12.349	10	1.235		
	Total	102.869	14			
$\beta$ -carotene bleaching	Between Groups	42.067	4	10.517	6.987	0.006
	Within Groups	15.053	10	1.505		
	Total	57.119	14			

**Table B.8** Analysis of variance for the effect of preparation and blanching methods on total glucosinolates in cabbage outer leaves

## ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1008466.881	4	252116.720	67.226	.000
Within Groups	37502.620	10	3750.262		
Total	1045969.501	14			

**Table B.9** Analysis of variance for the effect of MAE on sulforaphane from cabbage outer leaves

**ANOVA**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.526	10	0.153	18.535	0.000
Within Groups	0.091	11	0.008		
Total	1.617	21			

## **APPENDIX C**

### **Standard Curve and Chromatogram**

### C.1 Quantification of TPC

Quantification of TPC was performed based on a gallic acid standard curve. The standard curve was prepared by plotting the absorbance of the gallic acid standard solution at 765 nm against the corresponding concentration of the standard solution at 0.2, 0.4, 0.6, 0.8 and 1mg/mL. TPC of sample was calculated from standard curve of gallic acid and using this equation as followed:

$$\text{TPC (mg)} = \frac{(\text{Absorbance at 765 nm} \times \text{volume of sample solution})}{\text{Slope}}$$

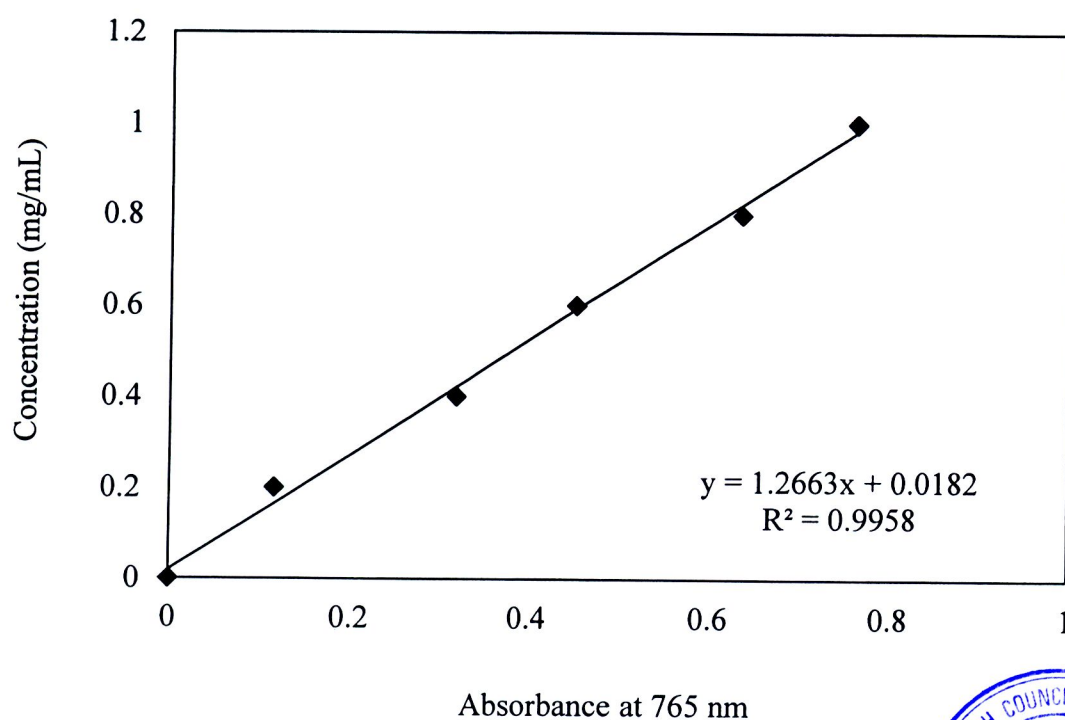


Figure C.1 Standard curve of gallic acid

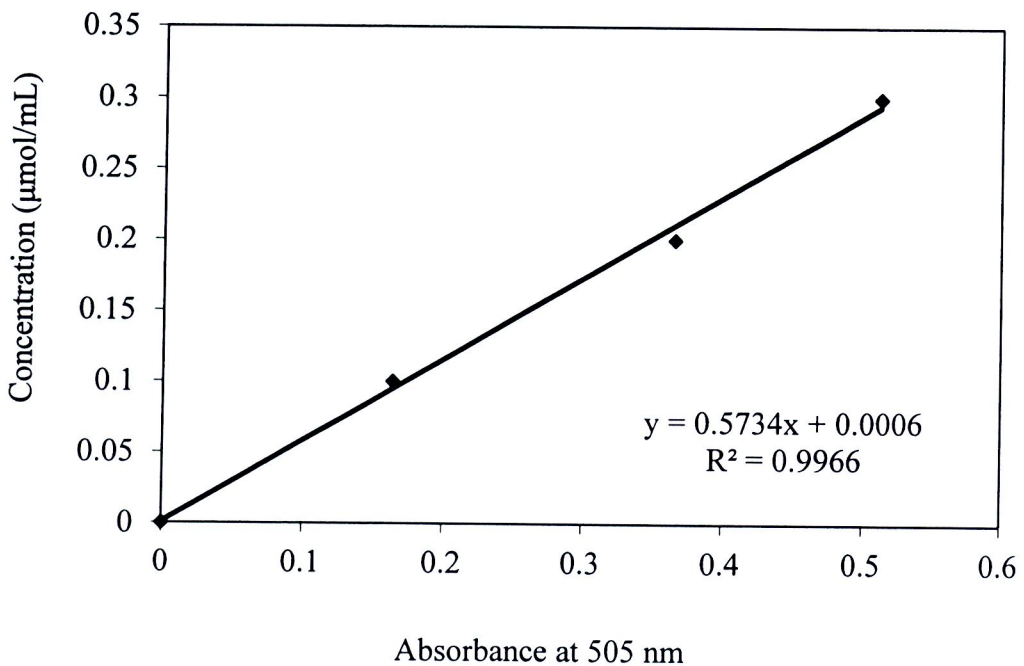


### C.2 Quantification of total glucosinolates

Quantification of total glucosinolate was performed based on a sinigrin standard curve. The standard solution was prepared at 0.1, 0.2, 0.3, 0.4 and 0.5  $\mu\text{mol/mL}$ . The absorbance was then measured using a spectrophotometer at 505 nm. 0.3 M potassium sulphate was used as blank. The glucosinolate concentration in the sample was calculated from the absorbance of sinigrin standard solution based on the following equation:

$$C = \frac{A_x}{K} \times \frac{D}{W}$$

where C = total glucosinolates concentration ( $\mu\text{mol/mL}$ ),  $A_x$  = absorbance of the sample, K = absorbance factor (absorbance/concentration of standard)( $\text{mL}/\mu\text{mol}$ ), D = dilution factor (300), W = mass of the sample taken (g).



**Figure C.2** Standard curve of glucosinolates

### C.3 Quantification of vitamin C

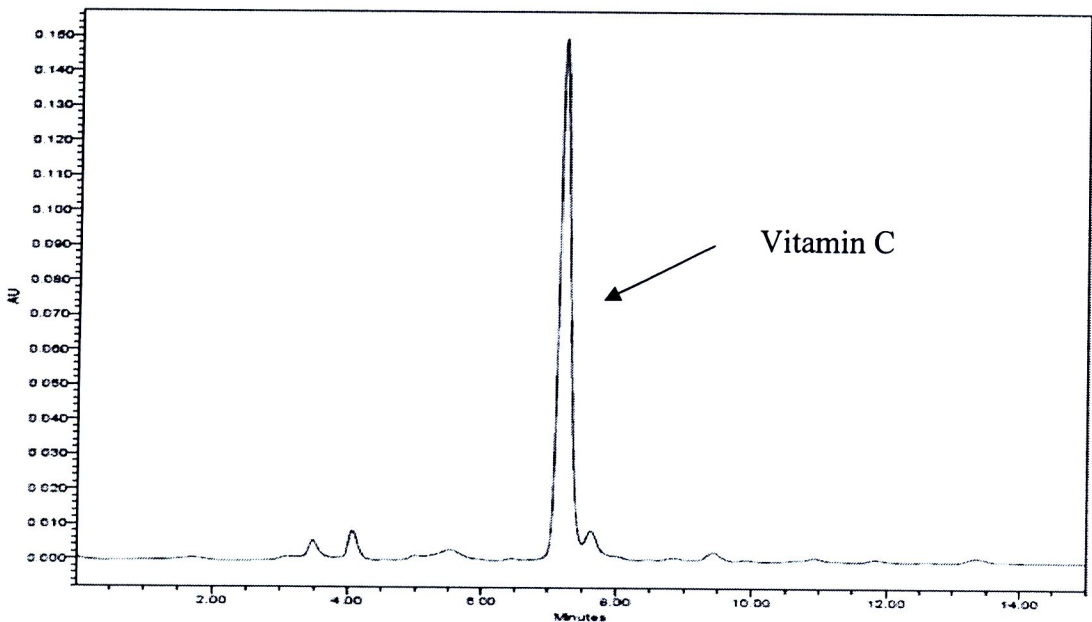
Quantification of vitamin C was performed based on an ascorbic acid standard curve. The standard curve was prepared by injecting the solutions of ascorbic acid at 5 concentrations (0.02, 0.04, 0.06, 0.08 and 1mg/mL) into HPLC. The condition of HPLC was described in Chapter 3. A typical chromatogram of vitamin C is shown in Figure C.3. Vitamin C of sample was calculated from standard curve of ascorbic acid and using this equation as followed:

$$\text{Vitamin C (mg)} = \frac{C \times V}{W}$$

where C = the concentration of vitamin C in the test solution

V = the volume of the test solution (100 mL)

W = the weight of sample used for the preparation of the test solution



**Figure C.3** Chromatogram of the HPLC elution profile of vitamin C

### C.4 Quantification of $\beta$ -carotene

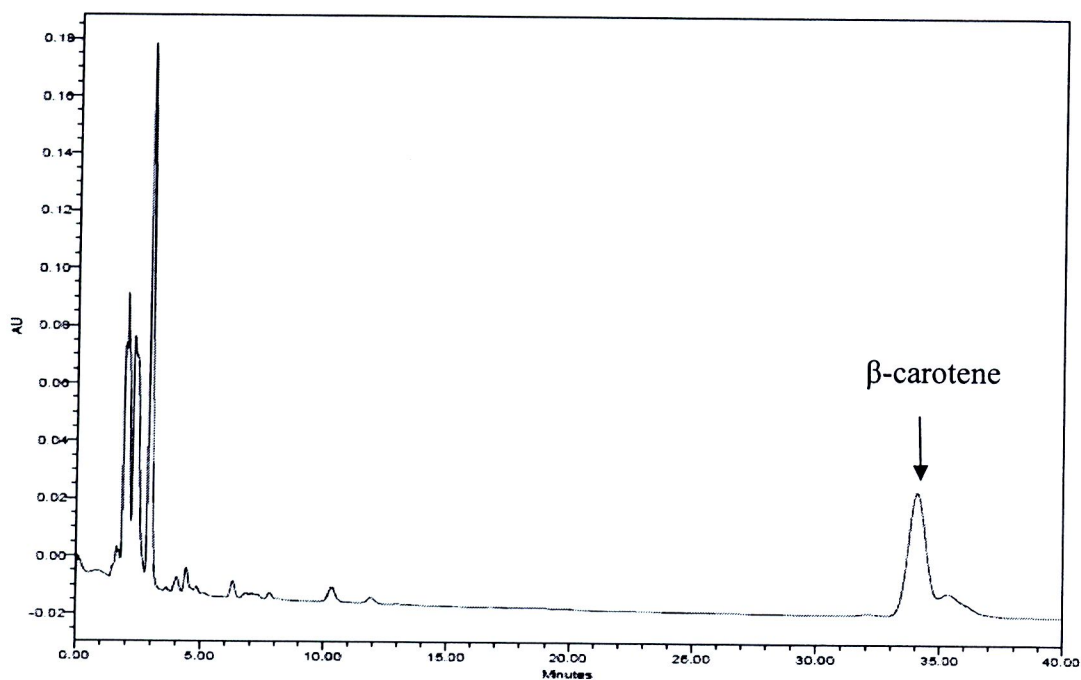
Quantification of  $\beta$ -carotene was performed based on a  $\beta$ -carotene standard curve. The standard curve was prepared by injecting the solutions of  $\beta$ -carotene at 5 concentrations (2, 4, 6, 8 and 10  $\mu\text{g/mL}$ ) into HPLC. The operation of HPLC was described in Chapter 3. A typical chromatogram of  $\beta$ -carotene is shown in Figure C.4.  $\beta$ -carotene of sample was calculated from standard curve of  $\beta$ -carotene and using this equation as followed:

$$\beta\text{-carotene (mg)} = \frac{C \times V}{W}$$

where C = the concentration of  $\beta$ -carotene in the test solution

V = the volume of the test solution (3 mL)

W = the weight of sample used for the preparation of the test solution



**Figure C.4** Chromatogram of the HPLC elution profile of  $\beta$ -carotene

### C.5 Quantification of $\alpha$ -tocopherol

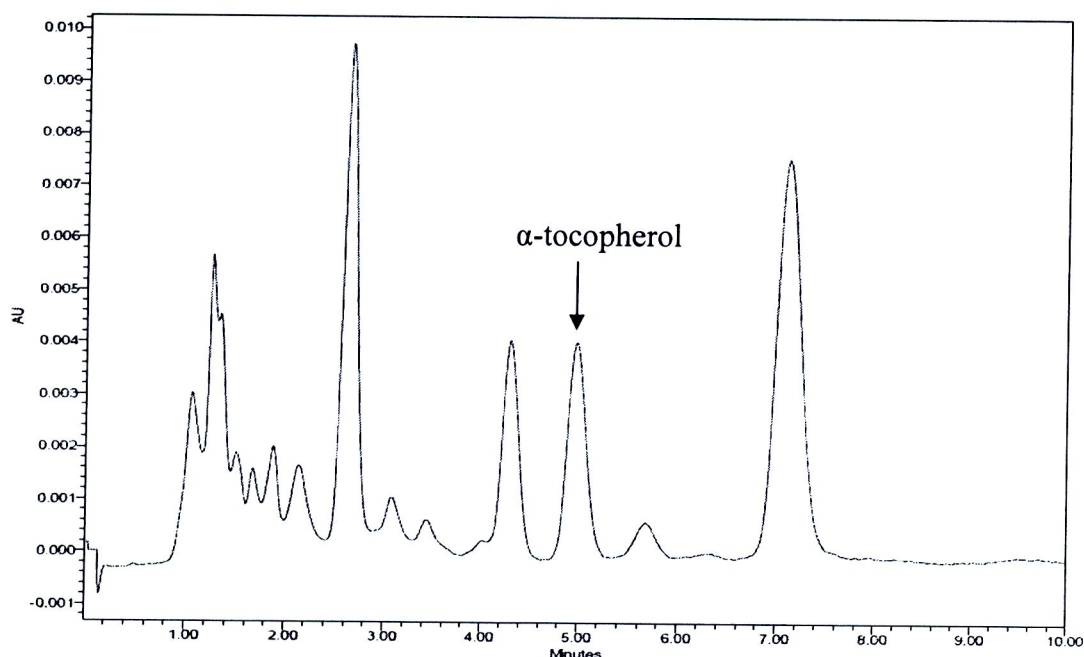
Quantification of  $\alpha$ -tocopherol was performed based on an  $\alpha$ -tocopherol standard curve. The standard curve was prepared by injecting the solutions of  $\alpha$ -tocopherol at 5 concentrations (2, 4, 6, 8 and 10  $\mu\text{g/mL}$ ) into HPLC. The condition of HPLC was described in Chapter 3. A typical chromatogram of  $\alpha$ -tocopherol is shown in Figure C.5.  $\alpha$ -tocopherol of sample was calculated from standard curve of  $\alpha$ -tocopherol and using this equation as followed:

$$\alpha\text{-tocopherol (mg)} = \frac{C \times V}{W}$$

where C = the concentration of  $\alpha$ -tocopherol in the test solution

V = the volume of the test solution (3 mL)

W = the weight of sample used for the preparation of the test solution



**Figure C.5** Chromatogram of the HPLC elution profile of  $\alpha$ -tocopherol

### C.6 Quantification of sulforaphane

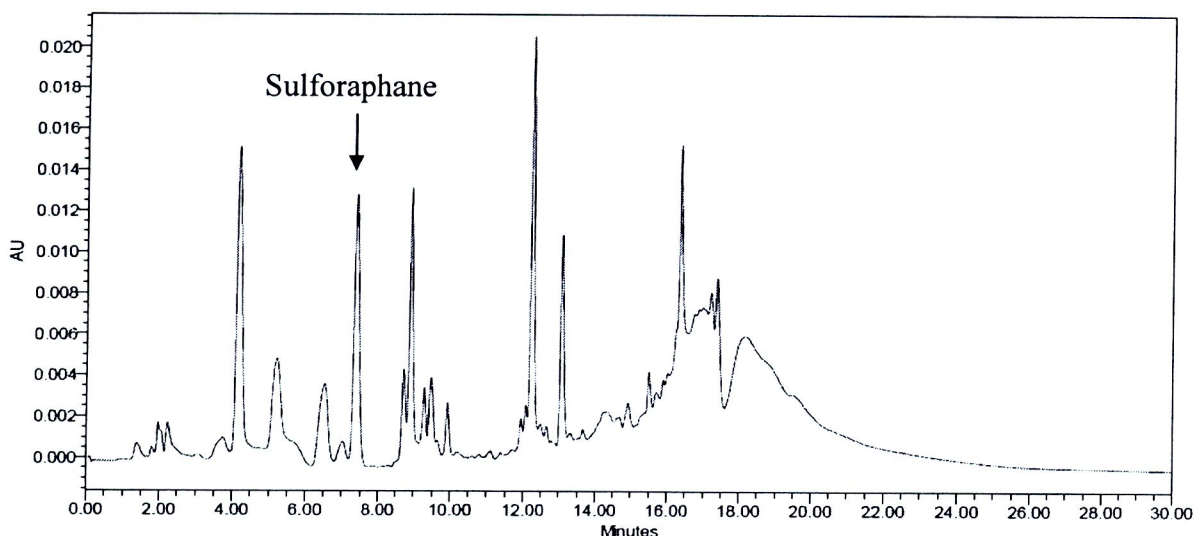
Quantification was based on the external standard method. A stock solution was prepared with 5.0 mg of sulforaphane reference standard, which was dissolved and diluted to 10 mL with acetonitrile. Aliquots of the standard stock solution of sulforaphane were pipetted into different 10 mL flasks and diluted to mark with acetonitrile. The final concentrations of sulforaphane were in the range of 2, 4, 6, 8 and 10 mg/mL. Each solution was injected into HPLC. The condition of HPLC was described in Chapter 5. A typical chromatogram of sulforaphane was shown in Figure C.6. Sulforaphane of sample was calculated from standard curve of sulforaphane and using this equation as followed:

$$\text{sulforaphane (mg)} = \frac{C \times V}{W}$$

where C = the concentration of sulforaphane in the test solution

V = the volume of the test solution (2 mL)

W = the weight of sample used for the preparation of the test solution



**Figure C.6** Chromatogram of the HPLC elution profile of sulforaphane

## CURRICULUM VITAE

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outer leaves during drying”. **Food Chemistry**, Vol. 127, No. 1, pp. 67-73.

Tanongkankit, Y., Chiewchan, N. and Devahastin, S., “Physicochemical Property changes of Cabbage Outer leaves upon Preparation into Functional Dietary Fiber Powder”, **Food and Bioproducts Processing**, Vol. 90, No. 3, pp. 541-548.



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