Appendix A

Statistical analysis

Table 1a Effect of packaging materials on PPO activity of dried longan pulp during storage at room temperature

Time (months)	PPO specific activity(units/mg protein)					
	control			Microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	15.83±1.6b	15.83±1.6b	15.83±1.6b	10.82±0.66a	10.82±0.66a	10.82±0.66a
1	7.79±0.92b,c	7.14±0.44b,c	6.49±1.4b	8.79±1.92b,c	4.93±1.04a	9.00±1.47c
2	5.12±0.29b	5.54±0.03b	5.72±1.62b	5.97±0.58b	3.36±0.85a	3.56±0.44a
3	2.80±1.24a	4.81±0.65b	1.56±1.16a,b	1.81±0.74a	2.38±1.46a	3.03±0.54a
4	0.51±0.57a	1.62±1.12a	1.56±0.18a	1.42±0.50a	1.58±0.8a	1.49±1.36a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 2a Effect of packaging materials on PPO activity of dried longan pulp during storage at 4°C

Time (months)	PPO specific activity(units/mg protein)					
	control			Microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	15.83±1.6b	15.83±1.6b	15.83±1.6b	10.82±0.66a	10.82±0.66a	10.82±0.66a
1	3.76±0.25a	4.68±0.91a	4.80±0.88a	6.68±1.97a,b	4.92±1.01a	8.90±4.04b
2	3.59±1.79a	1.62±1.0a	2.01±0.95a	2.72±0.62a	2.22±1.0a	2.49±0.27a
3	1.83±1.76a	1.21±0.30a	1.22±0.01a	2.80±0.74a	1.64±1.01a	2.21±0.02a
4	1.38±0.34a	1.15±0.89a	1.07±0.34a	1.86±0.99a	1.57±0.21a	1.56±0.28a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 3a Effect of packaging materials on POD activity of dried longan pulp during storage at room temperature

Time (months)	POD specific activityx10^3(units/mg protein)					
	control			Microwave treatment		
	LLDPE	OPP	Foil	OPP	LLDPE	Foil
0	22.08±5.62b	22.08±5.62b	22.08±5.62b	10.95±0.37a	10.95±0.37a	10.95±0.37a
1	14.23±0.27c	14.38±1.06c	15.44±0.56c	8.89±0.78b	8.40±0.68a,b	7.60±0.02a
2	13.99±0.43c	14.30±0.20c	14.86±0.27c	8.40±1.40b	4.84±0.30a	6.60±1.08a
3	12.78±0.23c	13.04±0.41c	14.20±0.44d	7.16±1.41b	4.55±0.34a	5.70±0.41a
4	12.14±0.06c	13.42±0.47d	14.04±0.04e	5.57±0.06b	3.88±0.40a	4.18±0.41a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 4a Effect of packaging materials on POD activity of dried longan pulp during storage at 4°C

Time (months)	POD specific activity x10^3(units/mg protein)					
	control			Microwave treatment		
	LLDPE	OPP	Foil	OPP	OPP	Foil
0	22.08±5.62b	22.08±5.62b	22.08±5.62b	10.95±0.37a	10.95±0.37a	10.95±0.37a
1	19.15±0.11d	19.06±0.32d	17.58±0.49c	10.82±0.41b	9.73±0.20a	9.15±0.46a
2	16.64±0.1d	15.69±0.33c	16.42±0.14c,d	9.77±0.51b	8.70±0.64a	8.28±0.06a
3	14.94±0.31d	15.73±0.52e	13.70±0.15c	7.71±0.25b	7.61±0.05b	5.22±0.05a
4	8.84±0.05e	9.53±0.0f	6.42±0.10c	7.62±0.07d	5.82±0.21b	4.71±0.01a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 5a Effect of packaging materials on PAL activity of dried longan pulp during storage at room temperature

Time (months)	PAL specific activity x 10^ -3(units/mg protein)					
	control			Microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	1.17±0.3a	1.17±0.3a	1.17±0.3a	0.96±0.02a	0.96±0.02a	0.96±0.02a
1	1.34±0.14b	1.37±0.32b	1.14±0.32a,b	0.74±0.0a	0.98±0.2a,b	0.99±0.58a,b
2	1.73±0.06b	1.61±0.04b	1.46±0.17b	1.16±0.16a	1.16±0.18a	1.20±0.07a
3	1.74±0.31b	1.63±0.15b	1.22±0.41a	1.46±0.02a	1.73±0.01b	1.61±0.05b
4	2.01±0.01c	2.32±0.08d	1.40±0.08a	1.78±0.08b	2.50±0.11e	2.00±0.11c

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 6a Effect of packaging materials on PAL activity of dried longan pulp during storage at 4°C

Time (months)	PAL specific activity x 10 ^ -3(units/mg protein)					
	control			Microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	1.17±0.3a	1.17±0.3a	1.17±0.3a	0.96±0.02a	0.96±0.02a	0.96±0.02a
1	1.26±0.11c	1.24±0.17c	1.05±0.12b	0.85±0.05a	0.83±0.07a	0.96±0.05a,b
2	1.48±0.12b	1.30±0.17b	1.12±0.12a	1.22±0.04a	1.08±0.07a	1.02±0.05a
3	1.44±0.12c	1.38±0.12a,b	1.38±0.18a,b	1.25±0.36a	1.45±0.12c	1.25±0.1a
4	1.48±0.06a,b	1.54±0.05b	1.37±0.87a	1.92±0.1d	1.66±0.01c	1.91±0.04d

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 7a Effect of packaging materials on total phenolic content activity of dried longan pulp during storage at room temperature

Time (months)	Total phenolic content(ug/g dry weight)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	513.88±18.68a	513.88±18.68a	513.88±18.68a	516.35±70.08a	516.35±70.08a	516.35±70.08
1	499.87±28.82a	427.32±41.1a	503.01±28.81a	453.94±18.16a	489.64±77.61a	449.18±31.76a
2	470.78±48.36b	360.95±83.3a	467.17±30.5b	436.23±10.28a,b	447.89±10.96a	429.79±21.6a,b
3	378.40±6.61a,b	348.17±5.09a	449.18±10.53c	346.28±37.27a	363.63±10.6a,b	380.49±31.8a,b
4	358.45±36.7a	354.07±55.22a	287.94±66.74a	302.58±52.89a	346.70±83.31a	379.02±52.89a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 8a Effect of packaging materials on total phenolic content of dried longan pulp during storage at 4°C

Time (months)	Total phenolic content(ug/g dry weight)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	513.88±18.68a	513.88±18.68a	513.88±18.68a	516.35±70.08a	516.35±70.08a	516.35±70.08a
1	453.94±18.16b	449.54±0.52b	373.91±27.2a	481.27±42.75b	495.02±0.0b	449.54±20.76b
2	422.57±31.15b	436.05±36.33b	370.21±8.82a	422.76±59.86b	475.10±28.27b	462.93±17.80b
3	378.40±20.56b	382.81±17.8b	332.66±27.46a	379.46±9.26b	407.02±6.96b	436.23±10.28c
4	355.05±30.0b	339.36±8.82b	296.69±40.31a	363.16±0.0b	320.49±20.36b	423.09±20.36c

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 9a Effect of packaging materials on titratable acidity of dried longan pulp during storage at room temperature

Time (months)	titratable acidity(%citric acid)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	0.371±0.07a	0.371±0.07a	0.371±0.07a	0.264±0.05a	0.264±0.05a	0.264±0.05a
1	0.420±0.08a	0.406±0.08a	0.336±0.07a	0.294±0.08a	0.294±0.06a	0.287±0.06a
2	0.385±0.08a	0.406±0.08a	0.315±0.06a	0.282±0.06a	0.259±0.05a	0.266±0.05a
3	0.384±0.0c	0.470±0.0c	0.293±0.06a	0.304±0.0a,b	0.280±0.03a	0.263±0.06a
4	0.394±0.08b	0.341±0.07a,b	0.323±0.0a,b	0.253±0.0a	0.221±0.04a	0.226±0.0a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 10a Effect of packaging materials on titratable acidity of dried longan pulp during storage at 4°C

Time (months)	titratable acidity(% citric acid)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	0.371±0.07a	0.371±0.07a	0.371±0.07a	0.264±0.05a	0.264±0.05a	0.264±0.05a
1	0.371±0.07a	0.273±0.06a	0.315±0.06a	0.234±0.05a	0.234±0.05a	0.256±0.05a
2	0.274±0.06a	0.326±0.07a	0.306±0.06a	0.198±0.04a	0.236±0.05a	0.205±0.04a
3	0.263±0.05a	0.245±0.05a	0.234±0.05a	0.210±0.04a	0.245±0.05a	0.256±0.05a
4	0.233±0.05a	0.199±0.04a	0.210±0.04a	0.245±0.05a	0.234±0.05a	0.210±0.04a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 11a Effect of packaging materials on total soluble solid of dried longan pulp during storage at room temperature

Time (months)	Total soluble solid (° Brix)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	9.1±0.07a	9.1±0.07a	9.1±0.07a	8.8±0.28a	8.8±0.28a	8.8±0.28a
1	8.2±0.28a,b	9.2±0.35d	9.0±0.0c,d	8.5±0.14b,c	8.7±0.14b,c	7.9±0.07a
2	9.4±0.07c	9.7±0.21c	8.8±0.28b	8.8±0.07b	8.6±0.21b	7.8±0.21a
3	9.0±0.0a	9.3±0.14b	9.1±0.07a,b	9.1±0.12a,b	10.1±0.12c	9.0±0.0a
4	10.3±0.12c	9.9±0.12b	9.9±0.12b	9.3±0.14a	9.4±0.28a	9.4±0.0a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 12a Effect of packaging materials on total soluble solid of dried longan pulp during storage at 4°C

Time (months)	Total soluble solid (° Brix)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	9.1±0.07a	9.1±0.07a	9.1±0.07a	8.8±0.28a	8.8±0.28a	8.8±0.28a
1	8.8±0.0c	7.6±0.28a	8.5±0.42b,c	8.1±0.07a,b	8.2±0.07b	9.0±0.0c
2	8.9±0.14b	8.6±0.85a,b	9.3±0.14b	8.0±0.0a	9.2±0.07b	8.7±0.14a,b
3	9.1±0.12a	9.1±0.12a	10.0±0.0b	9.0±0.0a	9.5±0.12a	9.0±0.0a
4	11.0±0.0b	9.0±0.07a	10.6±1.05b	9.6±0.5a,b	9.7±0.14a,b	9.8±0.85a,b

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 13a Effect of packaging materials on *L** value of dried longan pulp during storage at room temperature

Time (months)	*L** value (Lightness)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	38.89±0.28a	38.89±0.28a	38.89±0.28a	51.46±0.63b	51.46±0.63b	51.46±0.63b
1	36.00±0.20a	37.85±0.70b	44.68±0.17d	41.71±0.42c	42.38±0.55c	46.59±0.52e
2	33.90±0.32a	37.15±0.17b	39.69±1.84c,d	38.26±0.47b,c	40.43±0.30d,e	41.96±0.82e
3	32.36±0.14b	29.83±0.13a	37.53±0.29e	34.30±0.17c	32.36±0.09b	36.38±0.09d
4	29.26±0.32b	28.37±0.32a	37.93±0.36d	30.15±0.51c	29.24±0.07b	36.01±0.12e

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 14a Effect of packaging materials on *L** value of dried longan pulp during storage at 4°C

Time (months)	*L** value (Lightness)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	38.89±0.28a	38.89±0.28a	38.89±0.28a	51.46±0.63b	51.46±0.63b	51.46±0.63b
1	41.64±0.75a	42.08±0.40a	50.72±1.23d	47.96±0.50c	44.98±0.55b	52.06±0.67e
2	40.12±0.67a	40.40±0.00a	50.05±0.20d	44.81±0.32c	42.57±0.47b	54.47±0.32e
3	39.38±0.49a	41.16±0.43b	45.60±0.43d	43.22±0.19c	40.60±0.58b	50.60±0.03e
4	38.26±0.01a	40.07±0.00b	44.32±0.45d	42.96±0.15c	40.01±0.46b	51.52±0.01e

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 15a Effect of packaging materials on *a** value of dried longan pulp during storage at room temperature

Time (months)	*a** value (redness)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	5.06±0.092b	5.06±0.092b	5.06±0.092b	4.33±0.11a	4.33±0.11a	4.33±0.11a
1	9.15±0.03c	9.45±0.14d	8.54±0.01b	8.24±0.10b	9.44±0.09b	6.57 ±0.04a
2	9.19±0.04d	9.23±0.27d	8.20±0.04b	9.19±0.12d	8.79±0.14d	7.67±0.14c
3	17.67±0.03e	19.22±0.01f	9.95±0.11b	14.88±0.28c	16.95±0.07d	9.22±0.05a
4	18.88±0.28e	19.95±0.07f	12.38±0.05b	15.22±0.04c	17.53±0.34c	10.74±0.01a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 16a Effect of packaging materials on *a** value of dried longan pulp during storage at 4°C

Time (months)	*a** value (redness)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	5.06±0.092b	5.06±0.092b	5.06±0.092b	4.33±0.11a	4.33±0.11a	4.33±0.11a
1	4.65±0.03a	6.57±0.02c	6.48±0.24c	4.60±0.05a	5.79±0.06b	4.47±0.06a
2	4.63±0.06b	6.99±0.06d	4.94±0.09c	3.52±0.09a	6.99±0.22d	4.94±0.04c
3	6.63±0.07e	7.46±0.11f	5.93±0.02c	5.19±0.11b	6.21±0.01d	3.57±0.04a
4	8.65±0.04d	9.77±0.75e	8.58±0.01d	6.44±0.02b	7.36±0.04c	4.06±0.54a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 17a Effect of packaging materials on *b** value of dried longan pulp during storage at room temperature

Time (months)	*b** value (yellowness)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	19.71±0.17b	19.71±0.17b	19.71±0.17b	16.16±0.33a	16.16±0.33a	16.16±0.33a
1	18.40±0.09b	19.06±0.47c	21.39±0.02d	15.45±0.10d	18.27±0.41b	18.46±0.22b
2	17.66±0.09c	15.76±0.47a	17.66±0.29c	17.99±0.43c	16.23±0.21b	16.21±0.11b
3	11.50±0.11b	10.40±0.22a	12.38±0.35c	12.42±0.05c	11.75±0.02b	15.11±0.02d
4	8.18±0.27b	6.88±0.20a	11.06±0.05c	10.98±0.14c	8.64±0.02b	14.69±0.05d

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 18a Effect of packaging materials on *b** value of dried longan pulp during storage at 4°C

Time (months)	*b** value (yellowness)					
	control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	19.71±0.17b	19.71±0.17b	19.71±0.17b	16.16±0.33a	16.16±0.33a	16.16±0.33a
1	17.96±0.38b	17.63±0.22b	18.18±0.61b	15.61±0.32a	18.12±0.30b	20.72±0.52c
2	18.25±0.65b	15.25±0.28a	18.05±0.06b	15.68±0.10a	19.05±0.74c	22.29±0.09d
3	18.53±0.81b	15.35±0.74a	18.26±0.19b	15.27±0.16a	18.23±0.09b	21.27±0.10c
4	17.48±0.32b	15.25±0.00a	18.98±0.54c	15.07±0.46a	18.64±0.01c	20.87±0.31d

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 19a Effect of packaging materials on water activity and moisture content of dried longan pulp during storage at room temperature

Time (months)	water activity						moisture content(% wet basis)					
	control			microwave treatment			control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	0.50±0.06a	0.50±0.06a	0.50±0.06a	0.46±0.00a	0.46±0.00a	0.46±0.00a	13.3±0.47b	13.3±0.47b	13.3±0.47b	12.0±0.21a	12.0±0.21a	12.0±0.21a
1	0.54±0.00d	0.55±0.00d	0.55±0.00d,e	0.48±0.01b	0.50±0.00c	0.47±0.00a	13.3±0.15c	13.7±0.1d	12.6±0.05b	12.1±0.1a	12.6±0.2b	12.0±0.05a
2	0.52±0.00c	0.54±0.01c	0.51±0.01b	0.48±0.01a	0.48±0.00a	0.48±0.00a	13.8±0.15d	13.9±0.1d	12.9±0.05c	12.7±0.12c	12.4±0.25b	11.9±0.04a
3	0.55±0.01c	0.61±0.00d	0.54±0.00b	0.54±0.01b	0.54±0.01b	0.49±0.01a	13.3±0.14c	13.6±0.1c	12.6±0.24b	11.4±0.16a	12.8±0.01b	11.1±0.12a
4	0.59±0.00c	0.61±0.01c	0.58±0.01a,b	0.55±0.01a,b	0.56±0.00a,b	0.54±0.01a	13.6±0.06d	13.7±0.05d	12.1±0.14c	11.4±0.0b	13.3±0.36d	10.7±0.04a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Table 20a Effect of packaging materials on water activity and moisture content of dried longan pulp during storage at 4°C

Time (months)	water activity						moisture content(% wet basis)					
	control			microwave treatment			control			microwave treatment		
	LLDPE	OPP	Foil	LLDPE	OPP	Foil	LLDPE	OPP	Foil	LLDPE	OPP	Foil
0	0.50±0.06a	0.50±0.06a	0.50±0.06a	0.46±0.00a	0.46±0.00a	0.46±0.00a	13.3±0.47b	13.3±0.47b	13.3±0.47b	12.0±0.21a	12.0±0.21a	12.0±0.21a
1	0.50±0.00b,c	0.51±0.00c	0.48±0.00a	0.50±0.00b	0.50±0.00b,c	0.48±0.00a	13.3±0.15e	13.6±0.05e	12.8±0.1d	11.5±0.1c	11.8±0.2b	10.6±0.02a
2	0.50±0.00b,c	0.50±0.00c	0.50±0.00b,c	0.50±0.00b,c	0.49±0.00a,b	0.49±0.00a,b	12.2±0.2c	13.1±0.1d	12.4±0.04c	10.3±0.09b	9.3±0.18a	10.2±0.05b
3	0.52±0.01d	0.51±0.01c,d	0.49±0.01a,b	0.48±0.00a,b	0.49±0.00b,c	0.47±0.00a	12.7±0.18c	13.1±0.06c	11.9±0.14b	11.6±0.1b	12.9±0.08c	10.6±0.18a
4	0.51±0.01d	0.51±0.01d	0.45±0.00a	0.49±0.00c	0.48±0.00c	0.46±0.00b	12.7±0.10b	13.1±0.08b	10.6±0.08a	12.7±0.14b	13.0±0.50b	10.6±0.05a

mean±SD. Values within a row followed by different letters were significantly different ($p<0.05$).

Appendix B

Pictures of dried longan pulp

0 month							
1 month							
2 month							
3 month							
4 month							
	control	450 W/40s	450 W/60s	450 W/90s	900 W/40s	900 W/60s	900 W/90s

Figure 1b Dried longan pulp was pretreated by microwave heating at 450 W and 900 W for 40, 60 and 90 s stored in aluminum foil bag for 4 months at room temperature

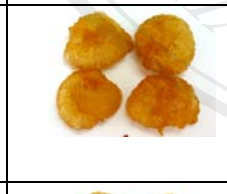
0 month							
1 month							
2 month							
3 month							
4 month							
	control	450 W/40s	450 W/60s	450 W/90s	900 W/40s	900 W/60s	900 W/90s

Figure 2b Dried longan pulp was pretreated by microwave heating at 450 W and 900 W for 40, 60 and 90 s stored in aluminum foil bag for 4 months at 4°C

0 month						
1 month						
2 month						
3 month						
4 month						
	Control/LLDPE bag	MW/ LLDPE bag	Control/ OPP bag	MW/OPP bag	Control/foil bag	MW/ foil bag

Figure 3b Dried longan pulp was pretreated by microwave heating and non-treated sample stored in LLDPE, OPP and aluminum foil bags for 4 months at room temperature

0 month						
1 month						
2 month						
3 month						
4 month						
	Control/LLDPE bag	MW/ LLDPE bag	Control/ OPP bag	MW/OPP bag	Control/foil bag	MW/ foil bag

Figure 4b Dried longan pulp was pretreated by microwave heating and non-treated sample stored in LLDPE, OPP and aluminum foil bags for 4 months at 4°C

Appendix C

Financial cost of dried-longan pulp production

1. Total cost of dried longan pulp production (Dararatana, 1999)

1.1 Longan fruit 300 kg x 20 Baht	=	6,000	Baht
1.2 Energy cost + fuel cost	=	800.00	Baht
1.3 Labor cost (seeding price + 1 person)	=	1,100	Baht
Total cost	**=**	**7,900**	**Baht**

Finally, dried longan product = 27 kg

Total value (300 Baht/kg) = 8,100 Baht

Profit 8,100-7,900 = 200 Baht

2. Total cost of microwave-pretreated dried longan pulp production

1.1 Longan fruit 300 kg x 20 Baht	=	6,000	Baht
1.2 Energy cost			
1.2.1 Microwave heating (450 W/ 90 s)	=	10.12* Baht	
1.2.2 Hot-air oven (1,000 W, 7 h)	=	20.00*	Baht
1.3 Labor cost (seeding price + 1 person)	=	1,100	Baht
Total cost	**=**	**7,130.12**	**Baht**

Finally, dried longan product = 27 kg

Total value (300 Baht/kg) = 8,100 Baht

Profit 8,100-7,130.12 = 969.88 Baht

Note; - * 1 unit of energy = 3 Baht

- hardware and microwave oven cost was not calculated

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Effects of Microwave Heat Treatment on Enzymatic Browning Activities in Dried Longan Pulp

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Abstract

Rapid browning during processing and storage is the main problem in the dehydration of foods. The enzymes which catalyse the browning reaction are polyphenol oxidase(PPO), phenylalanine ammonia-lyase(PAL) and peroxidase(POD). These reaction cause deterioration and loss in nutritional value. A microwave heat treatment is an alternative method of enzyme inactivation. The objective of this study was to determine the effect of microwave blanching on the quality of dried longan. Freshly longan pulp was heated in microwave oven at varying levels of power and for varying time periods. The enzyme activities (PPO, POD and PAL) were determined after the drying process. The results showed that the microwave heat treatment at 900 watts for 90s had the highest percentage of inactivation. PPO, POD and PAL enzyme activities in dried longan pulp were inactivated by 52%, 46% and 70%, respectively. These results indicated that the microwave heat treatment effectively prevented the browning reaction associated with PPO, PAL and POD activities.

Objective

In this study, the effect of microwave heat treatment on the quality of dried longan pulp was determined.

Introduction

The longan (*Dimocarpus longan Lour.*) is an important tropical fruit of Thailand. However, the dried longan products have a very short shelf life due to the enzymatic browning reaction and non-enzymatic reaction during processing and storage.

Enzymatic browning is attributed to oxidation of phenolic due to polyphenol oxidase(PPO) and peroxidase(POD) enzymes, that produce brown-colour pigments. Besides, phenylalanine ammonia lyase(PAL) is the first enzyme also involved in the synthesis of phenolic.

There are many method used for control the browning such chemical treatment especially bisulphites are most effective in preventing browning, but they can be dangerous to human health. Thus alternative treatment without toxic effect are needed.

Microwave heat treatment has been applied successfully in the inactivation of enzymes. The advantages of using the microwave heating are 1) in-depth heating 2) inactivation of enzyme and 3) avoidance of the leaching of vitamins and the other components. In these studies, a more detailed study of the effectiveness of the microwave heat treatment on PPO, POD and PAL activities and total phenolic content of dried longan were determined.

Materials and Methods

The fresh longan pulp was treated in microwave oven

The microwave treated longan pulp was dried in hot-air dryer

Microwave treated dried longan pulp

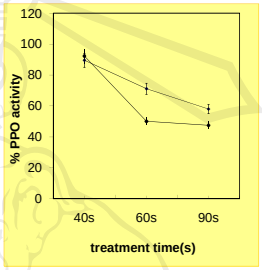
1.Determination of enzymatic assays
- PPO activity
- POD activity
- PAL activity

2. Determination of total phenolic content

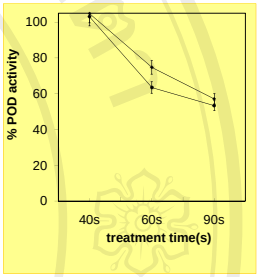
Results and Discussions

Effects of microwave heat treatment on PPO, POD and POD activities and total phenolic content

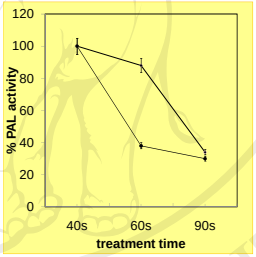
As shown in Fig. 1, the application of a microwave treatment at 450W could inactivate PPO in dried longan pulp (10% for 40s, 30% for 60s and 42% for 90s), POD(25% for 60s and 43% for 90s) and PAL(12% for 60s and 66% for 90s). While, the treatment at 900W was also exhibited the inactivation of PPO(8% for 40s, 50% for 60s and 52% for 90s), POD (36% for 60s and 46% for 90s) and PAL(62% for 60s and 70% for 90s).



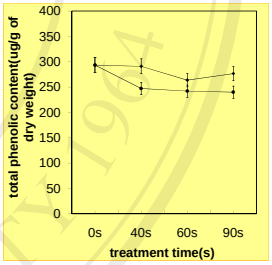
(a)



(b)



(c)



(d)

Figure 1 *Effects of microwave heat treatment on PPO(a), POD(b) and PAL(c) activities and total phenolic content(d) ■ 450W, ● 900W*

The total phenolic content of microwave treated dried longan pulp had slightly decrease when increasing of power and time (Fig.1(d)). Treatment at 900W for 90s showed the greatest loss of the total phenolic content which associated with the decreasing of PPO, POD and PAL activity.

Conclusions

These results showed that the microwave heat treatment at 900W for 90s could inactivate 52, 46 and 70% of the PPO, POD and PAL activities, respectively. In addition, the results also showed that the microwave heat treatment was effectively prevent the browning reaction associated with PPO, PAL and POD activities.

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