Supplementary Material

Maximizing Bioactive Compound Extraction from Mandarin (*Citrus reticulata*) Peels through Green Pretreatment Techniques

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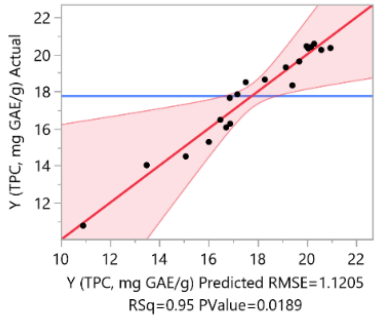
A



Summary of Fit

RSquare	0.9536
RSquare Adj	0.8237
Root Mean Square Error	1.1205
Mean of Response	17.779
Observations (or Sum Wgts)	20

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	14	129.028	9.2163	7.3400
Error	5	6.2782	1.2556	Prob > F
C. Total	19	135.306		0.0189*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	20.809	0.9293	22.39	<0.0001*
X1(1,4)	-1.248	0.397	-3.14	0.0256*
X2(1,5)	0.1804	0.6623	0.27	0.7962
X3(1,5)	-1.821	0.9585	-1.90	0.1159
X4(1,5)	0.5062	0.6262	0.81	0.4556
X1*X1	-0.177	0.7082	-0.25	0.8127
X1*X2	-1.24	0.6958	-1.78	0.1347
X2*X2	-3.361	1.6104	-2.09	0.0913
X1*X3	-0.014	1.3028	-0.01	0.9916
X2*X3	0.248	1.4825	0.17	0.8737
X3*X3	-2.465	0.7884	-3.13	0.0261*
X1*X4	-1.309	0.969	-1.35	0.2346
X2*X4	0.7576	1.5884	0.48	0.6535
X3*X4	-0.559	0.9124	-0.61	0.5666
X4*X4	-0.095	1.1918	-0.08	0.9395

B

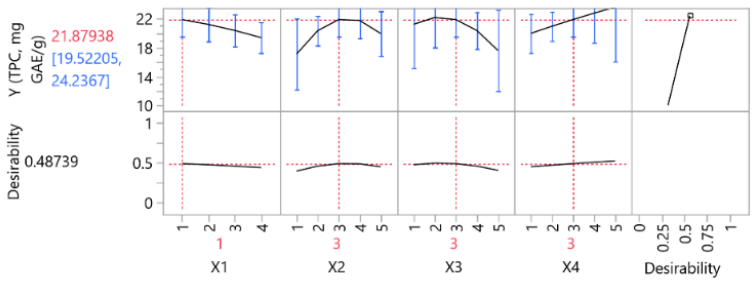


Figure S1. Plot **A** displays the actual response versus the predicted response (Total polyphenol content – TPC, mg GAE/g) for the optimization of mandarin peel extracts using hydroethanolic solutions, different extraction techniques, and parameters, and plot **B** displays the desirability function. Asterisks and colored values denote statistically significant values, while inset tables include statistics relevant to the evaluation of the resulting model.

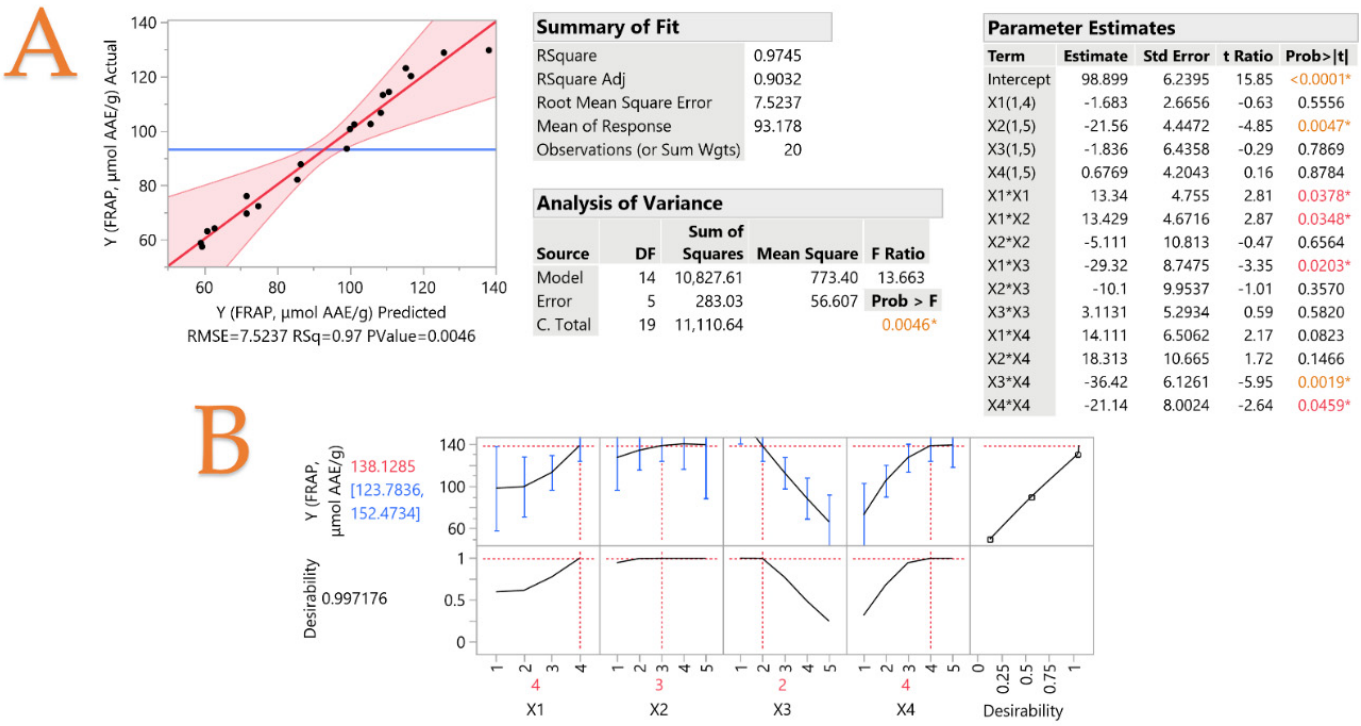


Figure S2. Plot **A** displays the actual response versus the predicted response (FRAP, µmol AAE/g) for the optimization of mandarin peel extracts using hydroethanolic solutions, different extraction techniques, and parameters, and plot **B** displays the desirability function. Asterisks and colored values denote statistically significant values, while inset tables include statistics relevant to the evaluation of the resulting model.

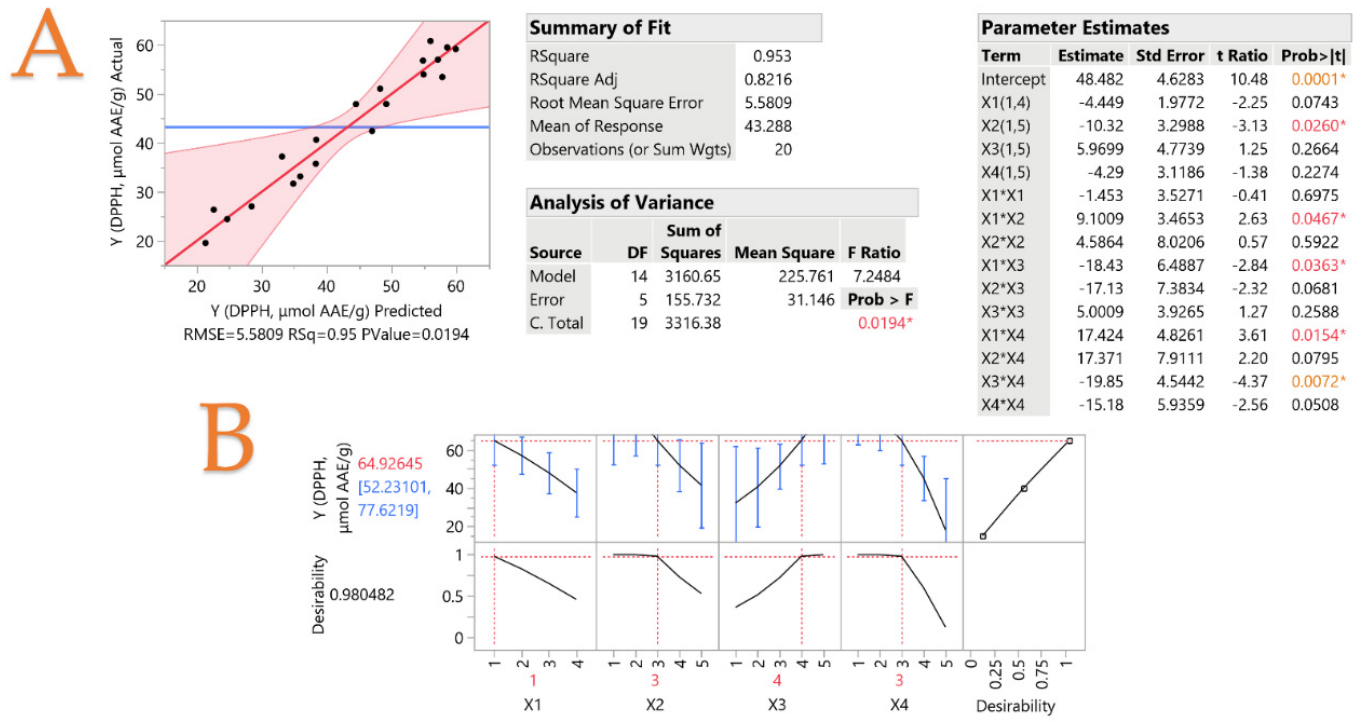
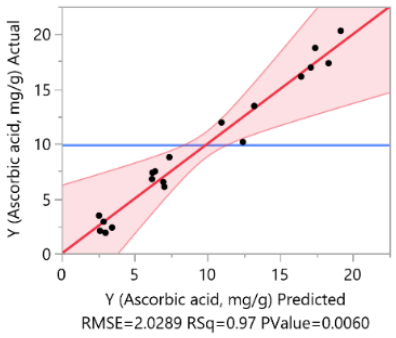


Figure S3. Plot **A** displays the actual response versus the predicted response (DPPH, µmol AAE/g) for the optimization of mandarin peel extracts using hydroethanolic solutions, different extraction techniques, and parameters, and plot **B** displays the desirability function. Asterisks and colored values denote statistically significant values, while inset tables include statistics relevant to the evaluation of the resulting model.

A



Summary of Fit	
RSquare	0.9716
RSquare Adj	0.892
Root Mean Square Error	2.0289
Mean of Response	9.905
Observations (or Sum Wgts)	20

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	14	703.502	50.2502	12.207
Error	5	20.5829	4.1166	Prob > F
C. Total	19	724.085		0.0060*

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	4.7092	1.6826	2.80	0.0380*
X1(1,4)	0.7551	0.7188	1.05	0.3416
X2(1,5)	5.7093	1.1993	4.76	0.0051*
X3(1,5)	1.3248	1.7356	0.76	0.4797
X4(1,5)	-1.206	1.1338	-1.06	0.3362
X1*X1	1.9779	1.2823	1.54	0.1836
X1*X2	0.6929	1.2598	0.55	0.6060
X2*X2	10.871	2.9159	3.73	0.0136*
X1*X3	-7.735	2.359	-3.28	0.0220*
X2*X3	-2.883	2.6842	-1.07	0.3318
X3*X3	1.6678	1.4275	1.17	0.2953
X1*X4	3.6344	1.7545	2.07	0.0931
X2*X4	4.3688	2.8761	1.52	0.1892
X3*X4	-4.445	1.652	-2.69	0.0433*
X4*X4	-3.834	2.158	-1.78	0.1358

B

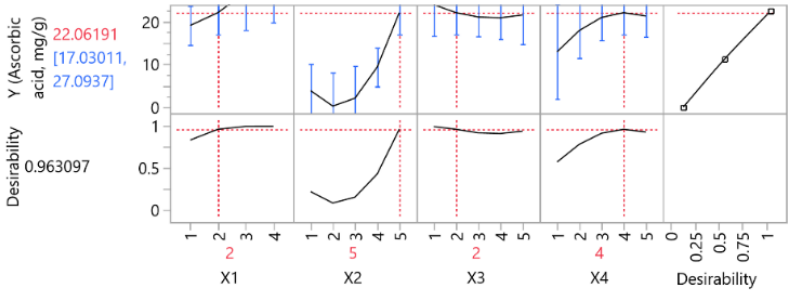


Figure S4. Plot **A** displays the actual response versus the predicted response (Ascorbic acid, mg/g) for the optimization of mandarin peel extracts using hydroethanolic solutions, different extraction techniques, and parameters, and plot **B** displays the desirability function. Asterisks and colored values denote statistically significant values, while inset tables include statistics relevant to the evaluation of the resulting model.

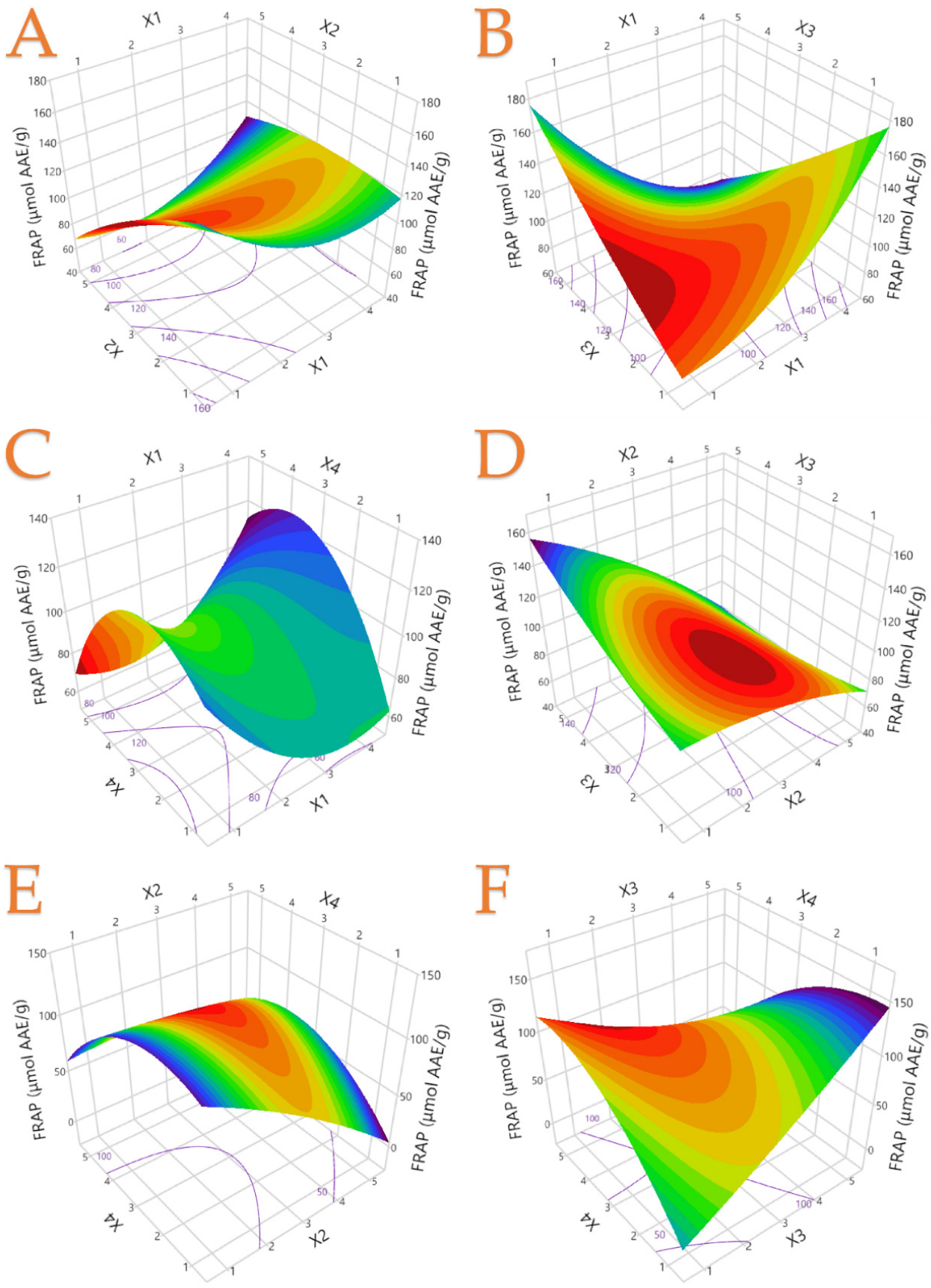


Figure S5. The optimal extraction of mandarin peel extracts in 3D graphs show the impact of the process variables considered in the response (FRAP, µmol AAE/g). Plot (**A**), covariation of X_1 and X_2; plot (**B**), covariation of X_1 and X_3; plot (**C**), covariation of X_1 and X_4; plot (**D**), 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.

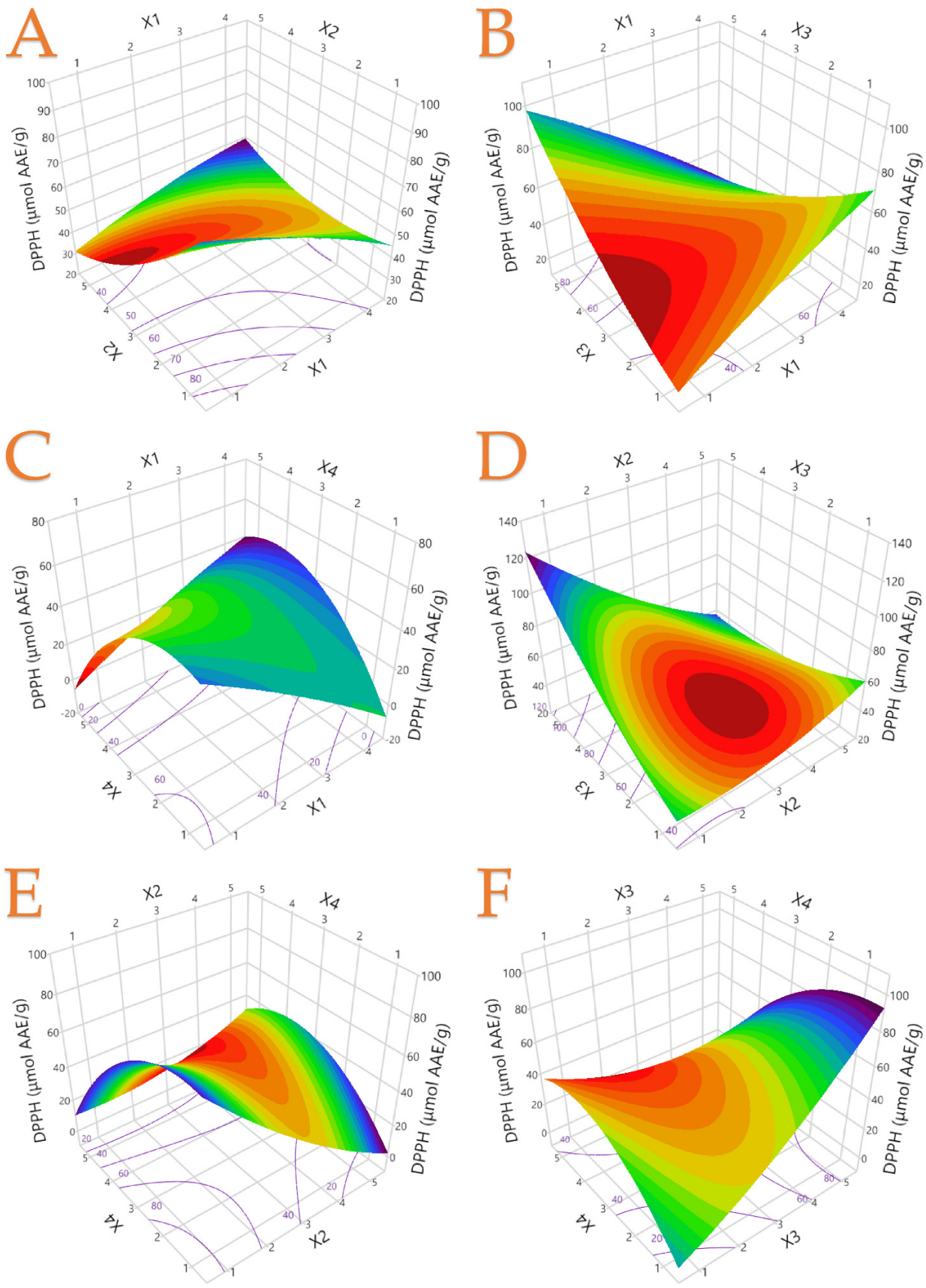


Figure S6. The optimal extraction of mandarin peel extracts in 3D graphs show the impact of the process variables considered in the response (DPPH, µmol AAE/g). Plot (**A**), covariation of X_1 and X_2; plot (**B**), covariation of X_1 and X_3; plot (**C**), covariation of X_1 and X_4; plot (**D**), 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.

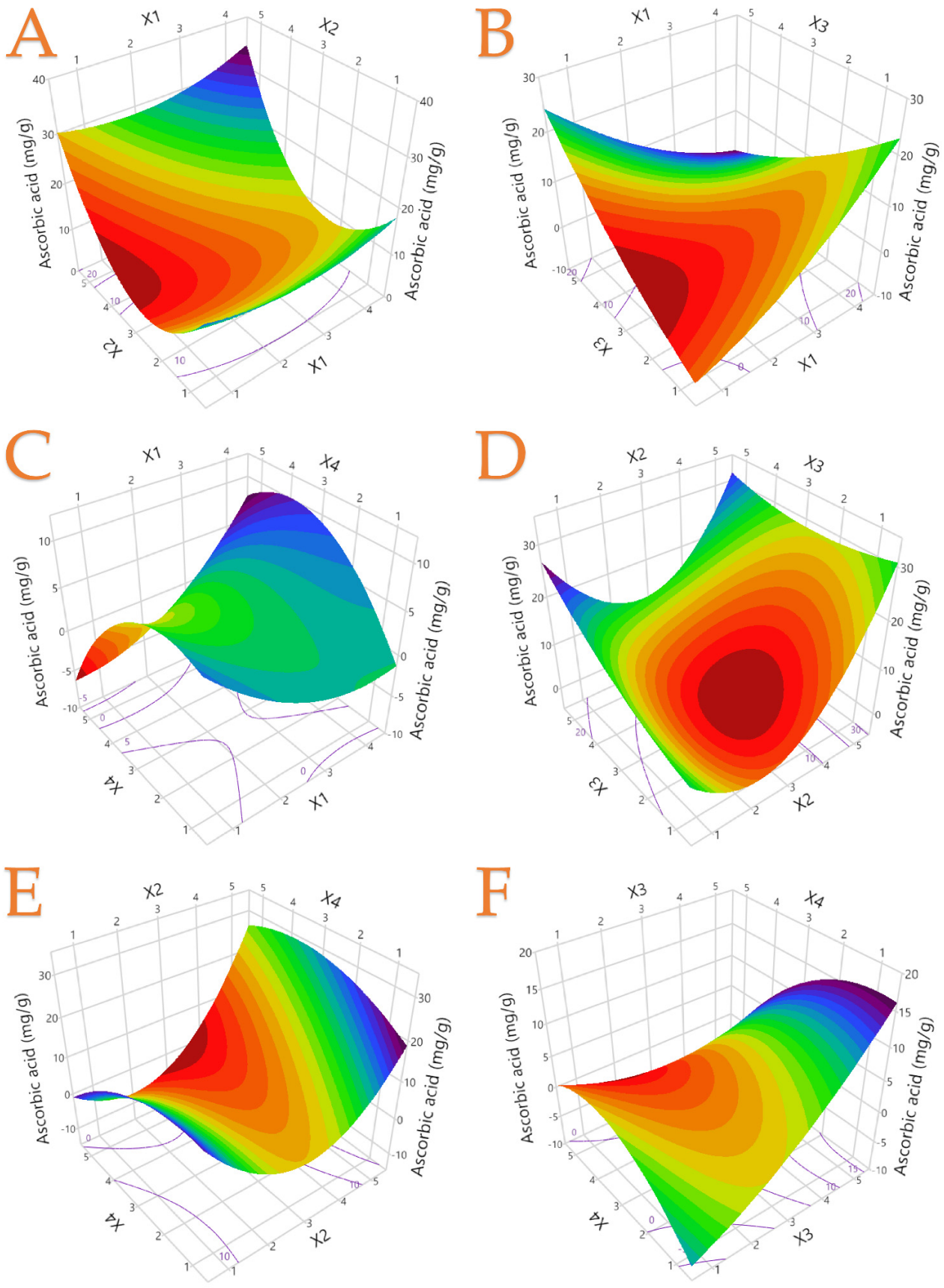


Figure S7. The optimal extraction of mandarin peel extracts in 3D graphs show the impact of the process variables considered in the response (Ascorbic acid, mg/g). Plot (**A**), covariation of X_1 and X_2; plot (**B**), covariation of X_1 and X_3; plot (**C**), covariation of X_1 and X_4; plot (**D**), 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.