

## Supplementary

We have performed a series of experiments to obtain the optimum results (Table 1).

Table 1 The optimization of the extraction method

NO.	particle size(mesh)	temperature(°C)	volume(mL)	time(min)	extraction efficiency(%)
1	100	35	30	60	7.35
2	300	35	30	60	7.48
3	100	55	30	60	7.43
4	300	55	30	60	7.54
5	100	45	20	45	7.81
6	100	45	40	75	8.12
7	100	45	40	45	7.93
8	100	45	20	75	7.86
9	100	45	30	75	7.57
10	300	45	30	45	7.64
11	100	45	30	75	7.49
12	300	45	30	45	7.78
13	200	35	20	60	7.56
14	200	55	20	60	7.72
15	200	35	40	60	7.68
16	200	55	40	60	7.91
17	100	45	20	60	7.45
18	300	45	20	60	7.59
19	100	45	40	60	7.52
20	300	45	40	60	7.66
21	200	35	30	45	7.73
22	200	55	30	45	7.87
23	200	35	30	75	7.75
24	200	55	30	75	8.07
25	200	45	30	60	8.27
26	200	45	30	60	8.26
27	200	45	30	60	8.23
28	200	45	30	60	8.28
29	200	45	30	60	8.21

The optimization of extraction method was determined and analysed by Design-ExpertV8.0.5.

Particle size (A), temperature (B), volume (C), and time (D) were taken as the influencing factors, and extraction efficiency Y as the response value. Multivariate regression fitting was performed on the experimental data with Design-ExpertV8.0.5 software, and the regression equation was obtained:

$$Y = -2.941 + 0.027A + 0.261B + 0.113C + 0.045D - 0.005AB + 0.004AC + 0.012AD + 0.017BC + 0.003BD + 0.002CD - 0.052A^2 - 0.032B^2 - 0.021C^2 - 0.004D^2$$

Box-Behnken Design was used to analyze the variance of the regression equation of the above experiments, and the results are shown in table 2.

Table 2 ANOVA of regression equation

Source	Sum of Square	df	Mean Square	F Value	Prob > F
Model	2.22	14	0.16	68.64	< 0.0001
A	0.065	1	0.065	27.88	0.0001
B	0.082	1	0.082	35.28	< 0.0001
C	0.057	1	0.057	24.8	0.0002
D	0.039	1	0.039	16.65	0.0011
AB	0.001	1	0.001	0.043	0.8383
AC	0.004	1	0.004	0	1
AD	0.009	1	0.009	0.39	0.543
BC	0.012	1	0.012	0.53	0.4789
BD	0.008	1	0.008	3.5	0.0825
CD	0.005	1	0.005	2.12	0.1677
A <sup>2</sup>	1.61	1	1.61	701.69	< 0.0001
B <sup>2</sup>	0.59	1	0.59	255	< 0.0001
C <sup>2</sup>	0.29	1	0.29	125.54	< 0.0001
D <sup>2</sup>	0.079	1	0.079	34.16	< 0.0001
Residual	0.032	14	0.002		
Lack of Fit	0.029	10	0.003	3.41	0.1241

The Model F-value of 68.64 implies the model is significant. There is only a

0.01% chance that a "Model F-Value" this large could occur due to noise. Values of "Prob > F" less than 0.0500 indicate model terms are significant. In this case A, B, C, D, A<sup>2</sup>, B<sup>2</sup>, C<sup>2</sup>, D<sup>2</sup> are significant model terms.

The optimization of extraction method was analysed by Design-ExpertV8.0.5 and obtain the optimum results as follows: 200 mesh of sample powders and 30 mL methanol under ultra sonication conditions at 45 °C held for 60 min.

Number	A	B	C	D	Y	Desirability
1	207.70	46.66	31.97	64.91	8.28	0.995