

Ultrasound-assisted ionic liquids extraction of carotenoids from Xinjiang apricots and evaluation of their antioxidant potential

XIAOHUI SUN, WANHUI GUO, NA JIANG, SHUANGYU CAO, LEI MA*, SHENGHONG LIU*

Key Laboratory of Agro-products Quality and Safety of Xinjiang, Institute of Quality Standards & Testing Technology for Agri-products, Xinjiang Academy of Agricultural Sciences, Urumqi, P.R. China.

**Corresponding authors: mal0416@163.com; shliu1028@163.com*

Citation: Sun X., Guo W., Jiang N., Cao S., Ma L., Liu S. (2025): Ultrasound-assisted ionic liquids extraction of carotenoids from Xinjiang apricots and evaluation of their antioxidant potential. Czech J. Food Sci., 43: 398–410.

The authors are fully responsible for both the content and the formal aspects of the electronic supplementary material. No editorial adjustments were made.

Electronic supplementary material (ESM)

Supplementary Table S1
Supplementary Figure S1
Supplementary Figure S2
Supplementary Figure S3
Supplementary Figure S4

Table S1. Coded and uncoded values of the independent variables in BBD matrix and observed results

Run	$R_{IL/E}$ (g·mL ⁻¹) X_1	$R_{S/L}$ (g·mL ⁻¹) X_2	Time of extraction (min) X_3	Number of extrac- tions X_4	Carotenoid content (µg·g ⁻¹) Y (actual)
1	-1 (1 : 1)	0 (1 : 2)	1 (20)	0 (4)	10.617
2	0 (1 : 2)	-1 (1 : 1)	1 (20)	0 (4)	8.068
3	0 (1 : 2)	1 (1 : 3)	1 (20)	0 (4)	11.577
4	-1 (1 : 1)	0 (1 : 2)	0 (15)	1 (5)	10.052
5	0 (1 : 2)	-1 (1 : 1)	-1 (10)	0 (4)	5.52
6	0 (1 : 2)	0 (1 : 2)	0 (15)	0 (4)	12.081
7	0 (1 : 2)	0 (1 : 2)	0 (15)	0 (4)	12.461
8	1 (1 : 3)	0 (1 : 2)	0 (15)	-1 (3)	9.95
9	1 (1 : 3)	0 (1 : 2)	-1 (10)	0 (4)	10.268
10	0 (1 : 2)	0 (1 : 2)	-1 (10)	-1 (3)	9.131
11	0 (1 : 2)	-1 (1 : 1)	0 (15)	1 (5)	10.577
12	0 (1 : 2)	-1 (1 : 1)	0 (15)	-1 (3)	5.658
13	0 (1 : 2)	1 (1 : 3)	0 (15)	1 (5)	10.738
14	0 (1 : 2)	0 (1 : 2)	1 (20)	-1 (3)	10.869
15	0 (1 : 2)	0 (1 : 2)	-1 (10)	1 (5)	11.006
16	0 (1 : 2)	0 (1 : 2)	1 (20)	1 (5)	11.263
17	0 (1 : 2)	1 (1 : 3)	0 (15)	-1 (3)	12.689
18	0 (1 : 2)	1 (1 : 3)	-1 (10)	0 (4)	9.632
19	-1 (1 : 1)	-1 (1 : 1)	0 (15)	0 (4)	6.919
20	1 (1 : 3)	1 (1 : 3)	0 (15)	0 (4)	10.404
21	1 (1 : 3)	-1 (1 : 1)	0 (15)	0 (4)	7.523
22	-1 (1 : 1)	0 (1 : 2)	-1 (10)	0 (4)	9.925
23	-1 (1 : 1)	0 (1 : 2)	0 (15)	-1 (3)	9.805
24	-1 (1 : 1)	1 (1 : 3)	0 (15)	0 (4)	10.901
25	1 (1 : 3)	0 (1 : 2)	1 (20)	0 (4)	11.659
26	0 (1 : 2)	0 (1 : 2)	0 (15)	0 (4)	11.824
27	1 (1 : 3)	0 (1 : 2)	0 (15)	1 (5)	10.786

<https://doi.org/10.17221/26/2025-CJFS>

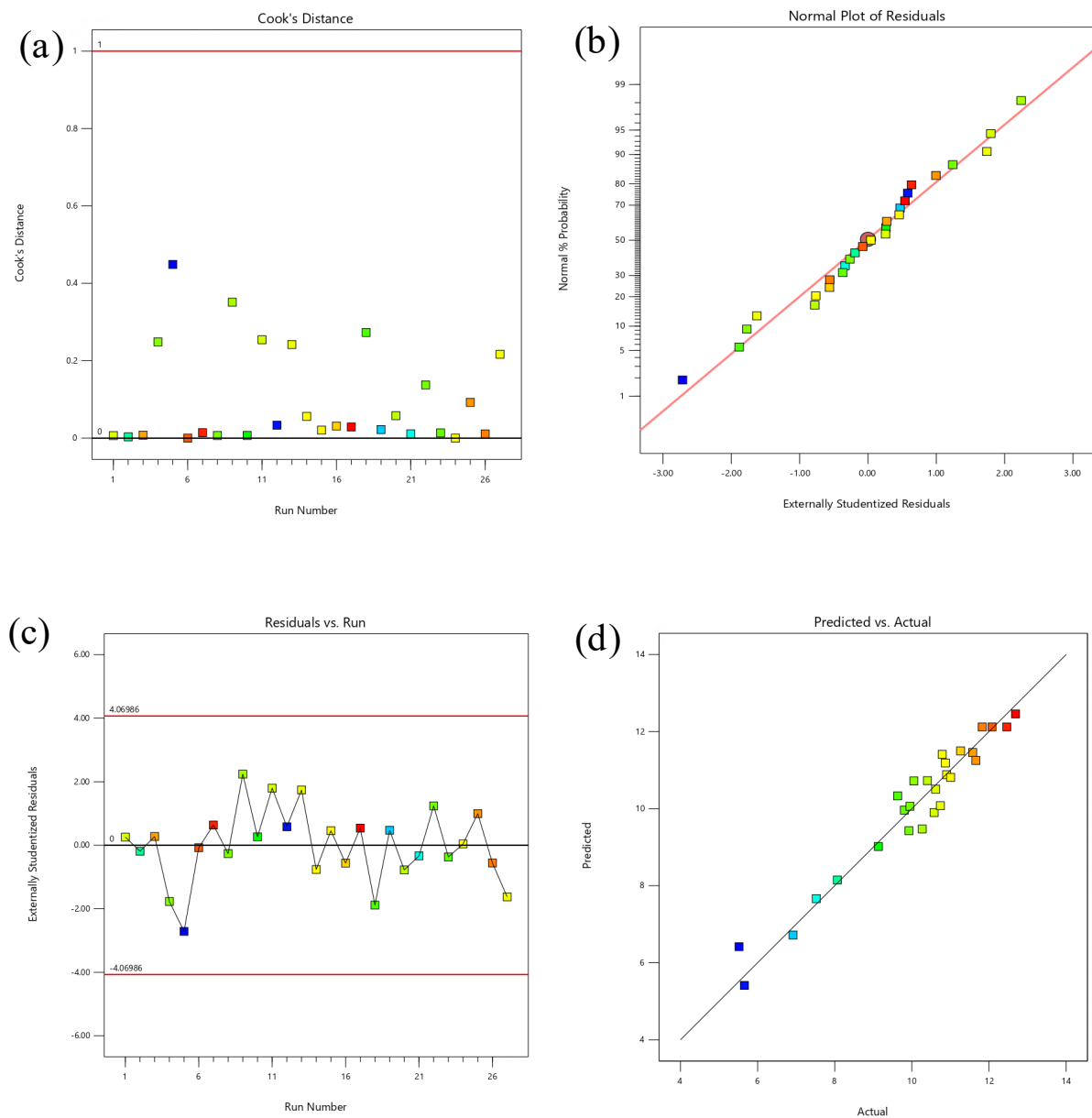


Figure S1. Response surface methodology model adequacy test diagram. (A) Cook's distance, (B) normal plot of residuals, (C) residuals vs. run, (D) predicted vs. actual

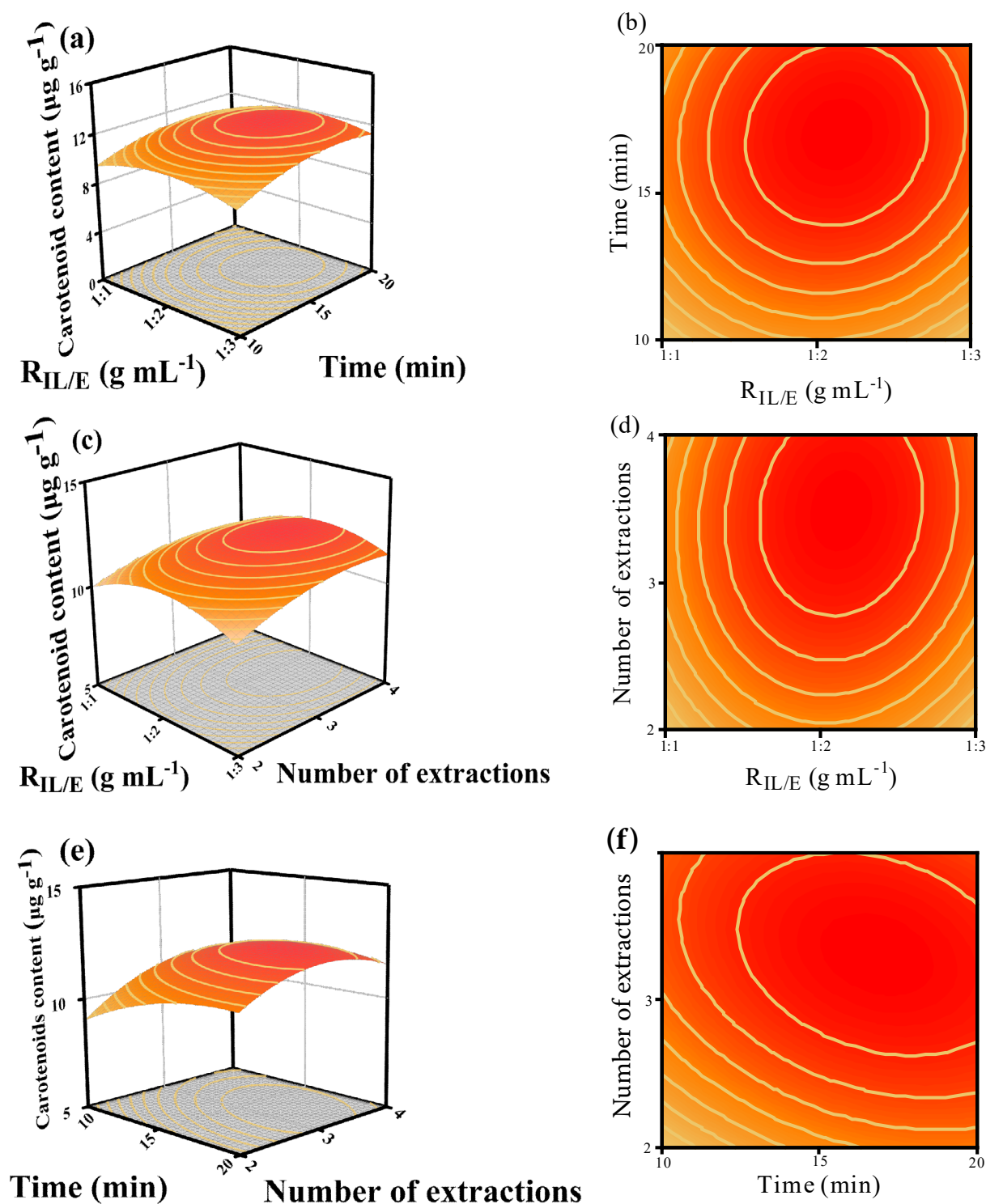


Figure S2. 3D surface plots and contour plots for the effect of on extraction ratio of carotenoids

<https://doi.org/10.17221/26/2025-CJFS>

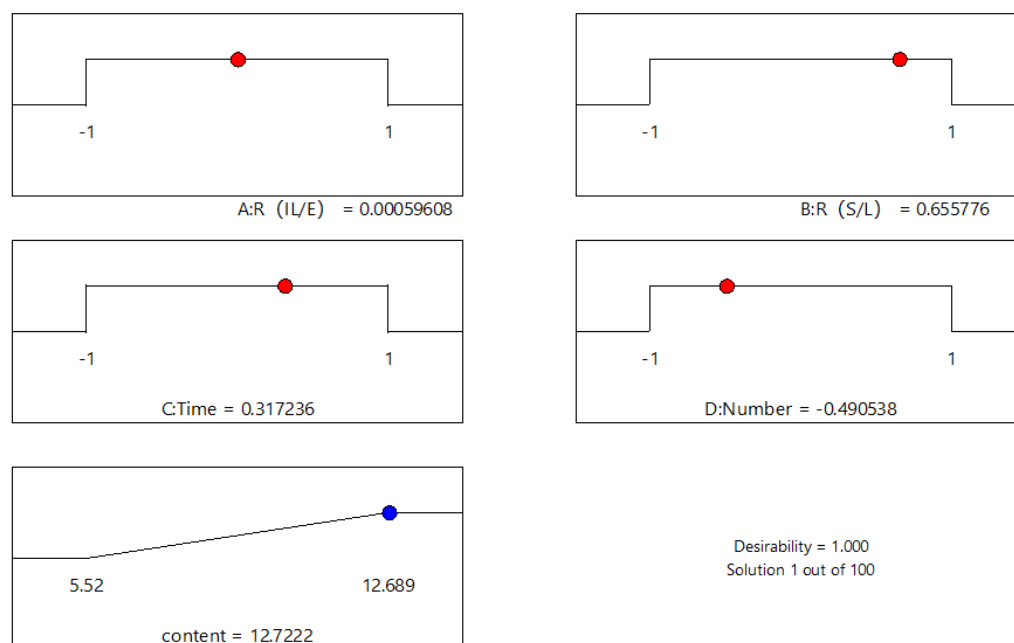


Figure S3. Desirability ramp for optimised conditions for extraction process conditions

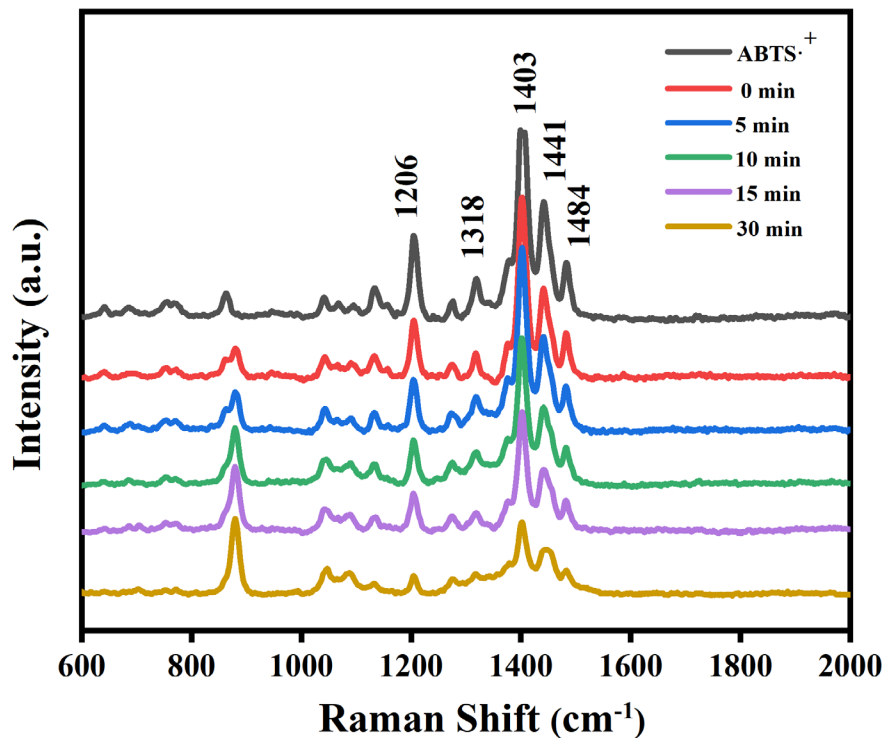


Figure S4. Raman spectroscopy of ethanol extract of Shushanggan apricot after reaction with ABTS⁺ radical at 0, 5,