

A Green and Effective Polyethylene Glycols-Based Microwave-Assisted Extraction of Carnosic and Rosmarinic Acids from *Rosmarinus Officinalis* Leaves

Chunyan Zhu¹, Yunchang Fan^{1,*} and Xiujun Bai²

¹College of Chemistry and Chemical Engineering, Henan Polytechnic University,
Jiaozuo 454003, China

²Shijiazhuang ENN gas Co., Ltd., Shijiazhuang, 050081, China

* Corresponding author. E-mail address: fanyunchang@hpu.edu.cn

Table S1. Results of regression analysis of the second-order polynomial models for the optimization of the extraction of CA and RA.

| Term | Coefficients Estimated | <i>p</i> -Value | <i>t</i> -Value |
|----------------|------------------------|-----------------|-----------------|
| RA | | | |
| Intercept | 1.34 | < 0.0001* | 25.56 |
| A | −0.014 | 0.378 | −0.92 |
| B | −0.016 | 0.288 | −1.12 |
| C | 0.016 | 0.300 | 1.09 |
| D | 0.046 | 0.008* | 3.29 |
| AB | 0.0025 | 0.910 | 0.12 |
| AC | 0.018 | 0.439 | 0.81 |
| AD | 0.0058 | 0.796 | 0.27 |
| BC | −0.038 | 0.111 | −1.75 |
| BD | −0.036 | 0.118 | −1.71 |
| CD | 0.016 | 0.484 | 0.73 |
| A ² | −0.026 | 0.366 | −0.95 |
| B ² | 0.0052 | 0.872 | 0.17 |
| C ² | −0.038 | 0.198 | −1.38 |
| D ² | −0.17 | < 0.0001* | −5.56 |
| CA | | | |
| Intercept | 2.64 | < 0.0001* | 17.14 |
| A | 0.22 | 0.001* | 4.91 |
| B | 0.064 | 0.155 | 1.54 |
| C | 0.26 | < 0.0001* | 5.89 |
| D | −0.077 | 0.092 | −1.86 |
| AB | −0.0078 | 0.905 | −0.12 |
| AC | −0.030 | 0.660 | −0.45 |
| AD | −0.16 | 0.031* | −2.52 |
| BC | −0.12 | 0.086 | −1.91 |
| BD | −0.034 | 0.598 | −0.55 |
| CD | −0.028 | 0.666 | −0.44 |
| A ² | −0.42 | < 0.0001* | −5.30 |
| B ² | −0.17 | 0.095 | −1.85 |
| C ² | −0.45 | < 0.0001* | −5.56 |
| D ² | −0.21 | 0.045* | −2.29 |

*Significant ($p < 0.05$).

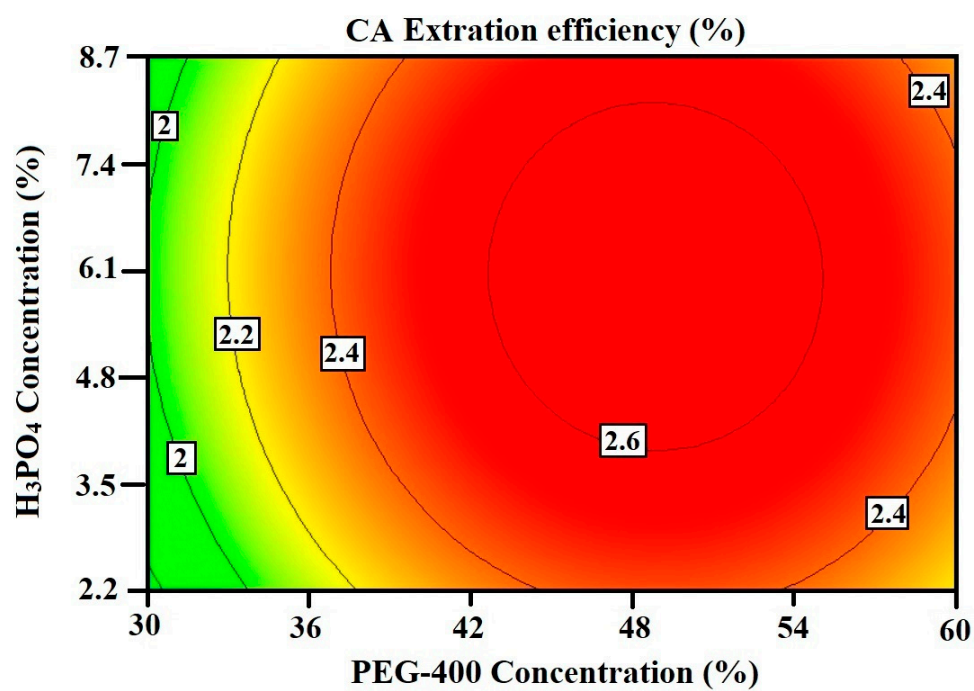


Figure S1. Contour plot of the interactive effects of PEG-400 concentration and H₃PO₄ concentration on the extraction of CA.

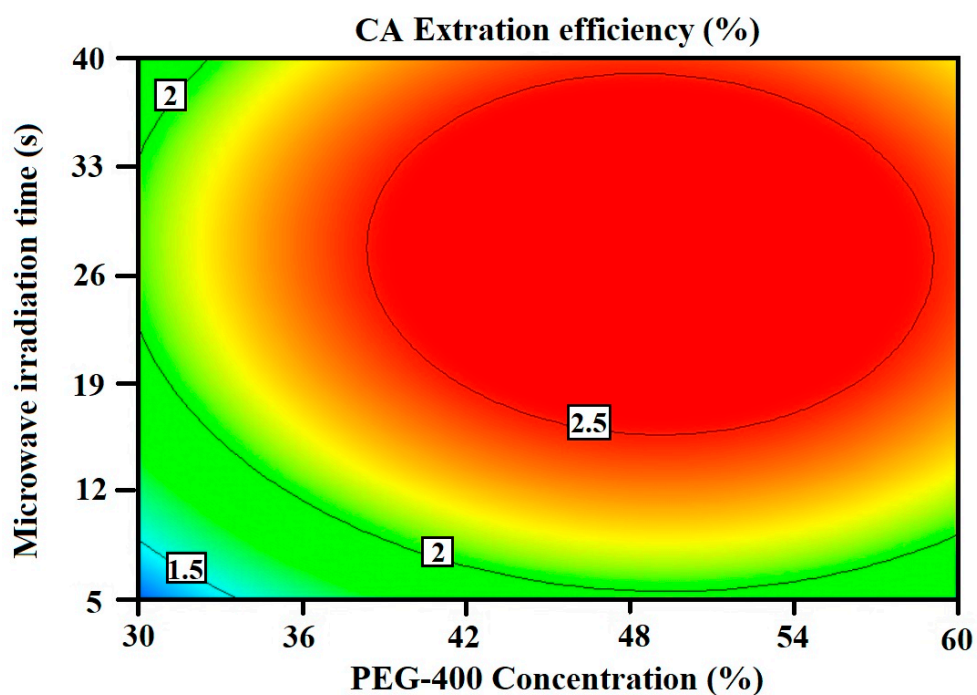


Figure S2. Contour plot of the interactive effects of PEG-400 concentration and microwave irradiation time on the extraction of CA.

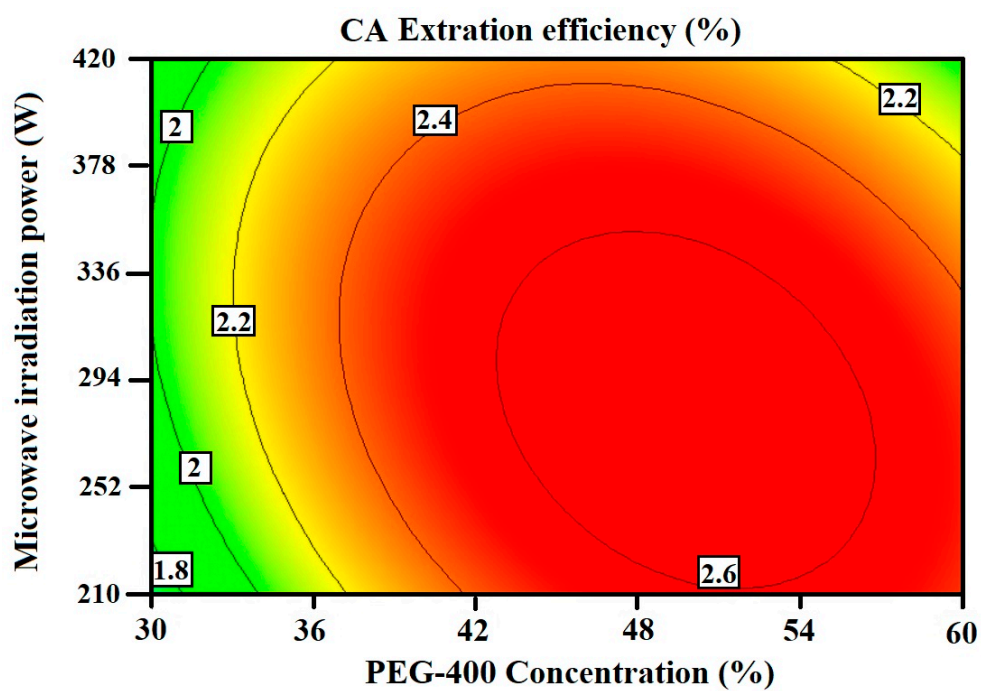


Figure S3. Contour plot of the interactive effects of PEG-400 concentration and microwave irradiation power on the extraction of CA.

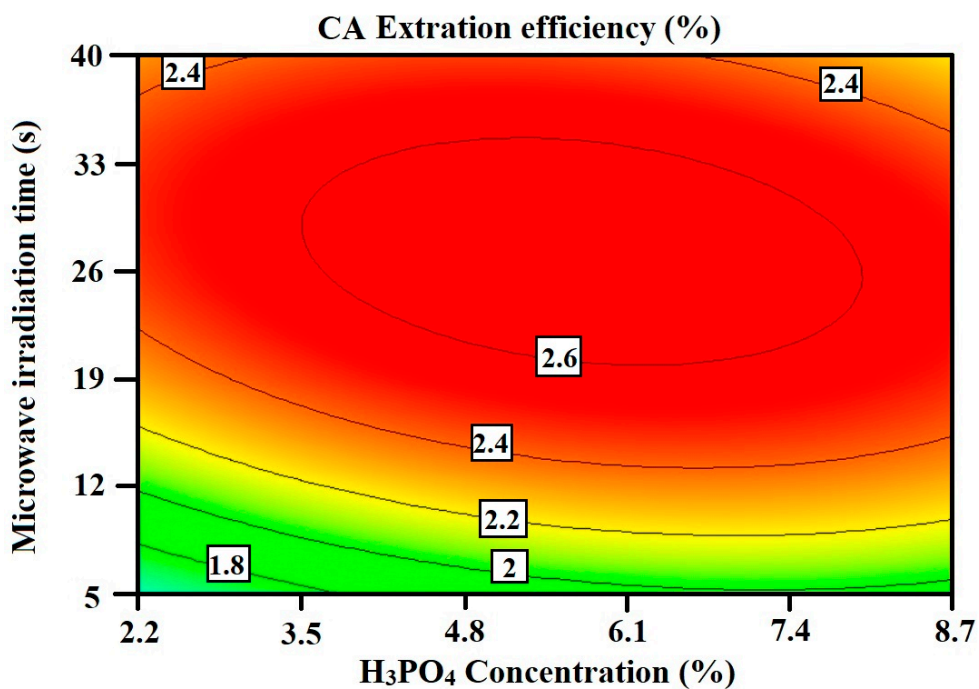


Figure S4. Contour plot of the interactive effects of H₃PO₄ concentration and microwave irradiation time on the extraction of CA.

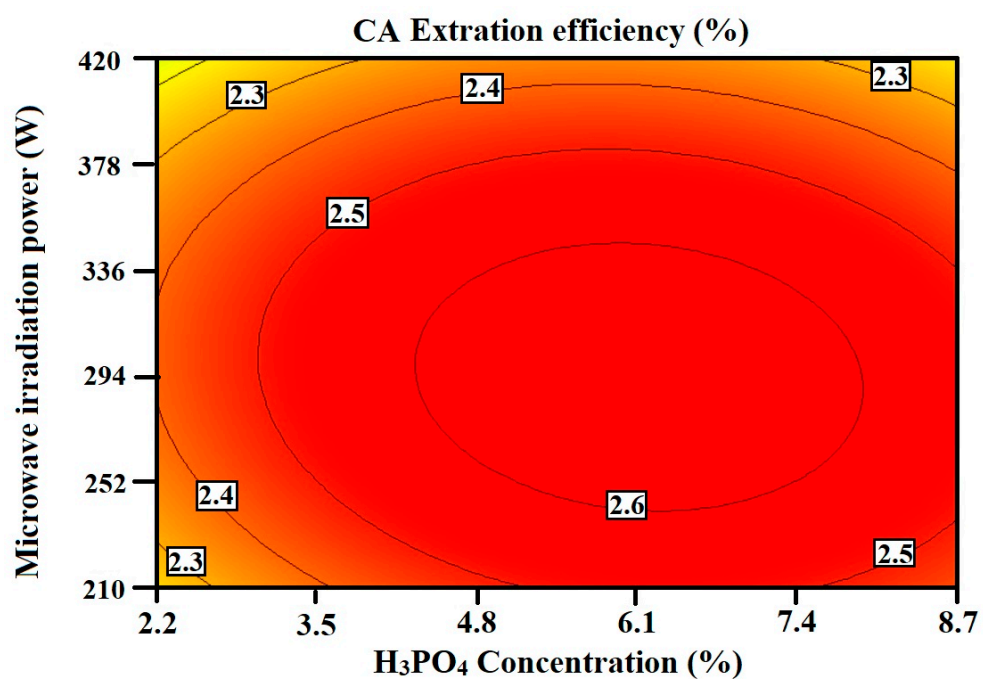


Figure S5. Contour plot of the interactive effects of H_3PO_4 concentration and microwave irradiation power on the extraction of CA.

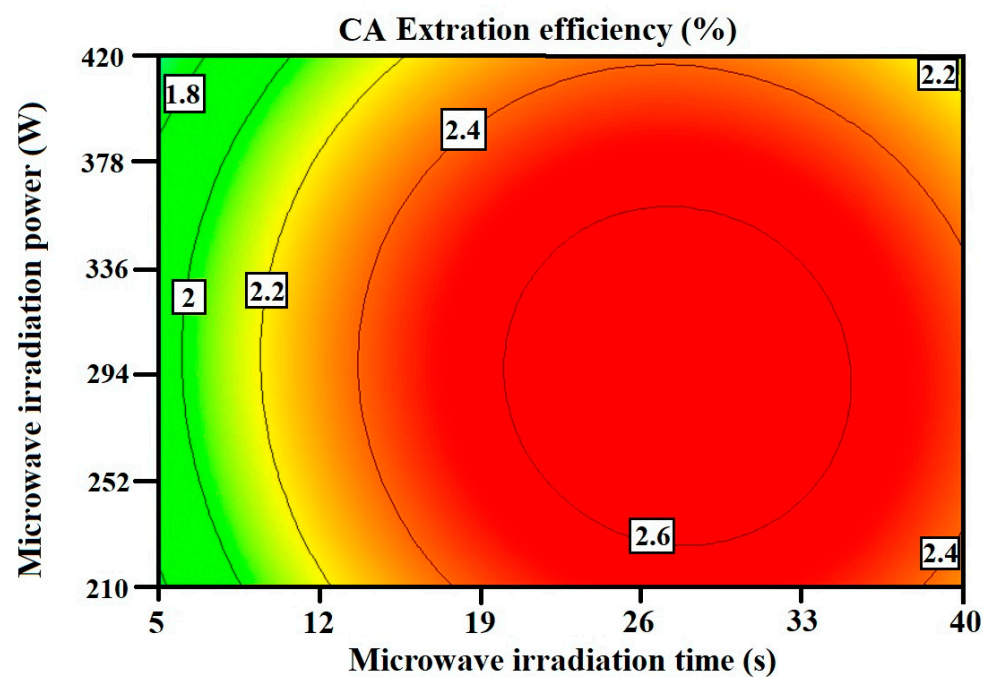


Figure S6. Contour plot of the interactive effects of microwave irradiation time and microwave irradiation power on the extraction of CA.

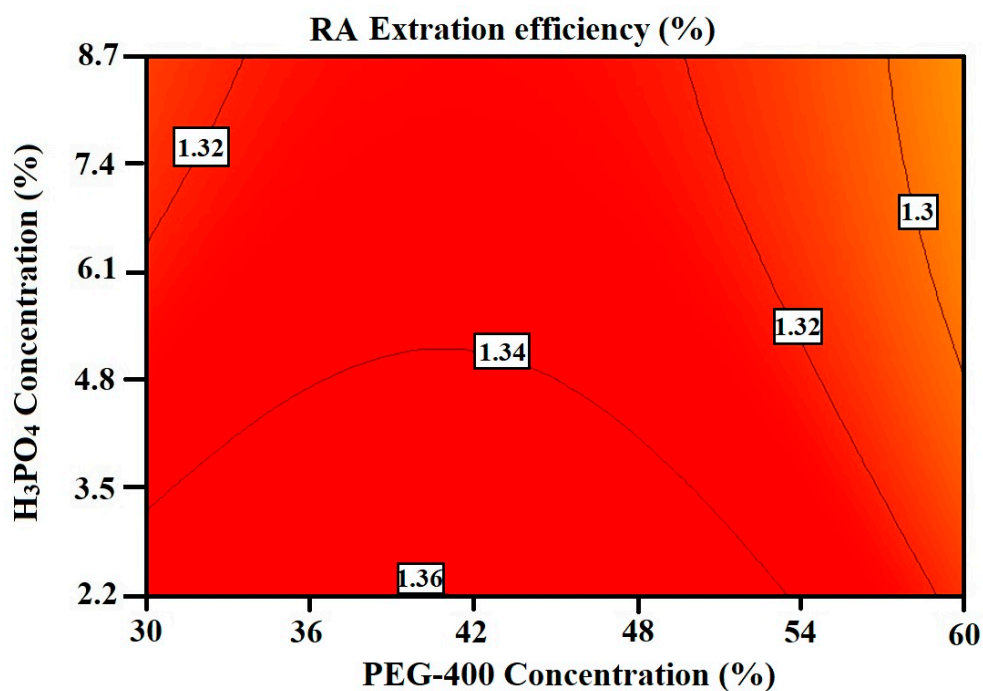


Figure S7. Contour plot of the interactive effects of PEG-400 concentration and H₃PO₄ concentration on the extraction of RA.

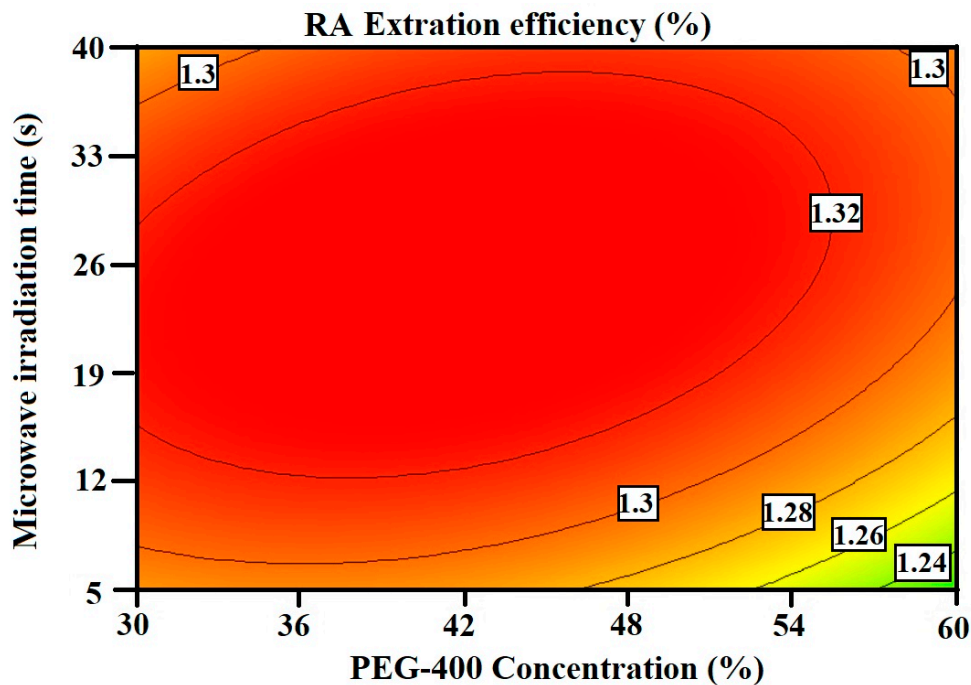


Figure S8. Contour plot of the interactive effects of PEG-400 concentration and microwave irradiation time on the extraction of RA.

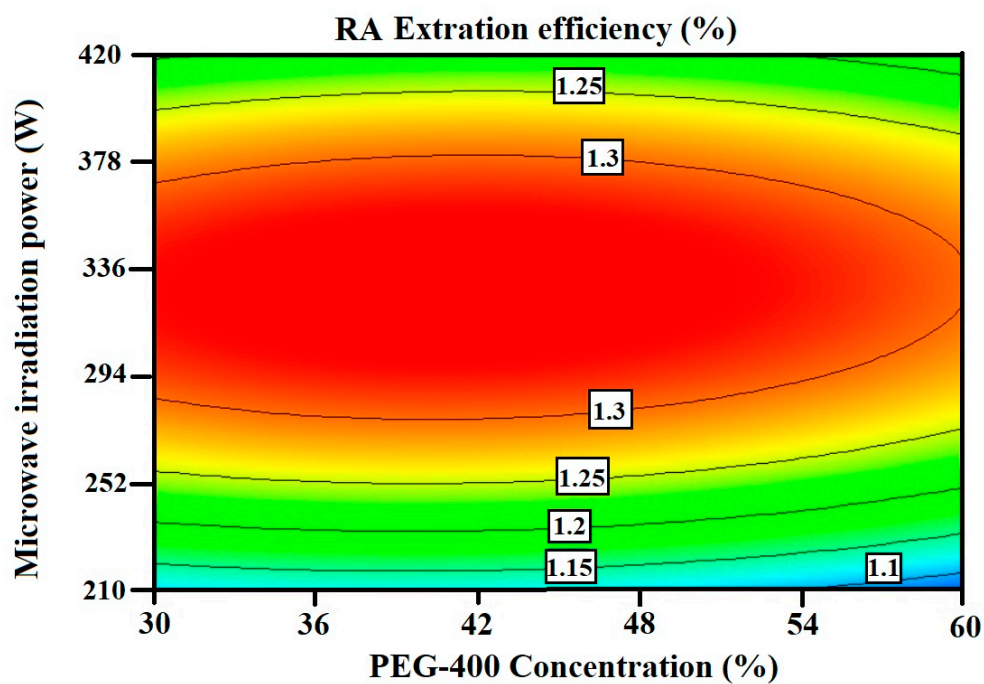


Figure S9. Contour plot of the interactive effects of PEG-400 concentration and microwave irradiation power on the extraction of RA.

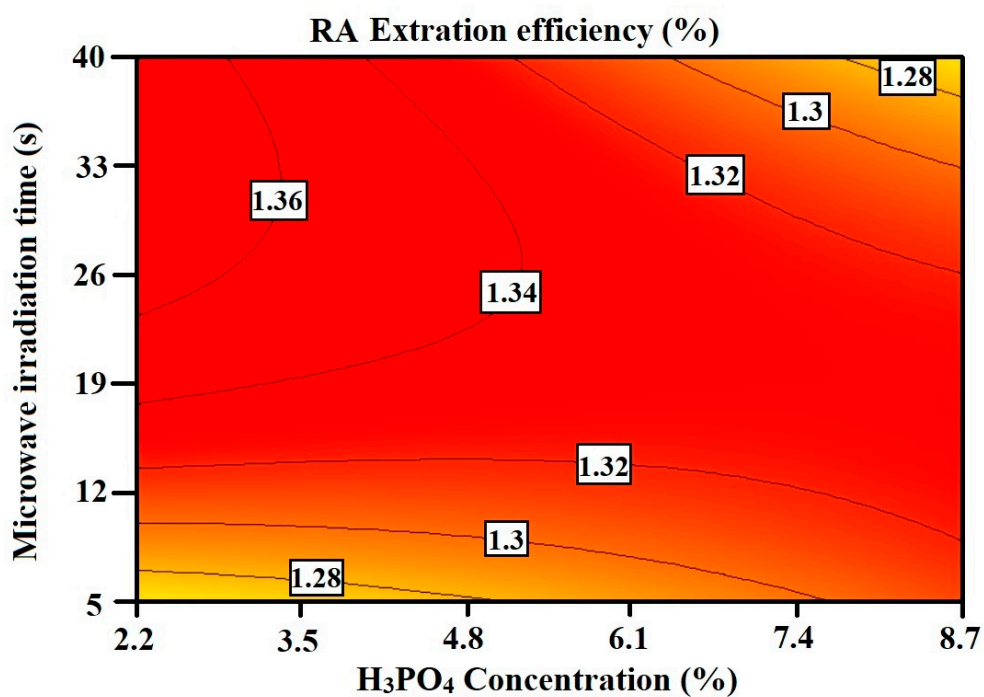


Figure S10. Contour plot of the interactive effects of H₃PO₄ concentration and microwave irradiation time on the extraction of RA.

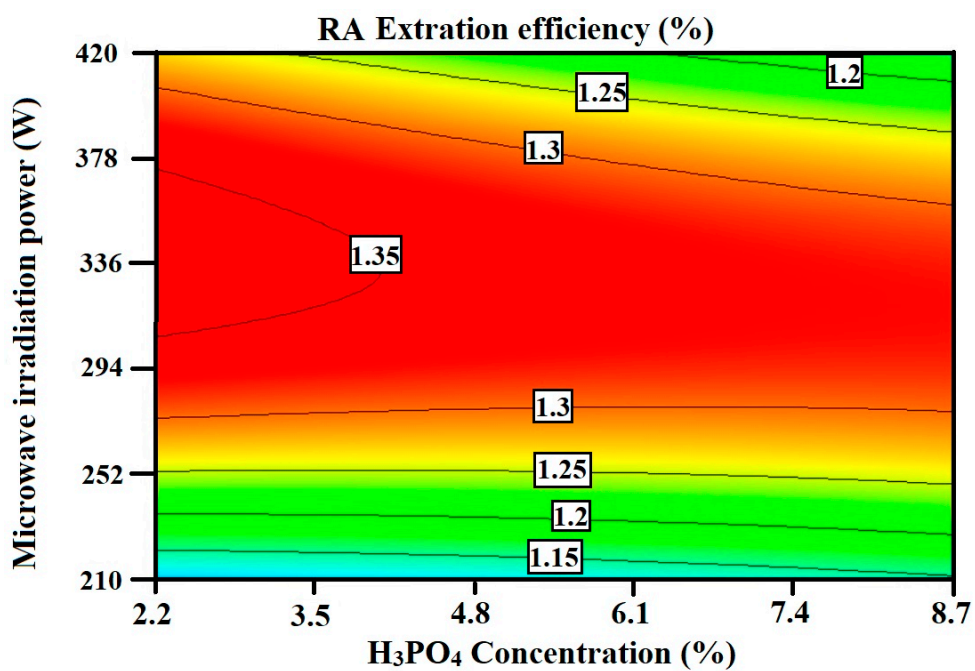


Figure S11. Contour plot of the interactive effects of H_3PO_4 concentration and microwave irradiation power on the extraction of RA.

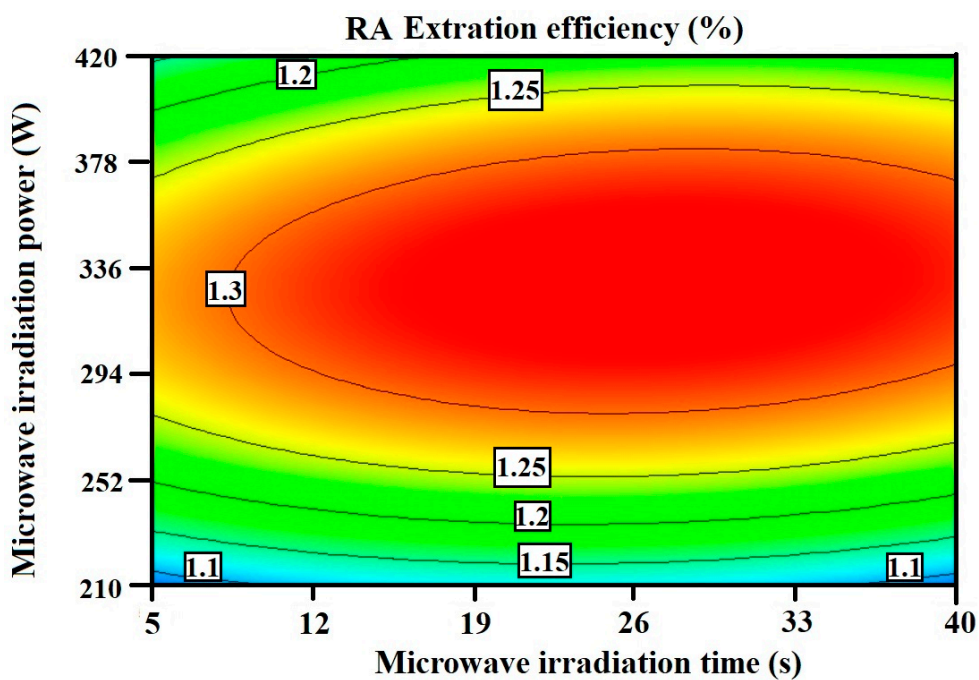


Figure S12. Contour plot of the interactive effects of microwave irradiation time and microwave irradiation power on the extraction of RA.