

Response Surface Methodology-Aided Optimization of Bioactive Compound Extraction from Apple Peels Through Pulsed Electric Field Pretreatment and Ultrasonication

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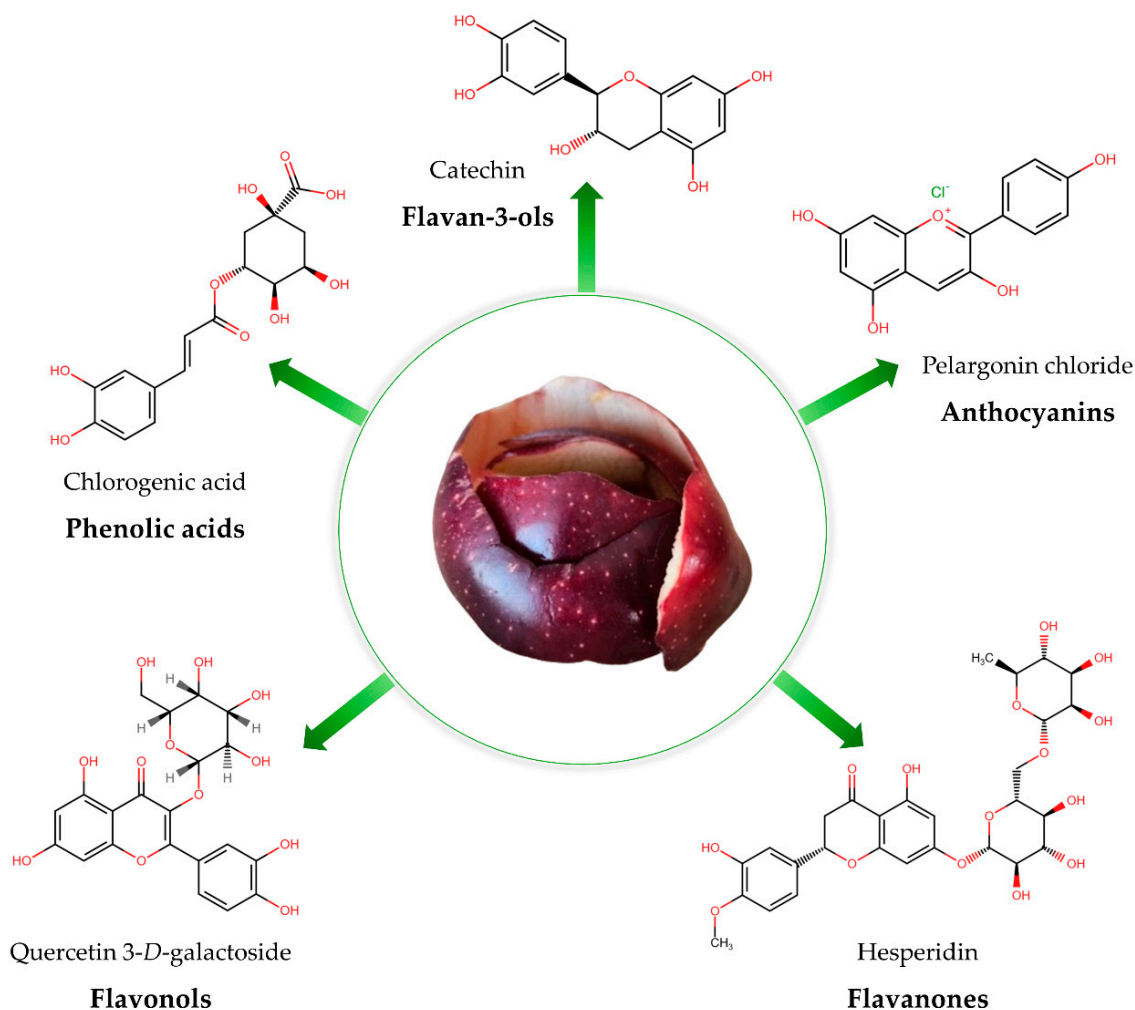


Figure S1. The primary polyphenol classes are present in apple peels.

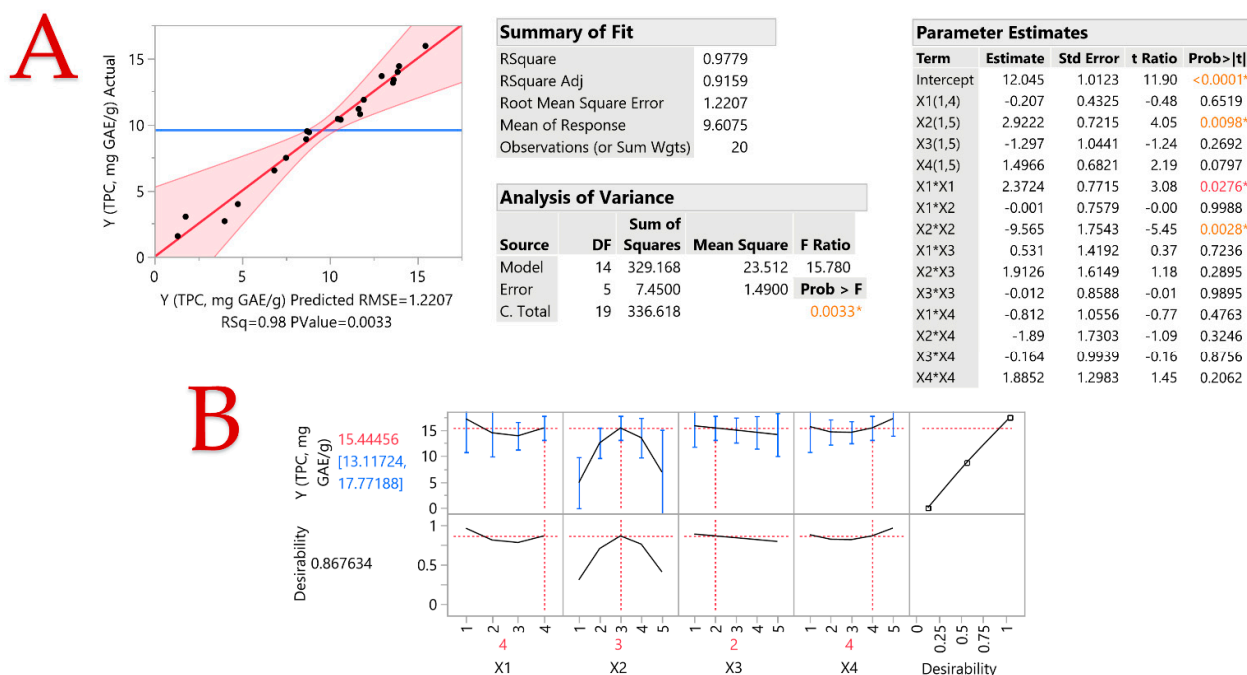


Figure S2. Plot A displays the actual response versus the predicted response (Total polyphenol content – TPC, mg GAE/g) for the optimization of apple peel extracts using hydroethanolic solutions, different extraction techniques, and parameters, and plot B displays the desirability function. Asterisks and colored values denote statistically significant values, while inset tables include statistics relevant to the evaluation of the resulting model. X1: extraction technique; X2: ethanol concentration; C, % v/v; X3: extraction duration; t, min; X4: extraction temperature; T, °C.

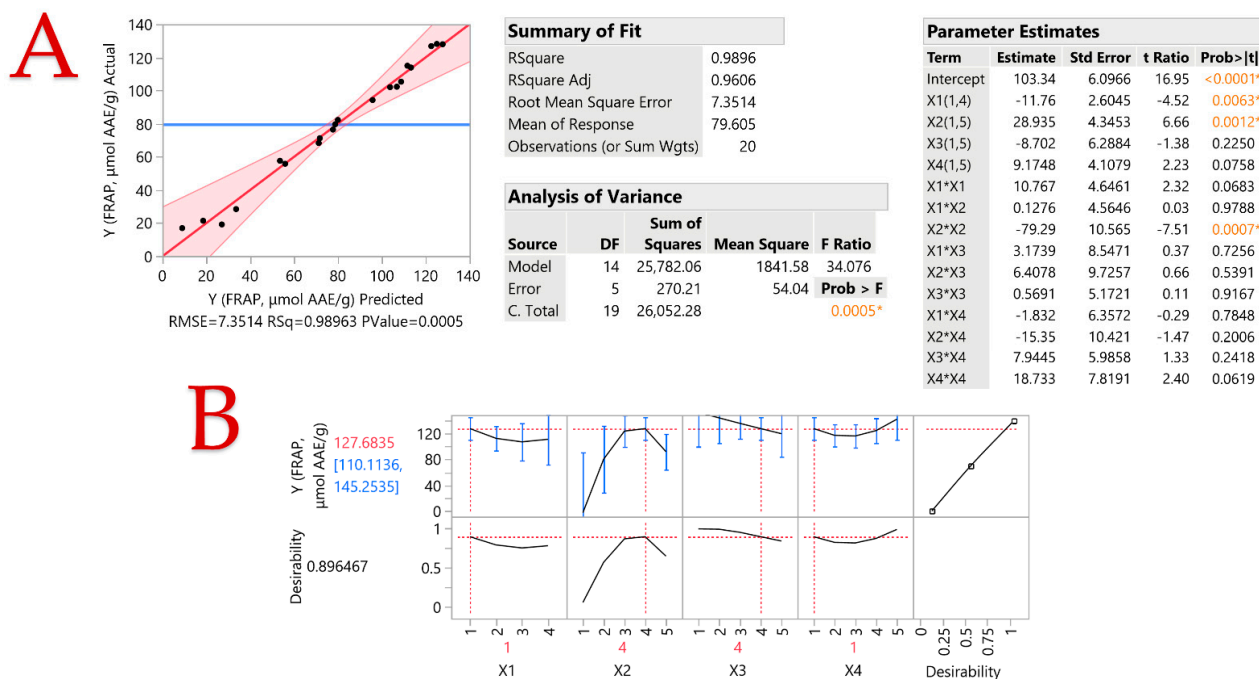


Figure S3. Plot A displays the actual response versus the predicted response (FRAP, μmol AAE/g) for the optimization of apple peel extracts using hydroethanolic solutions, different extraction techniques, and parameters, and plot B displays the desirability function. Asterisks and colored values denote statistically significant values, while inset tables include statistics relevant to the evaluation of the resulting model. X1: extraction technique; X2: ethanol concentration; C, % v/v; X3: extraction duration; t, min; X4: extraction temperature; T, °C.

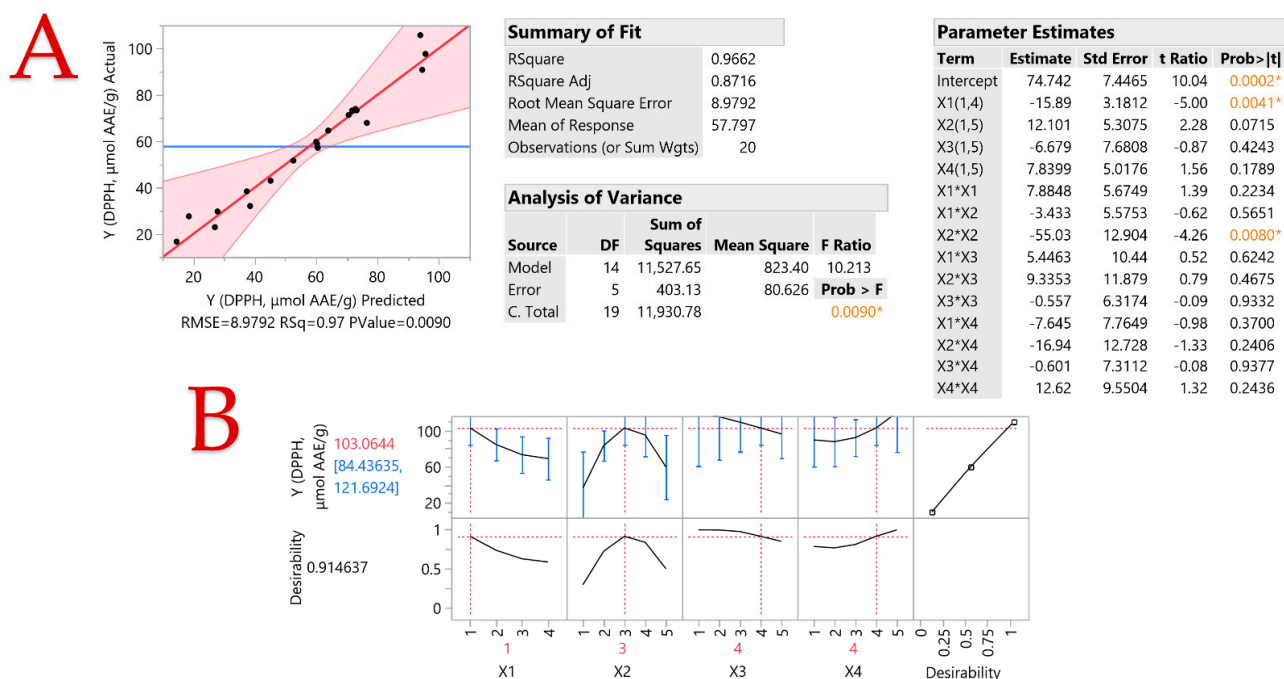


Figure S4. Plot **A** displays the actual response versus the predicted response (DPPH, $\mu\text{mol AAE/g}$) for the optimization of apple peel extracts using hydroethanolic solutions, different extraction techniques, and parameters, and plot **B** displays the desirability function. Asterisks and colored values denote statistically significant values, while inset tables include statistics relevant to the evaluation of the resulting model. X1: extraction technique; X2: ethanol concentration; C, % v/v; X3: extraction duration; t, min; X4: extraction temperature; T, $^{\circ}\text{C}$.

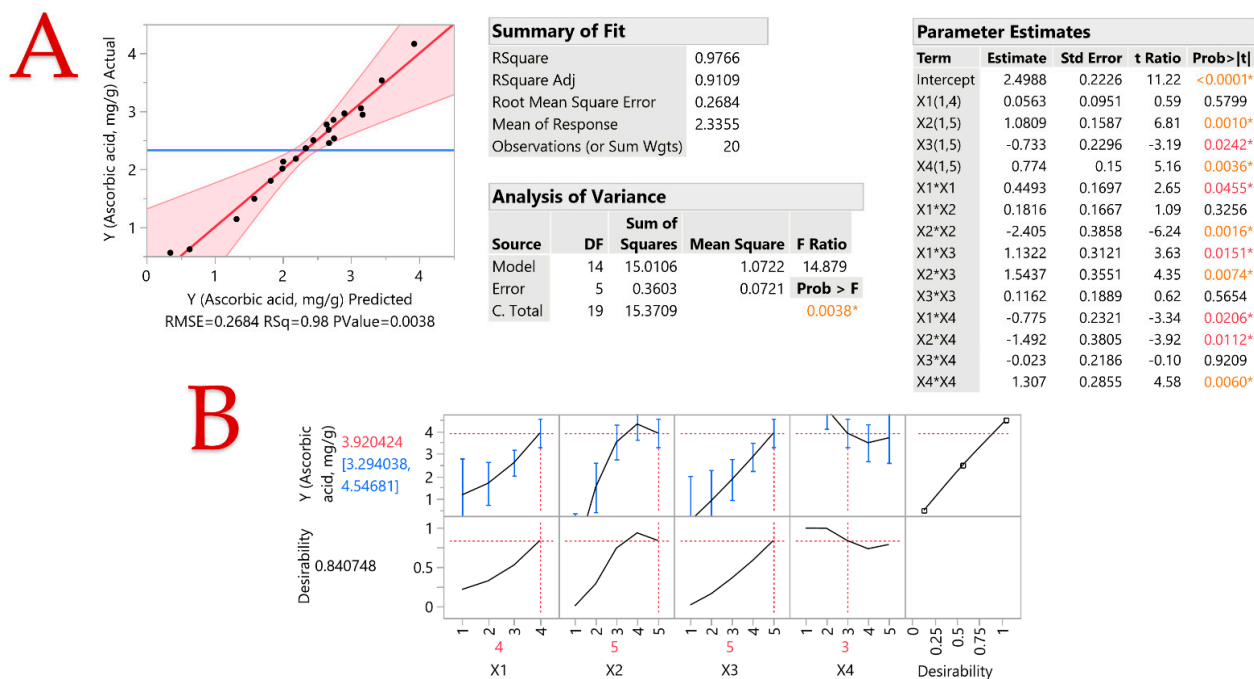


Figure S5. Plot **A** displays the actual response versus the predicted response (Ascorbic acid, mg/g) for the optimization of apple peel extracts using hydroethanolic solutions, different extraction techniques, and parameters, and plot **B** displays the desirability function. Asterisks and colored values denote statistically significant values, while inset tables include statistics relevant to the evaluation of the resulting model. X1: extraction technique; X2: ethanol concentration; C, % v/v; X3: extraction duration; t, min; X4: extraction temperature; T, $^{\circ}\text{C}$.

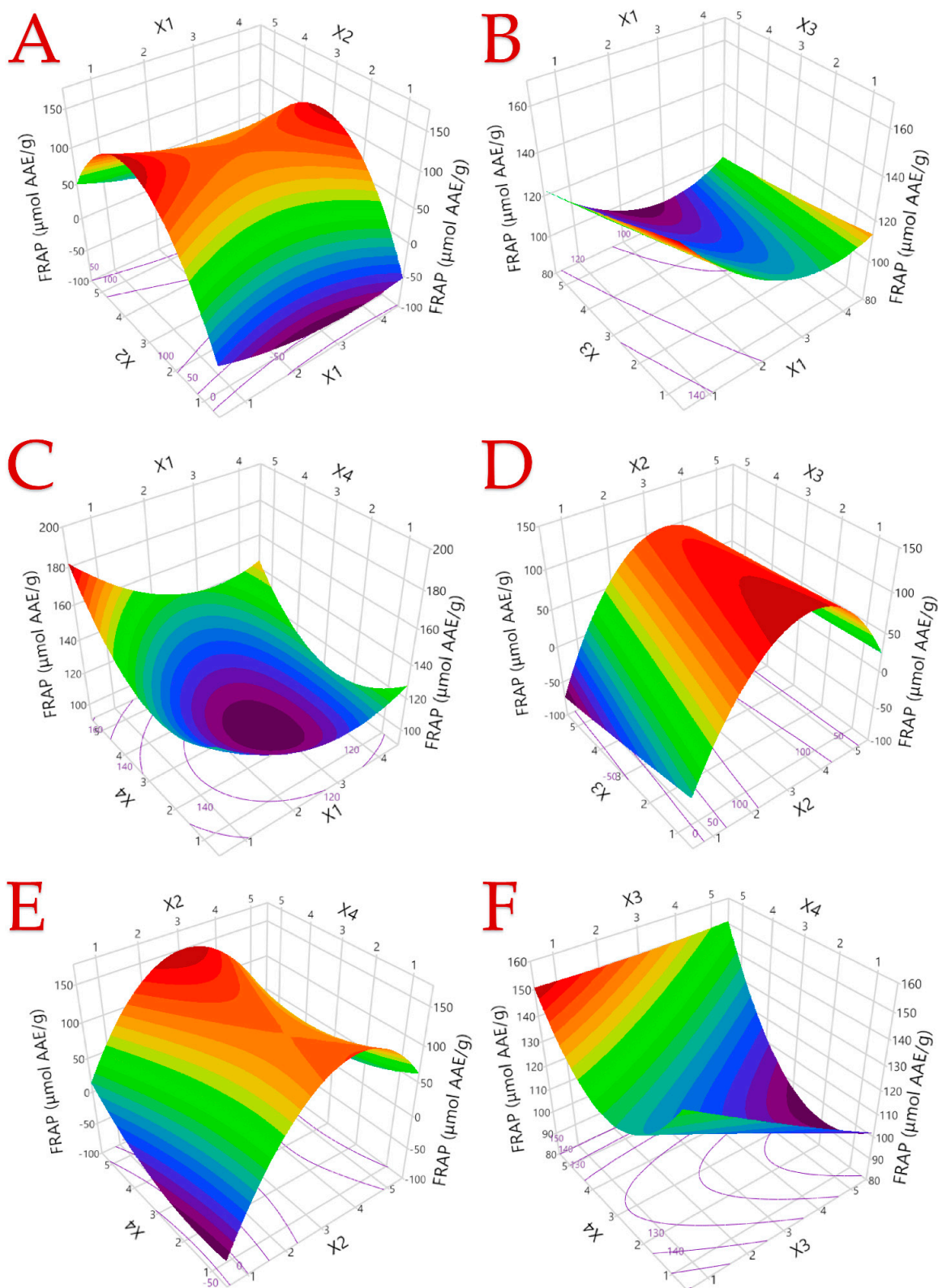


Figure S6. The optimal extraction of apple peel extracts is shown in 3D graphs that show the impact of the process variables considered in the response (FRAP, $\mu\text{mol AAE/g}$). Plot (A), covariation of X_1 (extraction technique) and X_2 (ethanol concentration; C , % v/v); plot (B), covariation of X_1 and X_3 (extraction duration; t , min); plot (C), covariation of X_1 and X_4 (extraction temperature; T , $^{\circ}\text{C}$); plot (D), covariation of X_2 and X_3 ; plot (E), covariation of X_2 and X_4 ; plot (F), covariation of X_3 and X_4 .

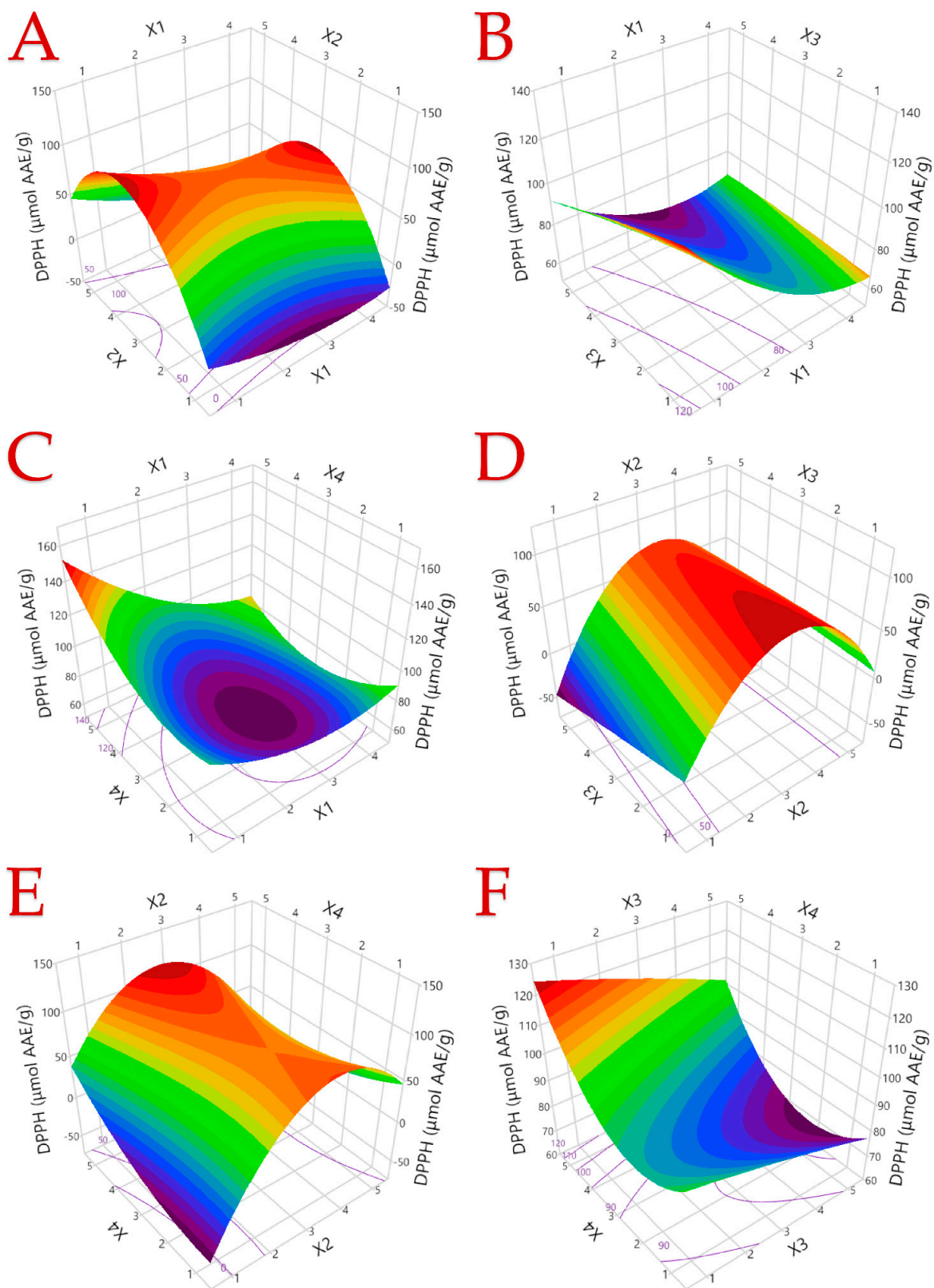


Figure S7. The optimal extraction of apple peel extracts is shown in 3D graphs that show the impact of the process variables considered in the response (DPPH, $\mu\text{mol AAE/g}$). Plot (A), covariation of X_1 (extraction technique) and X_2 (ethanol concentration; C, % v/v); plot (B), covariation of X_1 and X_3 (extraction duration; t , min); plot (C), covariation of X_1 and X_4 (extraction temperature; T , $^{\circ}\text{C}$); plot (D), covariation of X_2 and X_3 ; plot (E), covariation of X_2 and X_4 ; plot (F), covariation of X_3 and X_4 .

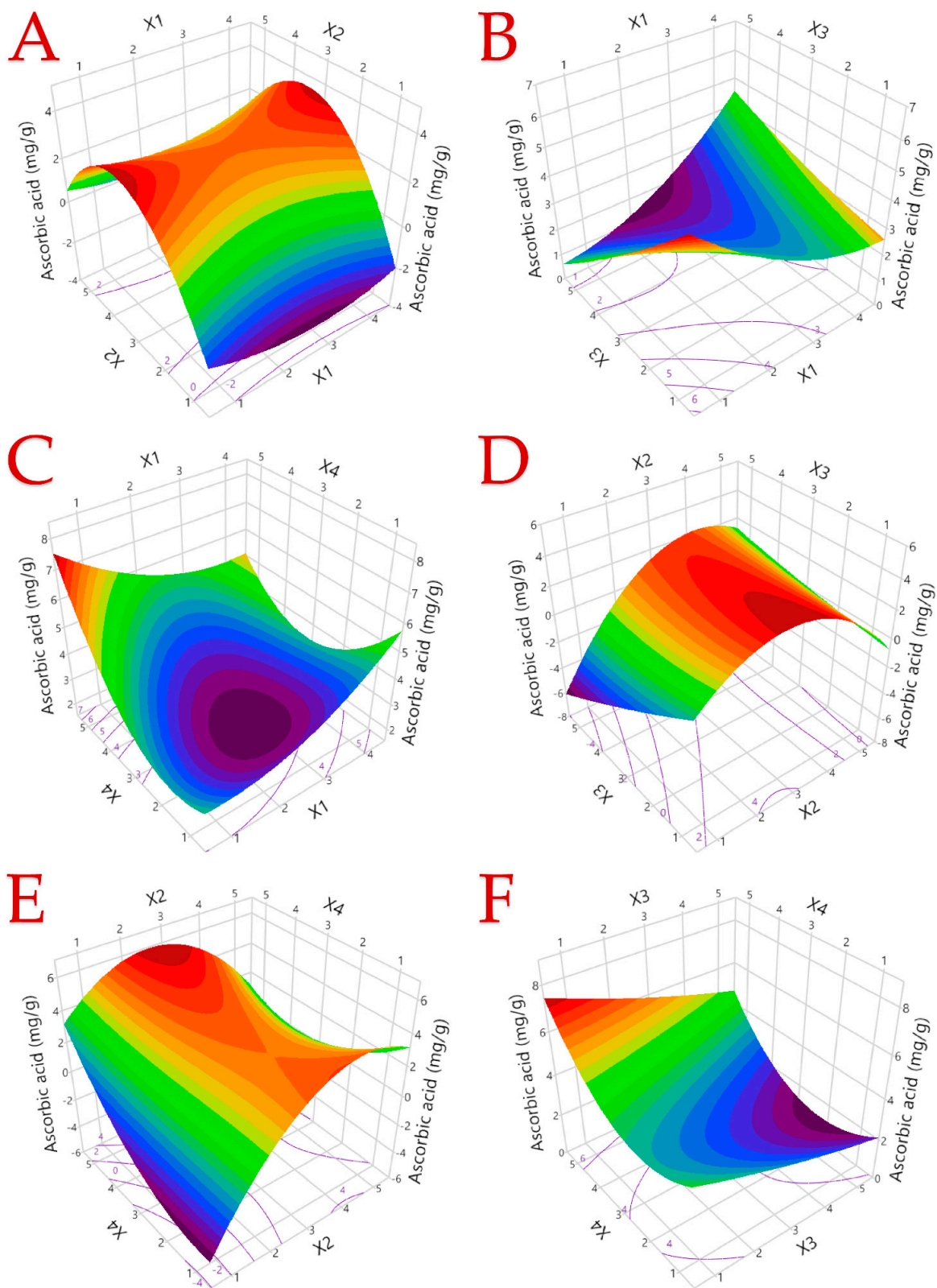


Figure S8. The optimal extraction of apple peel extracts is shown in 3D graphs that show the impact of the process variables considered in the response (Ascorbic acid, mg/g). Plot (A), covariation of X₁ (extraction technique) and X₂ (ethanol concentration; C, % v/v); plot (B), covariation of X₁ and X₃ (extraction duration; *t*, min); plot (C), covariation of X₁ and X₄ (extraction temperature; *T*, °C); plot (D), covariation of X₂ and X₃; plot (E), covariation of X₂ and X₄; plot (F), covariation of X₃ and X₄.

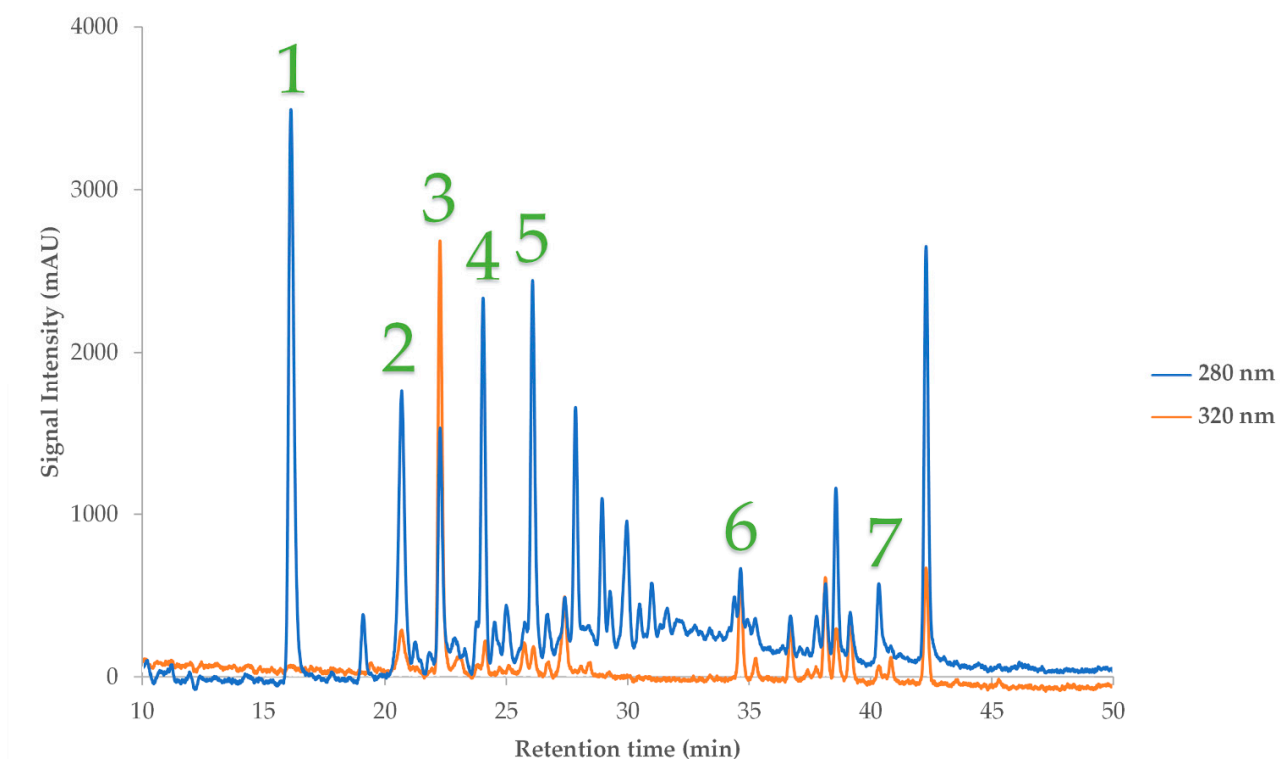


Figure S9. Exemplary HPLC chromatogram at 280, and 320 nm of apple peel optimal extract demonstrating polyphenolic compounds that were identified. 1: Pelargonin chloride; 2: Catechin; 3: Chlorogenic acid; 4: Homovanillic acid; 5: Epicatechin; 6: Quercetin 3-D-galactoside; 7: Hesperidin.