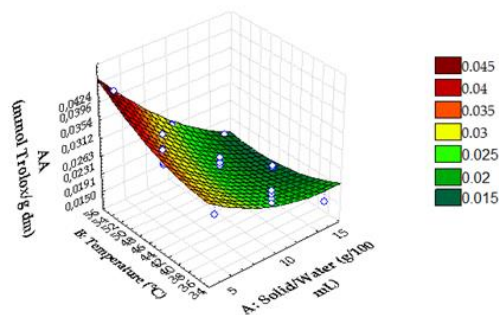
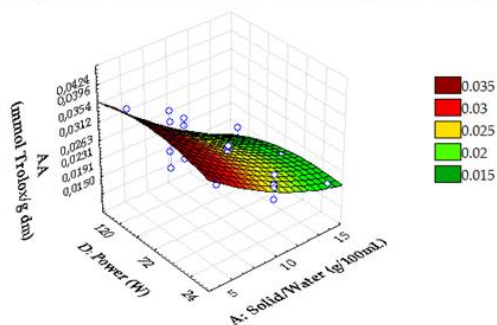


# Optimization of Process Variables for the Sustainable Extraction of Phenolic Compounds from Chicory and Fennel By-Products

Antonietta Baiano <sup>1,\*</sup>, Roberto Romaniello <sup>1</sup>, Ferruccio Giametta <sup>2</sup> and Anna Fiore <sup>1</sup>

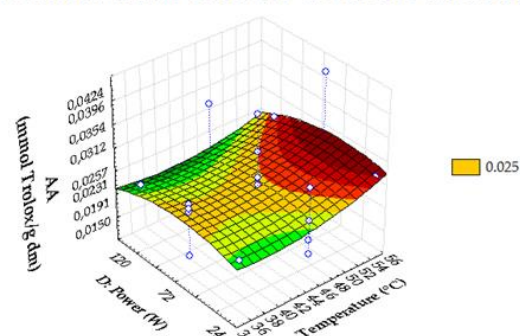
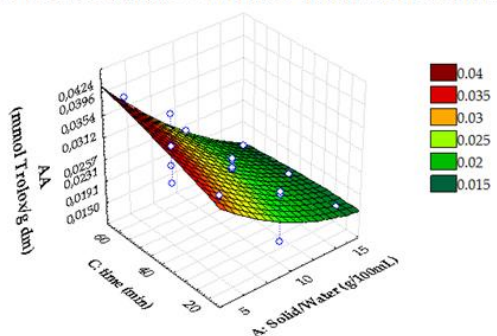
$$AA = 0.0424 - 0.0028A + 0.0001D + 6.6809E-5A^2 - 4.4084E-6AD - 7.5686E-7D$$

$$AA = 0.0593 - 0.0006A - 0.0013B + 0.0001A^2 - 7.1067E-5AB + 2.4451E-5B^2$$



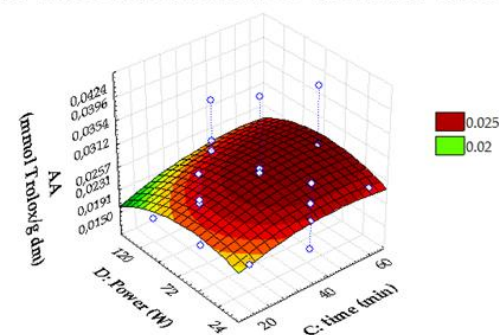
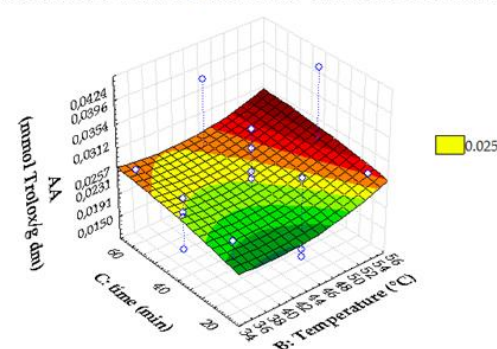
$$AA = 0.0375 - 0.0026A + 0.0003C + 7.7714E-5A^2 - 1.8051E-5AC - 9.5179E-7C^2$$

$$AA = 0.0422 - 0.0012B + 0.0001D + 1.5916E-5B^2 - 8.5249E-7BD - 7.6369E-7D^2$$



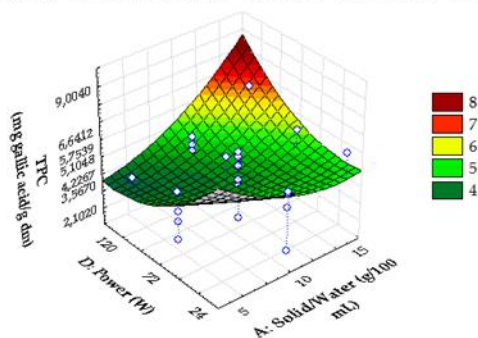
$$AA = 0.0469 - 0.0015B + 0.0002C + 1.8642E-5B^2 - 8.8128E-7BC - 9.911E-7C^2$$

$$AA = 0.0147 + 0.0003C + 0.0001D - 3.0856E-6C^2 + 5.2365E-7CD - 1.009E-6D^2$$

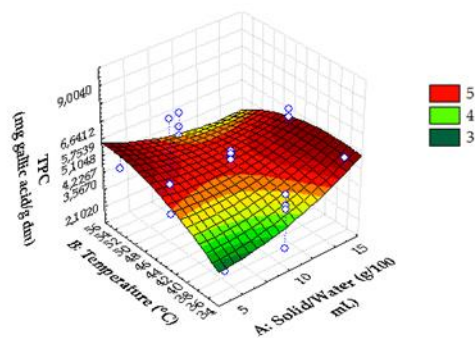


**Figure S1.** 3D response surface plots for antioxidant activity (mmol Trolox/g dm) of chicory extracts obtained through UAE: effect of solid-water ratio (A), temperature (B), extraction time (C), power (D), and their interactions.

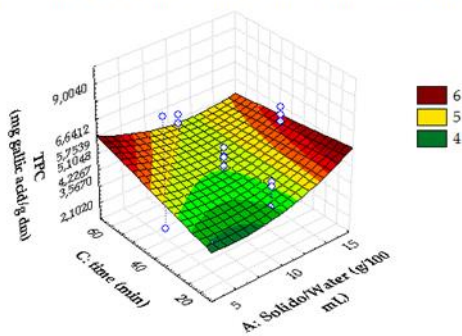
$$\text{TPC} = 12.537 - 0.8819A - 0.1115D + 0.0268A^2 + 0.0055AD + 0.0003D^2$$



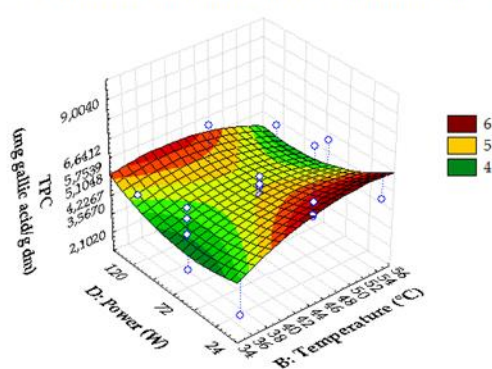
$$\text{TPC} = -14.9138 + 0.4728A + 0.7334B + 0.0157A^2 - 0.0164AB - 0.006B^2$$



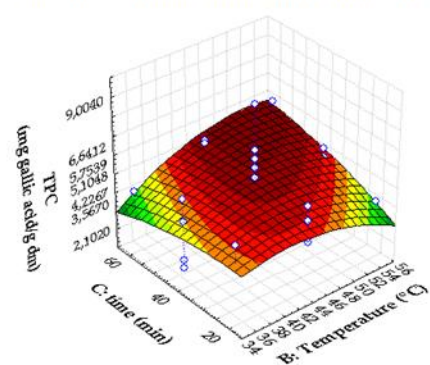
$$\text{TPC} = 3.5392 - 0.1515A + 0.0628C + 0.0206A^2 - 0.0053AC + 1.6588E-5C^2$$



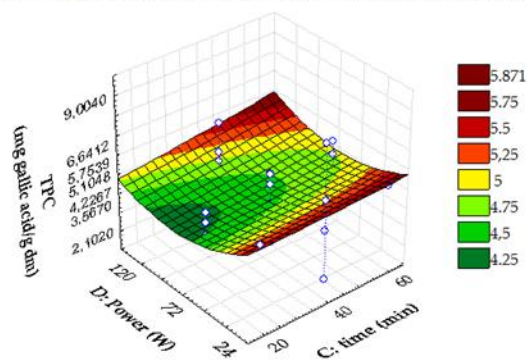
$$\text{TPC} = -9.717 + 0.6177B + 0.0056D - 0.0057B^2 - 0.001BD + 0.0002D^2$$



$$\text{TPC} = -5.9575 + 0.5433B - 0.0981C - 0.0073B^2 + 0.0035BC - 0.0006C^2$$

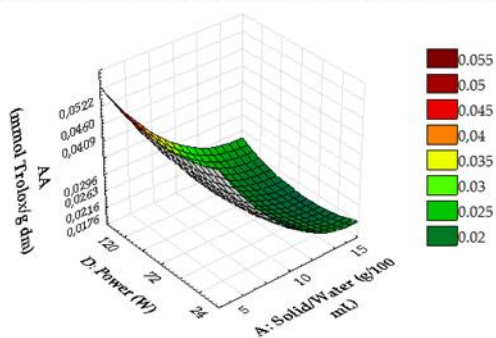


$$\text{TPC} = 6.5553 - 0.0062x - 0.0545D + 9.0521E-5C^2 + 0.0001CD + 0.0003D^2$$

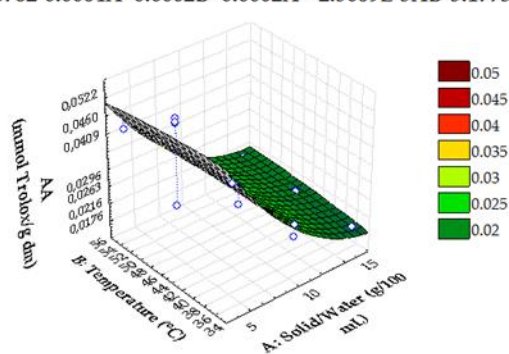


**Figure S2.** 3D response surface plots for TPC (mg gallic acid/g dm) of fennel extracts obtained through UAE: effect of solid-water ratio (A), temperature (B), extraction time (C), power (D), and their interactions.

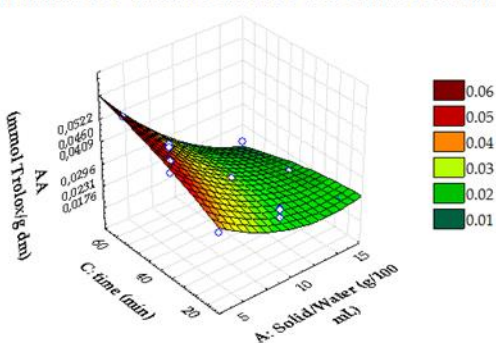
$$AA = 0.0851 - 0.0079A - 0.0002D + 0.0003A^2 + 1.3511E-6AD + 1.2318E-6D^2$$



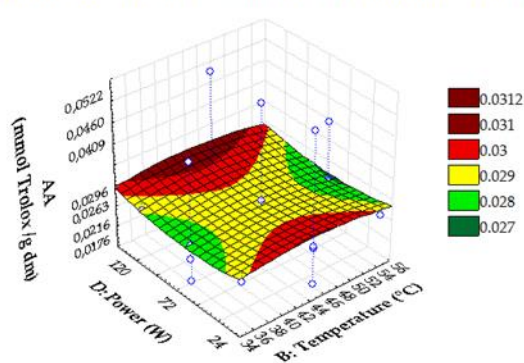
$$AA = 0.0782 - 0.0084A + 0.0002B + 0.0002A^2 + 2.5089E-5AB - 5.1775E-6B^2$$



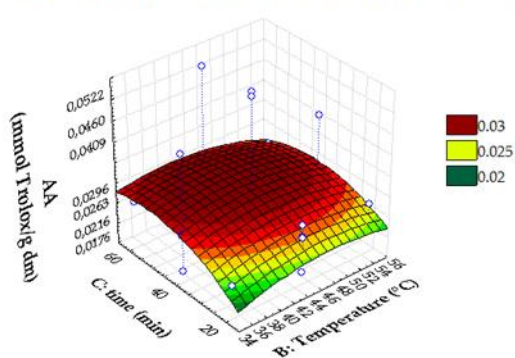
$$AA = 0.0446 - 0.0049A + 0.0009C + 0.0002A^2 - 5.6412E-5AC - 3.2672E-6C^2$$



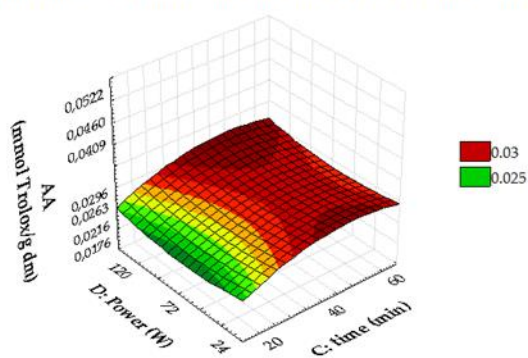
$$AA = 0.004 + 0.0012B - 8.0249E-5D - 1.3868E-5B^2 - 3.5165E-8BD + 5.633E-7D^2$$



$$AA = -0.0376 + 0.0022B + 0.0009C - 2.2158E-5B^2 - 4.8123E-6BC - 7.1177E-6C^2$$



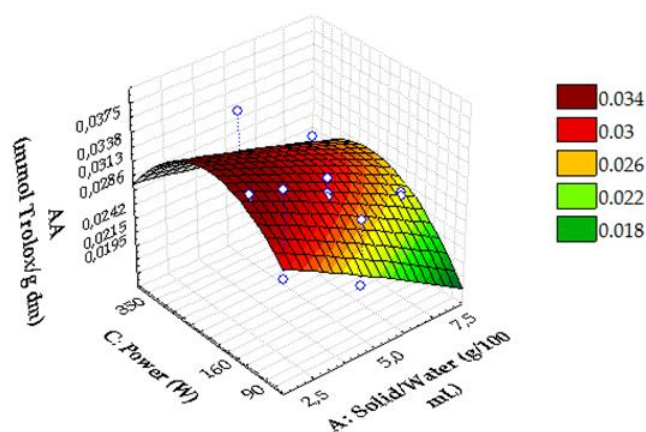
$$AA = 0.0191 + 0.0005C - 7.6529E-5D - 5.4398E-6C^2 + 1.1405E-7CD + 4.948E-7D^2$$



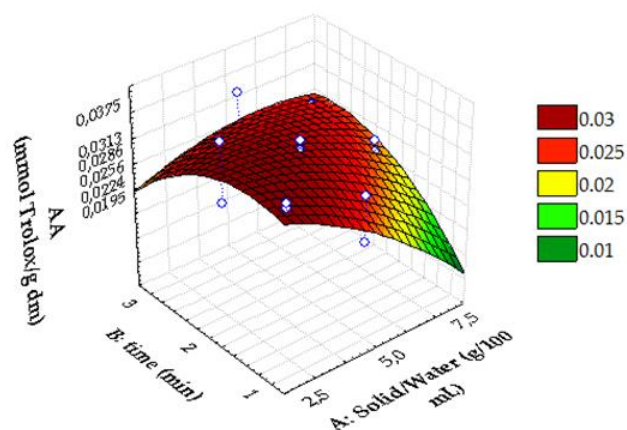
**Figure S3.** 3D response surface plots for antioxidant activity (mmol Trolox/g dm) of fennel extracts obtained through UAE: effect of solid-water ratio (A), temperature (B), extraction time (C), power (D), and their interactions.



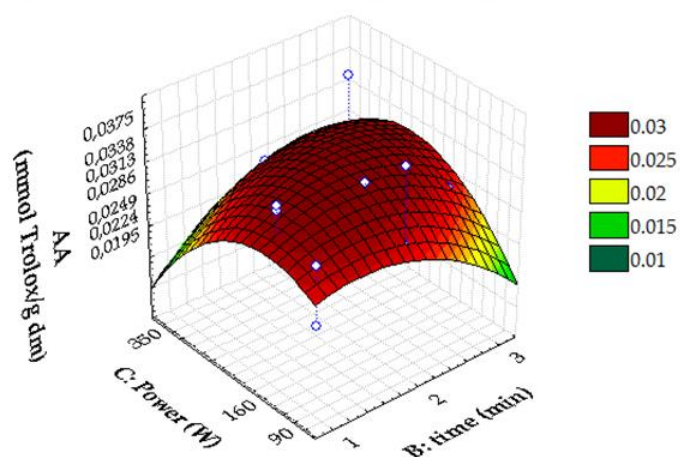
$$AA = 0.0281 - 0.0025A + 0.0001C - 3.8504E-5A^2 + 5.0784E-6AC - 2.9774E-7C^2$$



$$AA = 0.0337 - 0.0027A + 0.0066B - 0.0004A^2 + 0.0022AB - 0.0042B^2$$

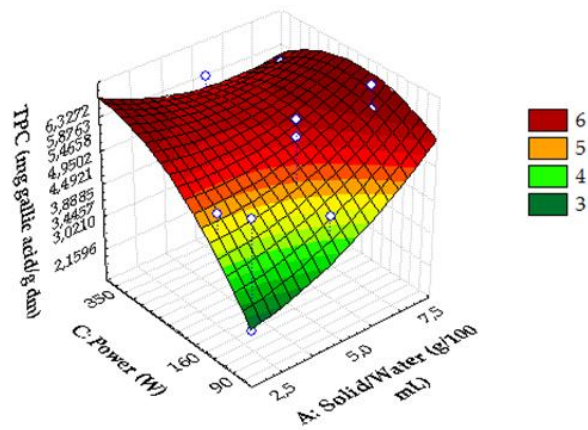


$$AA = 0.0169 + 0.0081B + 7.2877E-5C - 0.0038B^2 + 3.2794E-5BC - 3.3709E-7C^2$$

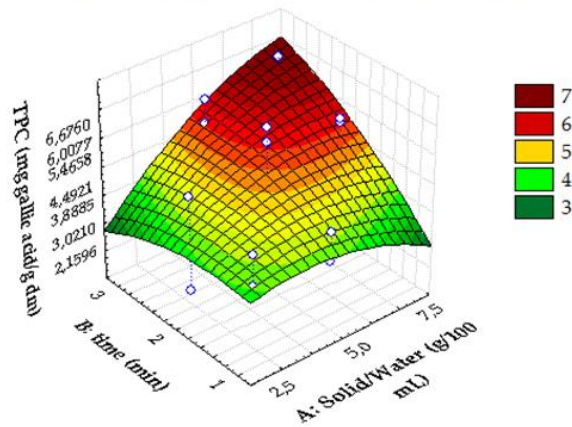


**Figure S4.** 3D response surface plots for antioxidant activity (mmol Trolox/g dm) of chicory extracts obtained through MAE: effect of solid-water ratio (A), extraction time (B), power (C), and their interactions.

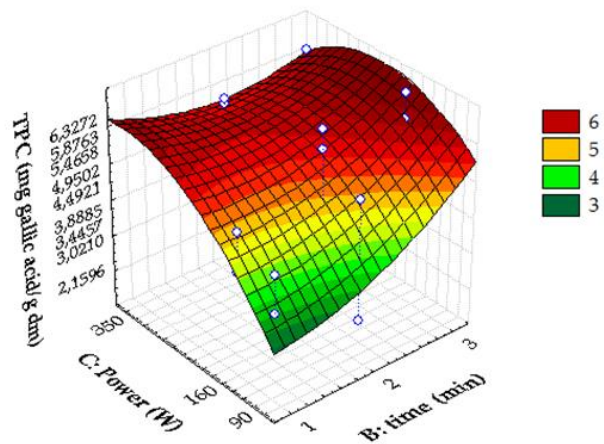
$$\text{TPC} = 0.854 + 0.0896A + 0.0314C + 0.0538A^2 - 0.002AC - 3.5258E-5C^2$$



$$\text{TPC} = 3.1058 + 0.2808A + 0.1736B - 0.0759A^2 + 0.3726AB - 0.3501B^2$$

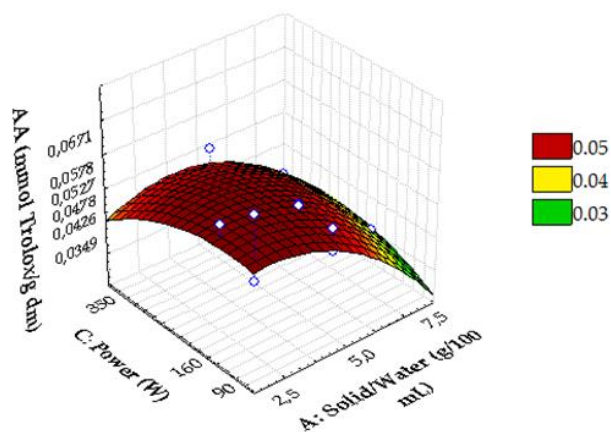


$$\text{TPC} = 1.2848 - 0.2112B + 0.0312C + 0.3854B^2 - 0.0038BC - 4.0433E-5C^2$$

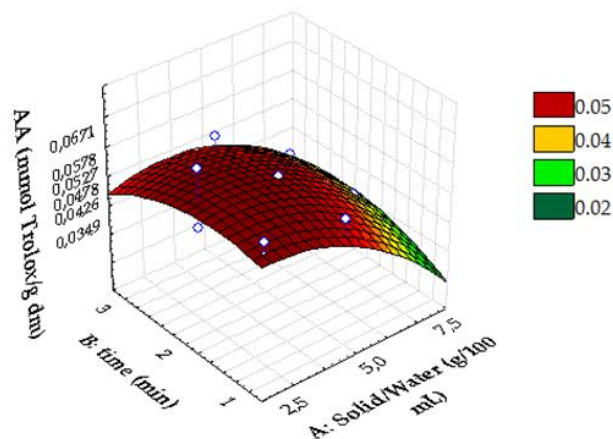


**Figure S5.** 3D response surface plots for TPC (mg gallic acid/g dm) of fennel extracts obtained through MAE: effect of solid-water ratio (A), extraction time (B), power (C), and their interactions<sup>1</sup>.

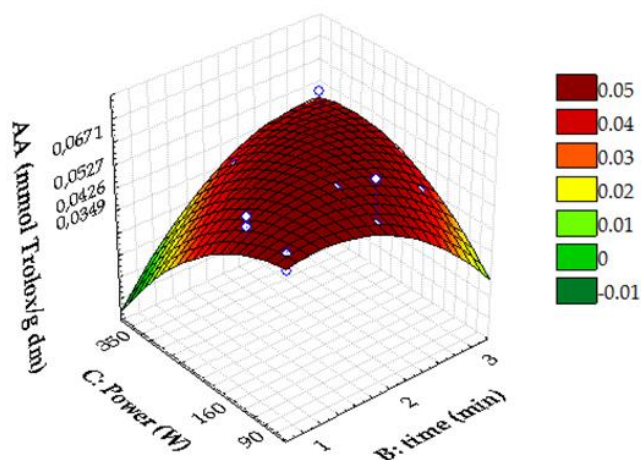
$$AA = 0.0481 + 0.0047A + 2.7035E-5C - 0.0011A^2 + 1.2169E-5AC - 2.2663E-7C^2$$



$$AA = 0.044 + 0.0037A + 0.0105B - 0.0011A^2 + 0.0014AB - 0.0045B^2$$



$$AA = 0.0465 + 0.0197B - 7.3497E-5C - 0.012B^2 + 0.0001BC - 5.8717E-7C^2$$



**Figure S6.** 3D response surface plots for antioxidant activity (mmol Trolox/g dm) of fennel extracts obtained through MAE: effect of solid-water ratio (A), extraction time (B), power (C), and their interactions.