

## Article

# Optimization of Three Extraction Methods and Their Effect on the Structure and Antioxidant Activity of Polysaccharides in *Dendrobium huoshanense*

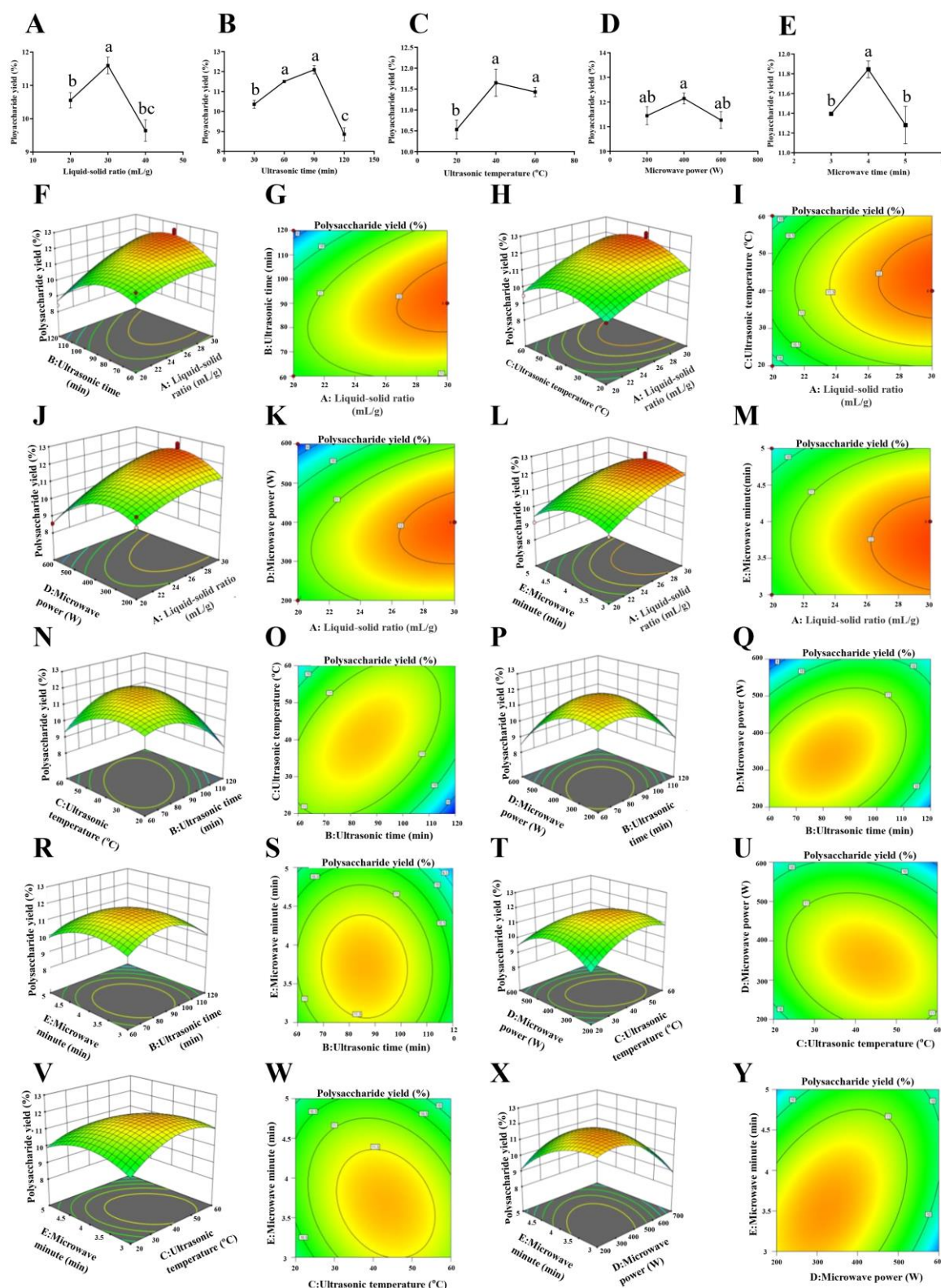
Hua Zhu <sup>1</sup>, Xin Yi <sup>1</sup>, Si-Si Jia <sup>1</sup>, Chun-Yao Liu <sup>1</sup>, Zi-Wei Han <sup>1</sup>, Bang-Xing Han <sup>2</sup>, Gong-Cheng Jiang <sup>3</sup>, Zheng-Feng Ding <sup>3</sup>, Ren-Lei Wang <sup>3,\*</sup> and Guang-Ping Lv <sup>1,\*</sup>

<sup>1</sup> School of Food and Pharmaceutical Engineering, Nanjing Normal University, Nanjing 210046, China; wfzh8233@163.com (H.Z.); 212702035@njnu.edu.cn (X.Y.); 18835540923@163.com (S.-S.J.); wissingni@163.com (C.-Y.L.); hinziwei@163.com (Z.-W.H.)

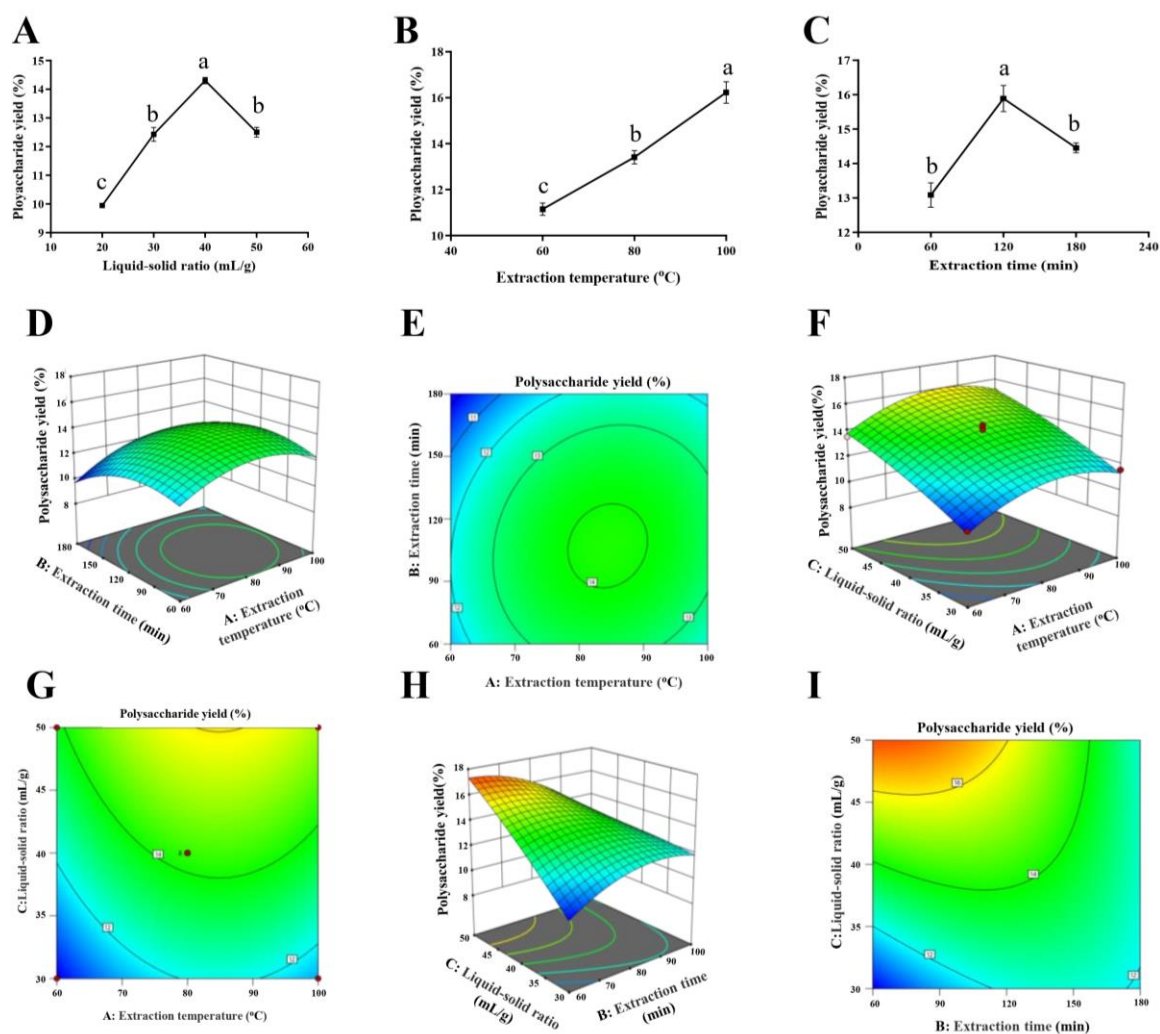
<sup>2</sup> College of Biological and Pharmaceutical Engineering, West Anhui University, Lu'an 237012, China; hanbx1978@wxc.edu.cn

<sup>3</sup> Key Laboratory of Biological Functional Molecules of Jiangsu Province, College of Life Science and Chemistry, Jiangsu Second Normal University, Nanjing 211200, China; ji680103@163.com (G.-C.J.); ding@jssnu.edu.cn (Z.-F.D.)

\* Correspondence: wr1@jssnu.edu.cn (R.-L.W.); guangpinglyu@njnu.edu.cn (G.-P.L.)



**Figure S1.** Effect of different (A) liquid-solid ration, (B) extraction time, (C) extraction temperature, (D) microwave power and (E) microwave minute on the yield of polysaccharides by UMAE. Response surfaces plots (F, H, J, L, N, P, R, T, V and X) and contour plots (G, I, K, M, O, Q, S, U, W and Y) showing the effects of liquid-solid ration, extraction time, extraction temperature, microwave power and microwave minute on the yield of polysaccharides by UMAE. Significant ( $p < 0.05$ ) differences are shown by data bearing different letters (a–c).



**Figure S2.** Effect of different (A) extraction temperature, (B) extraction time and (C) liquid-solid ration on the yield of polysaccharides by HAE. Response surfaces plots (D, F and H) and contour plots (E, G and I) showing the effects of extraction temperature, extraction time and liquid-solid ratio on the yield of polysaccharides by HAE. Significant ( $p < 0.05$ ) differences are shown by data bearing different letters (a–c).

**Table S1** Experimental design for independent variables and the response of the extraction yield of UMAE in Box-Behnken design.

Run	Coded variables					Uncoded variable					Response
	A	B	C	D	E	A (Liquid–solid ratio, (mL/g))	B (Ultrasonic time, min)	C (Ultrasonic temperature, °C)	D (Micro-wave power, W)	E (Micro-wave minute, min)	
1	-1	1	0	0	0	20:1	120	40	400	4	8.42
2	0	1	-1	0	0	30:1	120	20	400	4	9.24
3	0	0	0	1	1	30:1	90	40	600	5	10.16
4	-1	-1	0	0	0	20:1	60	40	400	4	11
5	0	0	-1	0	1	30:1	90	20	400	5	10.29
6	0	1	0	-1	0	30:1	120	40	200	4	9.66
7	0	-1	1	0	0	30:1	60	60	400	4	8.92
8	0	-1	0	0	1	30:1	60	40	400	5	9.74
9	0	0	0	0	0	30:1	90	40	400	4	11.79
10	0	0	0	1	-1	30:1	90	40	600	3	9.66
11	0	0	1	0	0	40:1	90	60	400	4	10.86
12	0	-1	0	0	-1	30:1	60	40	400	3	10.03
13	0	1	0	0	-1	30:1	120	40	400	3	11.42
14	0	0	0	0	0	30:1	90	40	400	4	12.32
15	0	1	0	1	0	30:1	120	40	600	4	10.77
16	0	0	0	0	-1	40:1	90	40	400	3	11.4
17	0	0	0	-1	1	30:1	90	40	200	5	8.64
18	0	0	1	-1	0	30:1	90	60	200	4	11.62
19	0	-1	0	-1	0	30:1	60	40	200	4	10.81
20	0	-1	0	0	0	40:1	60	40	400	4	9.18
21	0	0	-1	0	-1	30:1	90	20	400	3	10.79
22	0	0	0	-1	-1	30:1	90	40	200	3	11.32
23	0	-1	-1	0	0	30:1	60	20	400	4	10.66
24	0	0	-1	-1	0	30:1	90	20	200	4	9.43
25	0	1	0	0	1	30:1	120	40	400	5	10.75

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26	0	0	1	0	1	30:1	90	60	400	5	10.51
27	-1	0	-1	0	0	20:1	90	20	400	4	9.79
28	-1	0	0	0	1	20:1	90	40	400	5	9.07
29	0	0	0	0	0	30:1	90	40	400	4	12.5
30	0	1	0	0	0	40:1	120	40	400	4	10.74
31	0	0	1	1	0	30:1	90	60	600	4	10.22
32	0	0	0	0	1	40:1	90	40	400	5	10.25
33	0	0	-1	1	0	30:1	90	20	600	4	9.93
34	-1	0	0	0	-1	20:1	90	40	400	3	10.09
35	0	0	-1	0	0	40:1	90	20	400	4	9.66
36	-1	0	1	0	0	20:1	90	60	400	4	9.49
37	-1	0	0	-1	0	20:1	90	40	200	4	10.22
38	0	-1	0	1	0	30:1	60	40	600	4	9.09
39	0	0	0	-1	0	40:1	90	40	200	4	9.7
40	-1	0	0	1	0	20:1	90	40	600	4	8.56
41	0	0	0	0	0	30:1	90	40	400	4	12.39
42	0	1	1	0	0	30:1	120	60	400	4	11.52
43	0	0	0	0	0	30:1	90	40	400	4	11.88
44	0	0	0	1	0	40:1	90	40	600	4	10.48
45	0	0	0	0	0	30:1	90	40	400	4	12.57
46	0	0	1	0	-1	30:1	90	60	400	3	12.19
47	-1	0	0	-1	0	20:1	90	40	200	4	10.78
48	0	1	0	1	0	30:1	120	40	600	4	11.08
49	0	1	1	0	0	30:1	120	60	400	4	11.42
50	0	0	-1	0	-1	30:1	90	20	400	3	9.97

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**Table S2** ANOVA for response surface quadratic model for the yield of UMAE.

Source	Sum of squares	Df	Mean square	F-value	p-Value	
Model	51.49576	20	2.574788	13.65901	7.76E-10	significant
A-Liquid-solid ratio	16.0156	1	16.0156	84.96129	4.05E-10	***
B-Ultrasonic time	0.882579	1	0.882579	4.681999	0.038857	*
C-Ultrasonic temperature	0.216094	1	0.216094	1.146356	0.293144	
D-Microwave power	2.821115	1	2.821115	14.96575	0.000571	***
E-Microwave minute	1.511223	1	1.511223	8.016898	0.008336	**
AB	4.2849	1	4.2849	22.731	4.84E-05	***
AC	0.5625	1	0.5625	2.98401	0.094728	
AD	2.503331	1	2.503331	13.27994	0.001041	**
AE	0.004225	1	0.004225	0.022413	0.882029	
BC	4.124853	1	4.124853	21.88196	6.21E-05	***
BD	2.932033	1	2.932033	15.55416	0.000466	***
BE	0.0361	1	0.0361	0.191507	0.664907	
CD	0.9025	1	0.9025	4.787679	0.036869	*
CE	0.701478	1	0.701478	3.721277	0.063561	
DE	2.5281	1	2.5281	13.41134	0.000993	***
A <sup>2</sup>	15.35217	1	15.35217	81.44183	6.42E-10	***
B <sup>2</sup>	10.92444	1	10.92444	57.95311	2.16E-08	***
C <sup>2</sup>	7.153454	1	7.153454	37.94841	1.03E-06	***
D <sup>2</sup>	12.56768	1	12.56768	66.67036	5.28E-09	***
E <sup>2</sup>	5.145611	1	5.145611	27.29699	1.36E-05	***
Residual	5.466637	29	0.188505			
Lack of Fit	4.383104	20	0.219155	1.820338	0.178664	not significant
Pure Error	1.083533	9	0.120393			
Cor Total	56.96239	49				
R <sup>2</sup>	0.9040		R <sup>2</sup> <sub>Adj</sub>	0.8378		
C.V.%	4.1509		Pred R-Squared	0.6803	A <sub>deq</sub> Precision	13.1120

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

**Table S3** Experimental design for independent variables and the response of the extraction yield of HWE in Box-Behnken design.

Run	Coded variables			Uncoded variable			Response
	A	B	C	A (Extraction temperature, °C)	B (Extraction time, min)	C (Liquid-solid ratio, mL/g)	
1	-1	0	1	60	120	50:1	13.54
2	0	1	-1	80	180	30:1	11.17
3	-1	0	-1	60	120	30:1	10.08
4	1	0	-1	100	120	30:1	11.57
5	0	0	0	80	120	40:1	14.71
6	0	0	0	80	120	40:1	14.32
7	1	0	1	100	120	50:1	15.03
8	0	-1	1	80	60	50:1	17.86
9	0	1	1	80	180	50:1	12.05
10	0	-1	-1	80	60	30:1	10.01
11	1	1	0	100	180	40:1	12.03
12	-1	-1	0	60	60	40:1	11.87
13	1	-1	0	100	60	40:1	12.59
14	-1	1	0	60	180	40:1	10.05
15	0	0	0	80	120	40:1	14.52
16	0	0	0	80	120	40:1	14.11
17	0	0	0	80	120	40:1	14.6
18	0	0	0	80	120	40:1	13.98
19	0	0	0	80	120	40:1	14.34
20	0	0	0	80	120	40:1	13.94

**Table S4** ANOVA for response surface quadratic model for the yield of HWE.

Source	Sum of squares	Df	Mean square	F-value	p-Value	
Model	75.37	9	8.37	51.12	< 0.0001	significant
A	4.03	1	4.03	24.62	0.0006	***
B	6.18	1	6.18	37.71	0.0001	***
C	30.62	1	30.62	186.88	< 0.0001	***
AB	0.3969	1	0.3969	2.42	0.1506	
AC	0.0000	1	0	0	1	
BC	12.15	1	12.15	74.14	< 0.0001	***
A <sup>2</sup>	9.59	1	9.59	58.57	< 0.0001	***
B <sup>2</sup>	6.93	1	6.93	42.3	< 0.0001	***
C <sup>2</sup>	0.4429	1	0.4429	2.7	0.1312	
Residual	1.64	10	0.1638			
Lack of fit	1.06	3	0.3545	4.32	0.0508	not significant
Pure error	0.5748	7	0.0821			
Correlation total	77.01	19				
R <sup>2</sup>	0.9787		R <sup>2</sup> <sub>Adj</sub>	0.9599		
C.V.%	3.0853		Pred R-Squared	0.9595820 6909385	A <sub>deq</sub> Precision	26.6202

\*\*\*p &lt; 0.001.