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Supplementary Material

Physicochemical Characterisation of Polysaccharide Films with Embedded Bioactive Substances

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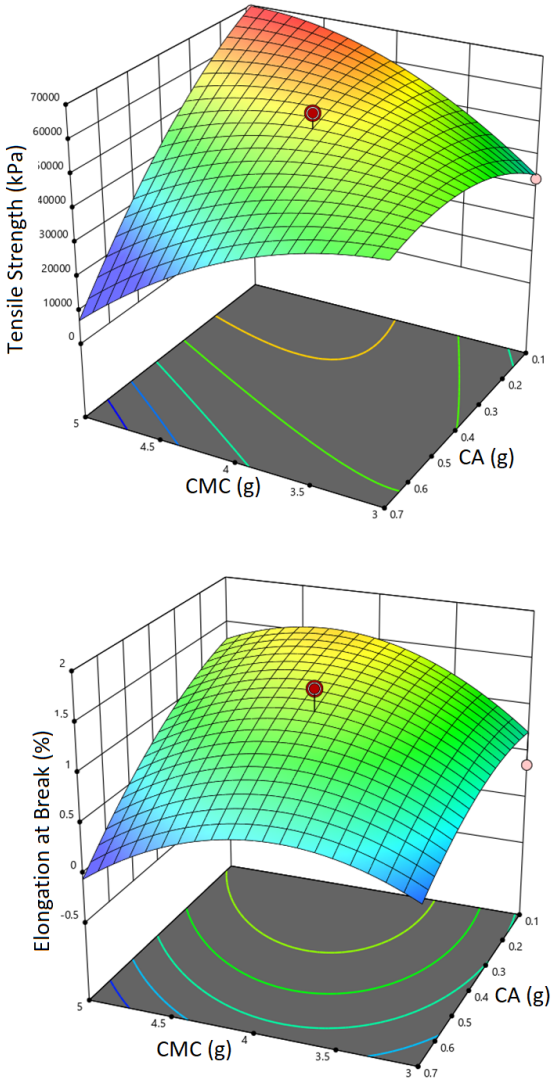

Figure S1. Response surface plots representing the effect of Sodium Carboxymethyl cellulose (CMCNa) and citric acid (CA) concentration on Tensile strength (A) and Elongation at break (B).

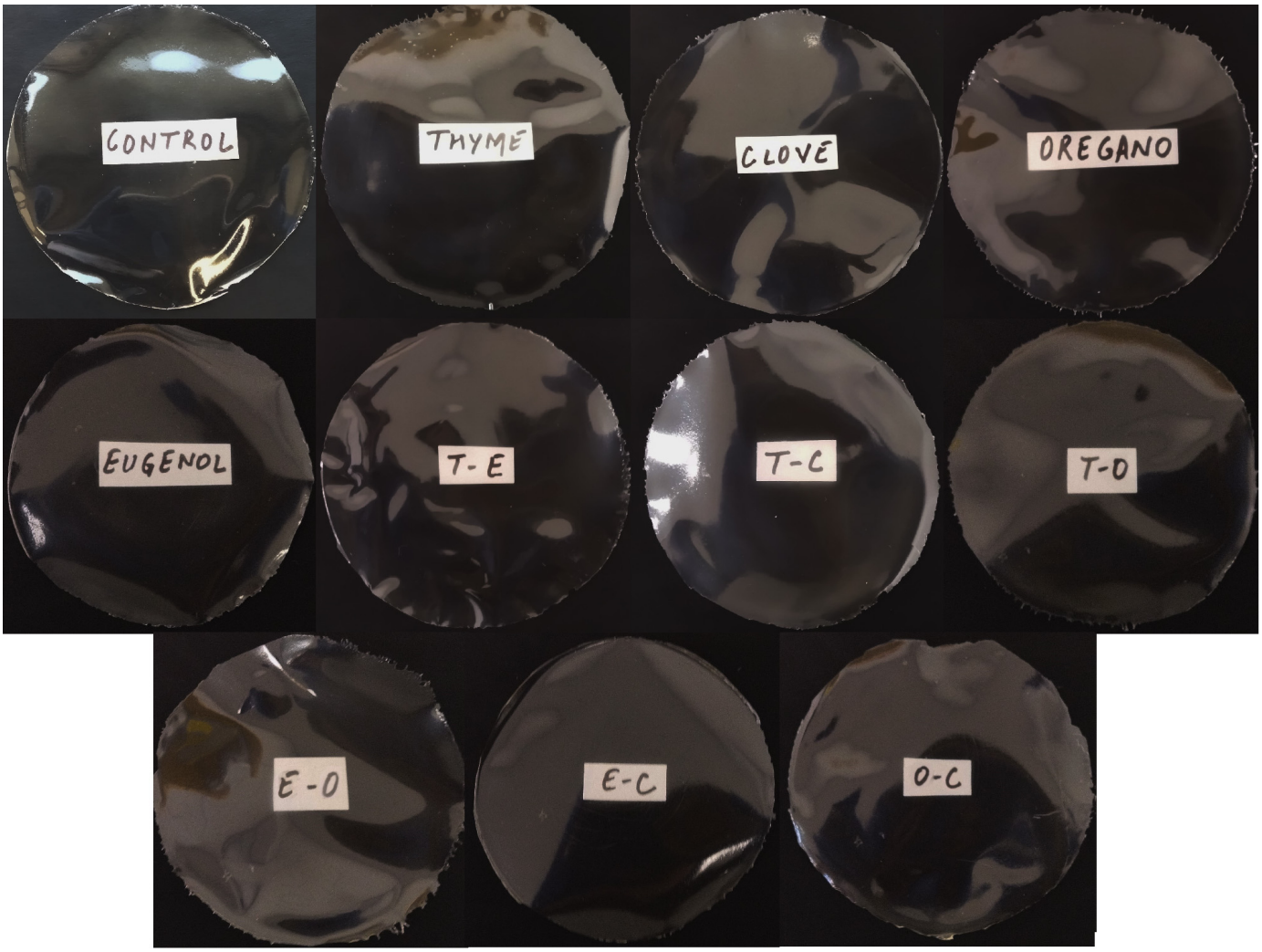

Figure S2. Physical appearance of the prepared films

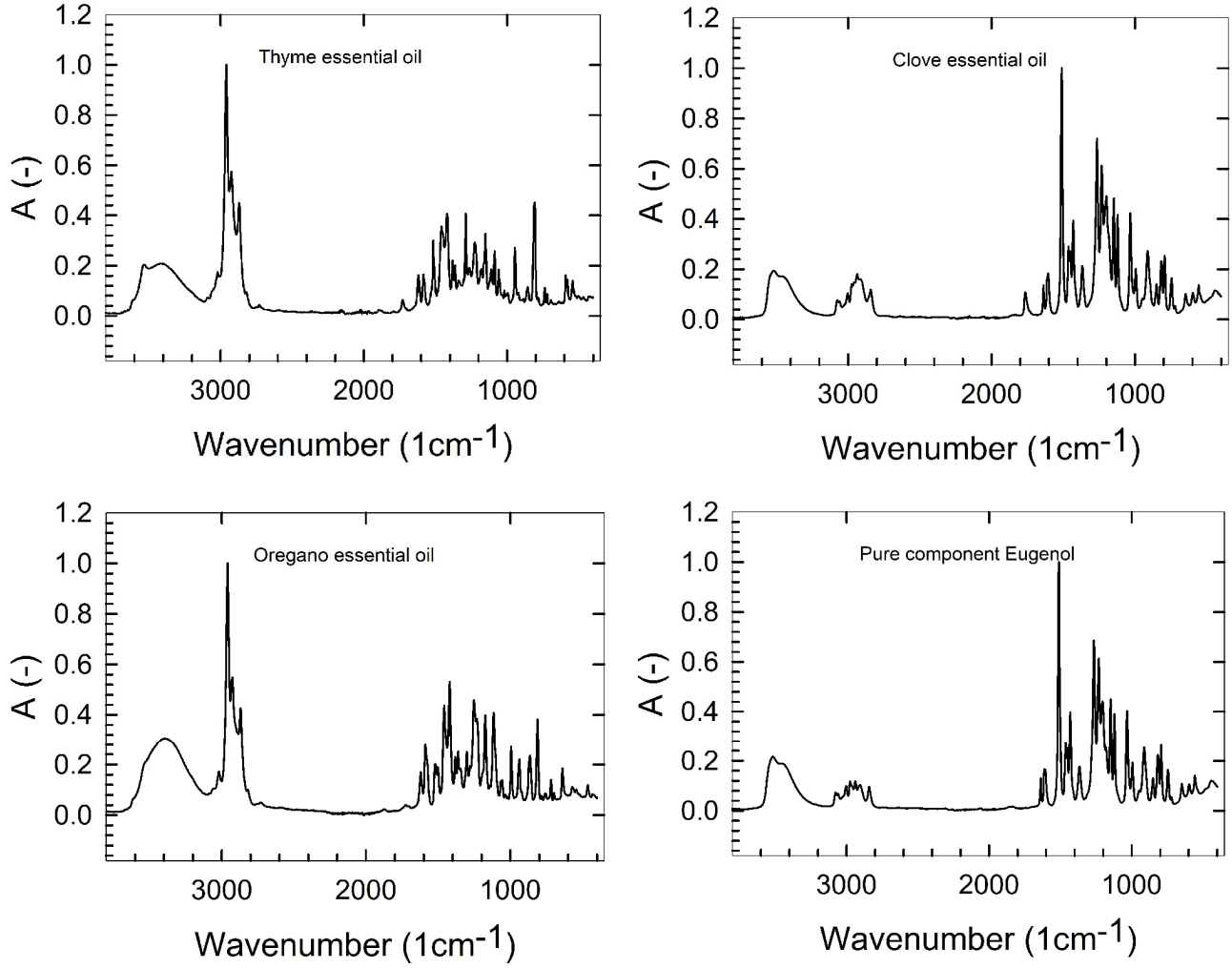

Figure S3. FT-IR analysis of the pure bioactive substances.

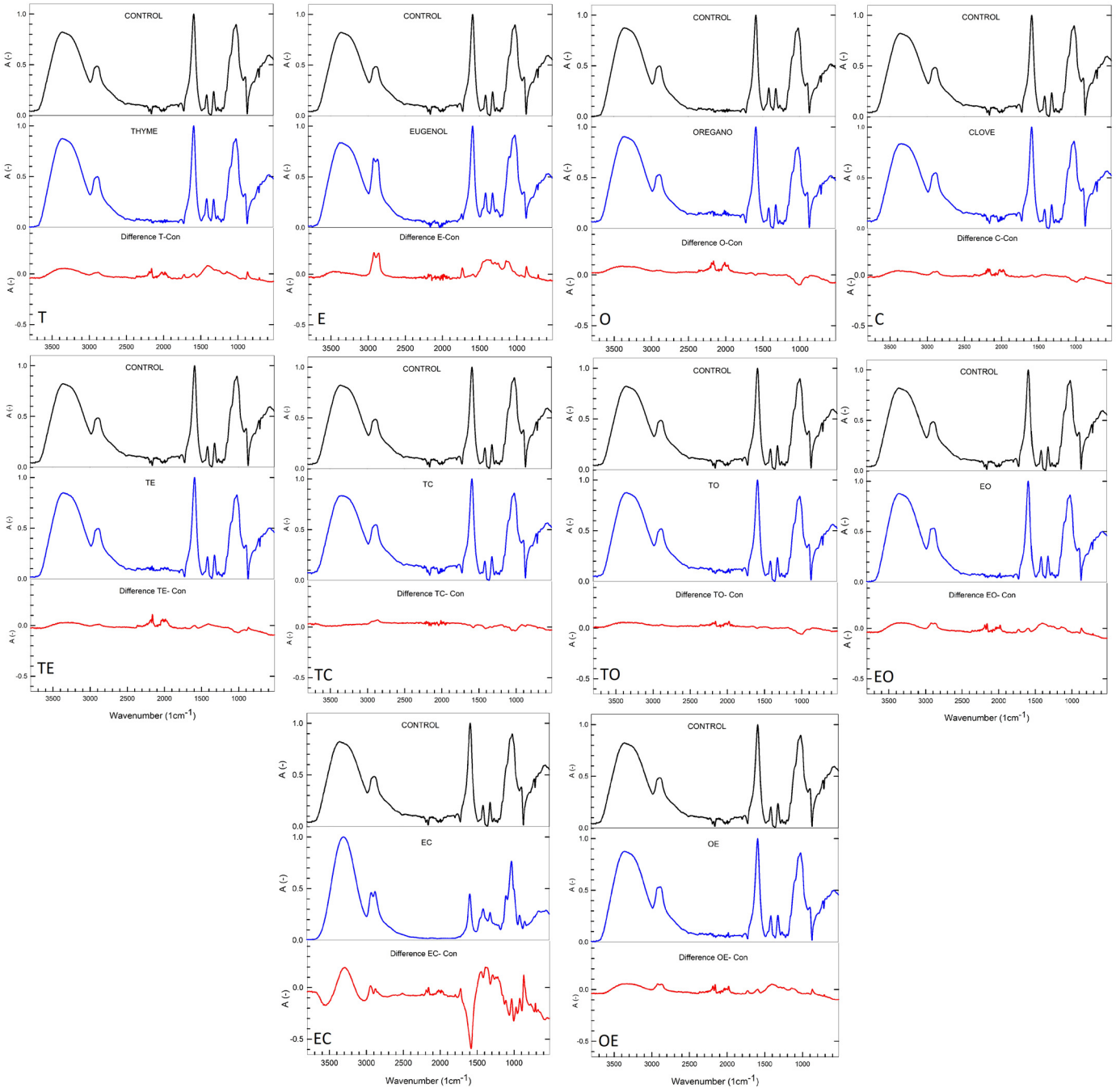

Figure S4. FT-IR analysis of films with bioactive components. The graphs are presented after subtracting the sample values from the control values to show the presence of bioactive components.

Table S1. Mechanical properties of the samples.

Sample	Tensile strength (MPa)	Elongation at break (%)	Elastic modulus (GPa)
Con	0.87 ± 0.07[a]	1.18 ± 0.06 [a]	5.51 ± 0.51 [a]
T	0.73 ± 0.24 [a]	1.69 ± 0.71 [a]	4.61 ± 1.69 [a]
E	0.58 ± 0.16 [a]	1.24 ± 0.33 [a]	5.40 ± 0.30 [a]
O	0.61 ± 0.05 [a]	1.77 ± 0.51 [a]	4.85 ± 0.87 [a]
C	0.87 ± 0.07 [a]	1.39 ± 0.12 [a]	4.62 ± 0.64 [a]
T-E	0.96 ± 0.25 [a]	2.06 ± 0.60 [a]	4.62 ± 1.07 [a]
T-O	0.78 ± 0.16 [a]	1.72 ± 0.30 [a]	4.83 ± 0.48 [a]
T-C	0.79 ± 0.29 [a]	1.46 ± 0.57 [a]	4.44 ± 0.11 [a]
E-O	0.55 ± 0.06 [a]	1.27 ± 0.43 [a]	4.03 ± 0.79 [a]
E-C	0.76 ± 0.09 [a]	2.44 ± 0.96 [a]	3.16 ± 0.45 [a]
O-C	0.65 ± 0.22 [a]	1.15 ± 0.33 [a]	5.01 ± 1.06 [a]

Results are mentioned as arithmetic mean ± standard deviation of three replicates. The values followed by the same letters in the same raw are not significantly different at the significance level of $p \leq 0.05$ by the Tukey test.

Table S2. Antioxidant activity (presented as % inhibition) of the samples at 4 °C.

Sample	DW @ 4°	AA	EtOH 10%	EtOH 50%
Con	22.62 ± 0.62[a]	15.80 ± 2.01[a]	23.77 ± 2.47[a]	21.84 ± 2.92[a]
T	28.59 ± 5.81[a]	18.55 ± 2.37[a]	38.99 ± 4.67[a]	37.38 ± 8.39[a]
E	76.77 ± 7.78[b]	34.14 ± 4.75[b]	50.33 ± 9.20[b]	72.99 ± 1.40[a]
O	22.15 ±0.45[a]	12.37 ± 2.29[a]	30.51 ± 4.99[b]	29.38 ± 2.89[a]
C	48.43 ± 5.44[c]	30.11 ± 4.27[a]	48.47 ± 10.08[b]	68.78 ± 3.85[a]
T-E	27.19 ± 12.43[a]	21.89 ± 4.04[ab]	39.77 ± 8.14[ab]	50.92 ± 3.81[a]
T-O	24.29 ± 4.37[a]	15.02 ± 3.54[ab]	26.40 ± 3.89[ab]	30.80 ± 5.11[a]
T-C	64.69 ± 9.00[b]	30.75 ± 3.59[ab]	68.97 ± 1.27[c]	66.40 ± 7.00[a]
E-O	74.84 ± 1.40[b]	26.58 ± 4.77[ab]	50.14 ± 12.31[c]	58.74 ± 1.85[a]
E-C	59.49 ± 7.35[b]	10.35 ± 3.16[b]	58.22 ± 9.08[c]	80.84 ± 2.42[b]
O-C	43.74 ± 9.94[ac]	21.94 ± 1.69[ab]	48.13 ± 10.9[ab]	64.02 ± 4.23[a]

Results are mentioned as arithmetic mean ± standard deviation of three replicates. The values followed by the same letters in the same raw are not significantly different at the significance level of $p \leq 0.05$ by the Tukey test.

Table S3. Antioxidant activity (presented as % inhibition) of the samples at 25 °C.

Sample	DW @ 25°	AA	EtOH 10%	EtOH 50%
Con	20.77 ± 0.65[a]	16.15 ± 1.47[a]	17.38 ± 0.97[a]	10.10 ± 7.96[a]
T	51.39 ± 1.65[a]	23.52 ± 3.68[a]	29.72 ± 1.26[a]	41.34 ± 5.78[a]
E	60.16 ± 0.46[b]	44.54 ± 11.2[a]	33.52 ± 1.12[a]	64.16 ± 6.80[a]
O	21.95 ± 1.40[b]	24.94 ± 2.86[a]	17.32 ± 0.37[a]	23.18 ± 4.84[a]
C	66.60 ± 0.64[c]	46.10 ± 3.12[a]	37.93 ± 1.68[a]	67.26 ± 7.92[a]

T-E	44.12 ± 0.40^{b}	37.56 ± 2.17^{a}	54.26 ± 1.58^{a}	47.42 ± 4.12^{a}
T-O	29.13 ± 2.06^{b}	27.89 ± 1.42^{a}	18.28 ± 1.28^{a}	31.52 ± 4.85^{a}
T-C	54.94 ± 0.65^{b}	47.19 ± 0.94^{a}	59.76 ± 1.45^{b}	73.52 ± 5.99^{a}
E-O	43.47 ± 0.56^{b}	55.70 ± 0.47^{b}	56.84 ± 0.89^{ab}	75.08 ± 1.34^{b}
E-C	43.47 ± 8.11^{b}	42.91 ± 7.38^{ab}	61.59 ± 1.04^{ab}	65.66 ± 9.12^{ab}
O-C	43.47 ± 1.07^{b}	41.99 ± 3.62^{a}	57.46 ± 2.71^{a}	70.46 ± 2.85^{ab}

Results are mentioned as arithmetic mean ± standard deviation of three replicates. The values followed by the same letters in the same raw are not significantly different at the significance level of $p \leq 0.05$ by the Tukey test.