Optimizing Uniaxial Oil Extraction of Bulk Rapeseeds; Spectrophotometric and Chemical analyses of the Extracted Oil under Pretreatment Temperatures and Heating Intervals

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Table S1. Correlation analysis of the chemical properties with the factors effect.

Dependent variables	**Temperature T_{PR} (°C)**	**Heating time H_{TM} (min)**
Peroxide value (meq O_2/kg)	0.200	0.768
P value	> 0.05	< 0.05
Acid value (mg KOH/g oil)	0.074	–0.184
P value	> 0.05	> 0.05
Free fatty acid (mg KOH/g oil)	0.074	–0.184
P value	> 0.05	> 0.05

P values < 0.05 indicate significant; *P* values > 0.05 denote indicates non-significant.

Table S2. Multiple regression results of the chemical properties with the factors effect.

Effect	**Peroxide value (meq O_2/kg), Model**	**Standard Error**	**t-value**	**P value**
Intercept	2.390	0.889	2.686	< 0.05
T_{PR} (°C)	0.015	0.012	1.276	> 0.05
H_{TM} (min)	0.039	0.008	4.888	< 0.05
Effect	Acid value (mg KOH/g oil), Model	Standard Error	t-value	P value
Intercept	1.498	0.346	4.324	< 0.05
T_{PR} (°C)	0.001	0.004	0.293	> 0.05
H_{TM} (min)	–0.002	0.003	–0.727	> 0.05
Effect	Free fatty acid (mg KOH/g oil), Model	Standard Error	t-value	P value
Intercept	0.753	0.174	4.324	< 0.05
T_{PR} (°C)	0.001	0.002	0.292	> 0.05
H_{TM} (min)	–0.001	–0.002	–0.727	> 0.05

T_{PR}: temperature (°C); H_{TM}: heating time (min); *P* values < 0.05 indicate significant; *P* values > 0.05 denote indicates non-significant.

Table S3. Test of sum of squares whole model of the factors effect on the peroxide value, acid value and free fatty acid value of rapeseed oil.

Dependent variables	R^2	F-value	P value
Peroxide value (meq O_2/kg)	0.629	12.762	< 0.05
Acid value (mg KOH/g oil)	0.039	0.307	> 0.05
Free fatty acid (mg KOH/g oil)	0.039	0.037	> 0.05

P values < 0.05 indicate significant; *P* values > 0.05 denote indicates non-significant

Table S4. Post-hoc tests of peroxide value of rapeseed oil with the factors effect.

Post-hoc tests	Temperature T_{PR} (°C)	N	Subset 1	Subset 2	Heating time H_{TM} (min)	N	Subset 1	Subset 2	Subset 3
Turkey HSD	40	6	5.097	**	30	6	4.613	**	
	80	6	5.711	5.711	60	6	5.416	**	
	60	6	**	6.186	90	6	**	6.966	
	P-value		0.197	0.354	P-value		0.083	1.000	
Duncan	40	6	5.097	**	30	6	4.613	**	**
	80	6	5.711	5.711	60	6	**	5.416	**
	60	6	**	6.186	90	6	**	**	6.966
	P-value		0.092	0.179	P-value		1.000	1.000	1.000

HSD: Honestly Significance Difference; Means for groups in homogeneous subsets are displayed. ** The mean difference is significant at 0.05 level. P values > 0.05 indicate non-significant.

Table S5. Tests of normality of absorbance, A (-) of rapeseed oil with the factors effect.

		Kolmogorov-Smirnov			Shapiro-Wilk		
A (-)	W_L (nm)	R^2	df	P value	R^2	df	P value
	325	0.121	27	0.200	0.970	27	0.608
	330	0.109	27	0.200	0.969	27	0.571
	335	0.106	27	0.200	0.972	27	0.661
	340	0.266	27	0.000	0.717	27	0.000
	345	0.292	27	0.000	0.729	27	0.000
	350	0.299	27	0.000	0.767	27	0.000
	355	0.299	27	0.000	0.754	27	0.000
	360	0.168	27	0.049	0.921	27	0.041
	365	0.235	27	0.001	0.844	27	0.001
	370	0.279	27	0.000	0.834	27	0.001
	375	0.272	27	0.000	0.813	27	0.000
	380	0.255	27	0.000	0.806	27	0.000
	385	0.241	27	0.000	0.819	27	0.000
	390	0.253	27	0.000	0.828	27	0.000
	395	0.239	27	0.000	0.868	27	0.003
	400	0.216	27	0.002	0.901	27	0.014
	405	0.159	27	0.079	0.911	27	0.024
	410	0.185	27	0.019	0.914	27	0.028
	415	0.167	27	0.052	0.916	27	0.032
	420	0.153	27	0.106	0.922	27	0.044
	425	0.111	27	0.200	0.908	27	0.020

	430	0.172	27	0.038	0.846	27	0.001
	435	0.191	27	0.013	0.856	27	0.001
	440	0.177	27	0.029	0.868	27	0.003
	445	0.262	27	0.000	0.756	27	0.000
	450	0.123	27	0.200	0.913	27	0.027
	455	0.189	27	0.015	0.851	27	0.001
	460	0.208	27	0.004	0.726	27	0.000
	465	0.100	27	0.200	0.953	27	0.250
	470	0.094	27	0.200	0.946	27	0.171
	475	0.100	27	0.200	0.941	27	0.130
	480	0.123	27	0.200	0.940	27	0.120
	485	0.130	27	0.200	0.937	27	0.101
	490	0.100	27	0.200	0.948	27	0.189
	495	0.098	27	0.200	0.966	27	0.508
	500	0.096	27	0.200	0.964	27	0.460
	505	0.160	27	0.073	0.914	27	0.029
	510	0.122	27	0.200	0.940	27	0.120
	515	0.136	27	0.200	0.944	27	0.149
	520	0.142	27	0.172	0.944	27	0.151
	525	0.142	27	0.176	0.945	27	0.162
	530	0.142	27	0.174	0.946	27	0.170
	535	0.142	27	0.170	0.946	27	0.170
	540	0.138	27	0.200	0.946	27	0.169
	545	0.137	27	0.200	0.945	27	0.160
	550	0.139	27	0.197	0.945	27	0.160
	555	0.136	27	0.200	0.943	27	0.145
	560	0.131	27	0.200	0.942	27	0.140
	565	0.131	27	0.200	0.942	27	0.137
	570	0.130	27	0.200	0.941	27	0.128
	575	0.129	27	0.200	0.940	27	0.124
	580	0.129	27	0.200	0.939	27	0.118
	585	0.131	27	0.200	0.939	27	0.116
	590	0.129	27	0.200	0.939	27	0.117
	595	0.126	27	0.200	0.939	27	0.117
	600	0.126	27	0.200	0.940	27	0.119

P values > 0.05 denote normal distribution of the data; P values < 0.05 denote the data are not normally distributed; R^2 is the coefficient of determination.

Table S6. Tests of normality of transmittance, T (%) of rapeseed oil with the factors effect.

		Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
T (%)	**W_L (nm)**	**R^2**	**df**	**P value**	**R^2**	**df**	**P value**
	325	0.155	27	0.096	0.966	27	0.494
	330	0.115	27	0.200	0.976	27	0.768
	335	0.069	27	0.200	0.985	27	0.955
	340	0.174	27	0.036	0.888	27	0.007
	345	0.166	27	0.053	0.901	27	0.014
	350	0.159	27	0.077	0.879	27	0.005
	355	0.141	27	0.183	0.929	27	0.065
	360	0.161	27	0.070	0.940	27	0.122
	365	0.206	27	0.005	0.887	27	0.007
	370	0.242	27	0.000	0.870	27	0.003
	375	0.226	27	0.001	0.856	27	0.002

380	0.216	27	0.002	0.839	27	0.001
385	0.234	27	0.001	0.843	27	0.001
390	0.218	27	0.002	0.857	27	0.002
395	0.192	27	0.012	0.920	27	0.039
400	0.167	27	0.052	0.914	27	0.029
405	0.160	27	0.075	0.906	27	0.019
410	0.185	27	0.018	0.892	27	0.009
415	0.271	27	0.000	0.859	27	0.002
420	0.271	27	0.000	0.859	27	0.002
425	0.278	27	0.000	0.783	27	0.000
430	0.405	27	0.000	0.652	27	0.000
435	0.384	27	0.000	0.683	27	0.000
440	0.342	27	0.000	0.733	27	0.000
445	0.405	27	0.000	0.656	27	0.000
450	0.423	27	0.000	0.597	27	0.000
455	0.495	27	0.000	0.476	27	0.000
460	0.423	27	0.000	0.597	27	0.000
465	0.327	27	0.000	0.811	27	0.000
470	0.207	27	0.004	0.856	27	0.002
475	0.220	27	0.002	0.872	27	0.003
480	0.264	27	0.000	0.788	27	0.000
485	0.325	27	0.000	0.779	27	0.000
490	0.247	27	0.000	0.849	27	0.001
495	0.168	27	0.048	0.914	27	0.029
500	0.143	27	0.162	0.948	27	0.189
505	0.118	27	0.200	0.936	27	0.097
510	0.074	27	0.200	0.963	27	0.439
515	0.087	27	0.200	0.963	27	0.432
520	0.115	27	0.200	0.961	27	0.387
525	0.124	27	0.200	0.962	27	0.414
530	0.122	27	0.200	0.962	27	0.417
535	0.116	27	0.200	0.963	27	0.422
540	0.115	27	0.200	0.962	27	0.412
545	0.115	27	0.200	0.962	27	0.400
550	0.115	27	0.200	0.961	27	0.390
555	0.119	27	0.200	0.960	27	0.370
560	0.120	27	0.200	0.959	27	0.359
565	0.123	27	0.200	0.959	27	0.355
570	0.125	27	0.200	0.959	27	0.345
575	0.128	27	0.200	0.959	27	0.351
580	0.129	27	0.200	0.959	27	0.350
585	0.129	27	0.200	0.958	27	0.336
590	0.131	27	0.200	0.958	27	0.340
595	0.129	27	0.200	0.959	27	0.347
600	0.126	27	0.200	0.959	27	0.352

P values > 0.05 denote normal distribution of the data; P values < 0.05 denote the data are not normally distributed; R^2 is the coefficient of determination.

Table S7. Correlation analysis of the absorbance and transmittance of rapeseed oil with the factors effect.

Effect	Absorbance, A (-)	Transmittance, T (%)
W_L (nm)	–0.505	0.455
P-value	< 0.05	< 0.05
T_{PR} (°C)	0.008	0.166
P-value	< 0.05	< 0.05
H_{TM} (min)	0.019	–0.029
P-value	> 0.05	> 0.05

W_L: Wavelength (nm); T_{PR}: temperature (°C); H_{TM}: heating time (min); P values < 0.05 indicate significant; P values > 0.05 denote indicates non-significant.

Table S8. Multivariate tests of significance of the factors effects on absorbance (-) and transmittance, T (%).

Effect	Test	Value	F-value	Effect df	Error df	P value
Intercept	Wilks Lambda	0.547	624.489	2	1507	< 0.05
W_L (nm)	Wilks Lambda	0.745	258.288	2	1507	< 0.05
T_{PR} (°C)	Wilks Lambda	0.857	125.360	2	1507	< 0.05
H_{TM} (min)	Wilks Lambda	0.999	0.979	2	1507	> 0.05

W_L: Wavelength (nm); T_{PR}: temperature (°C); H_{TM}: heating time (min); P values < 0.05 indicate significant; P values > 0.05 denote indicates non-significant.

Table S9. Multiple regression analysis of the factors effect on absorbance, A (-) and transmittance, T (%).

	Absorbance, A (-)			
Effect	Model	Standard Error	t-value	P value
Intercept	4.303749	0.152415	28.237	< 0.05
W_L (nm)	–0.005874	0.000258	–22.726	< 0.05
T_{PR} (°C)	0.000464	0.001279	0.363	> 0.05
H_{TM} (min)	0.000725	0.000853	0.851	> 0.05
	Transmittance, T (%)			
Effect	Model	Standard Error	t-value	P value
Intercept	–34.9241	2.425593	–14.398	< 0.05
W_L (nm)	0.0831	0.004113	20.198	< 0.05
T_{PR} (°C)	0.1497	0.020355	7.353	< 0.05
H_{TM} (min)	–0.0174	0.013570	–1.283	> 0.05

W_L: Wavelength (nm); T_{PR}: temperature (°C); H_{TM}: heating time (min); P values < 0.05 indicate significant; P values > 0.05 denote indicates non-significant.

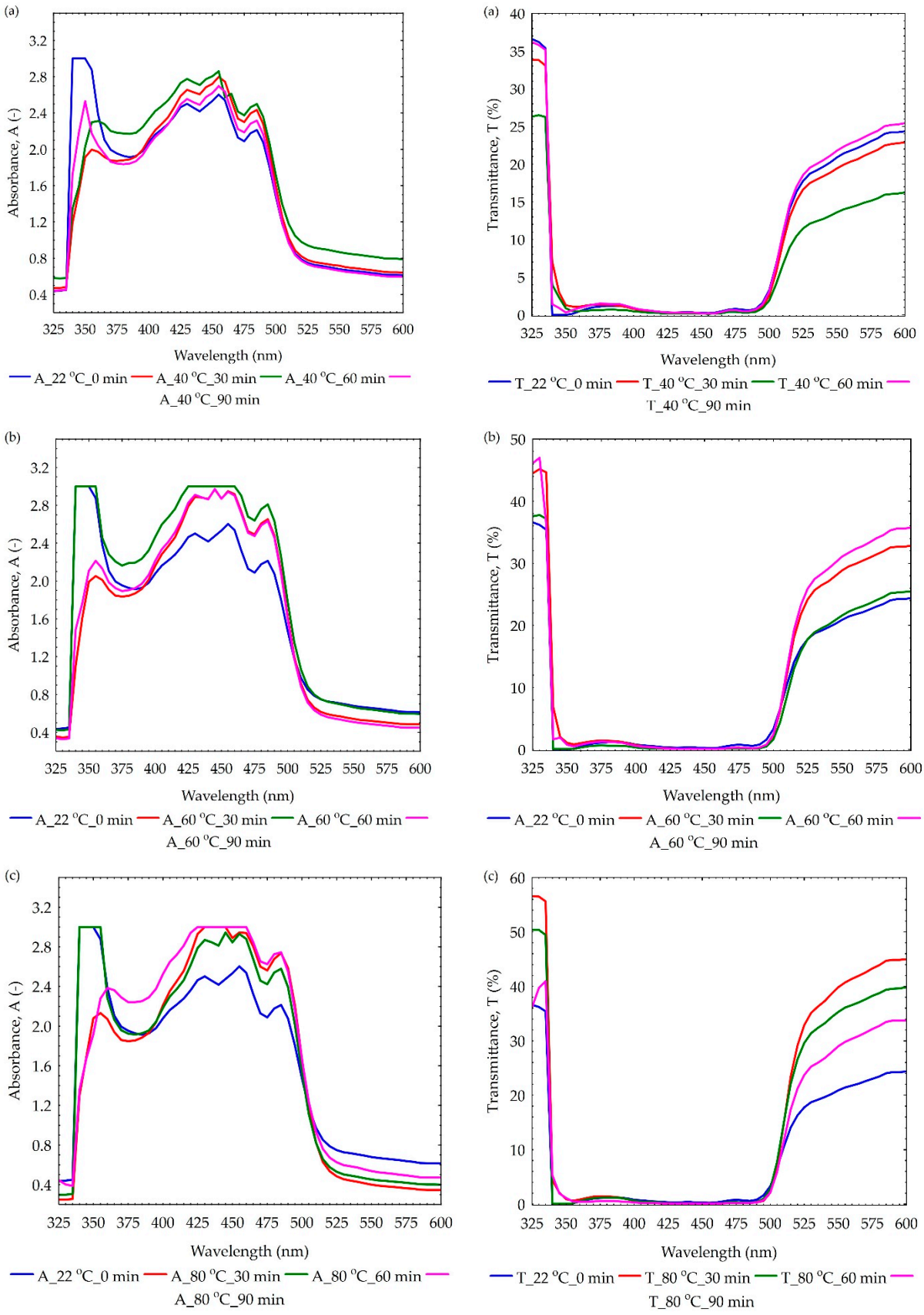

Figure S1. Absorbance and tranmittance versus wavelength of rapeseed oil at laboratory temperature, pretreatment temperatures and heating times (a to c).