

## Supplementary Information

# Application of deep eutectic solvents to prepare mixture extracts of three long-lived trees with maximized skin-related bioactivities

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**Table 1.** Effects of the molar ratios between glycerol and xylitol on the ISO yields.

Molar ratio of glycerol to xylitol	ISO yield $\pm$ SD <sup>a</sup> ( $\mu\text{g g}^{-1}$ )	% RSD
1:1 (DES 1-1)	869.4 $\pm$ 10.4	1.20%
2:1 (DES 1-2)	883.5 $\pm$ 49.2	5.56%
3:1 (DES 1-3)	877.0 $\pm$ 45.3	5.17%
4:1 (DES 1-4)	898.5 $\pm$ 20.7	2.31%
5:1 (DES 1-5)	945.6 $\pm$ 15.2	1.60%

<sup>a</sup> Obtained using a DES solution containing 30% w/w of water (n = 3).

**Table 2.** Effects of the added water in DES 1-5 (glycerol:xylitol, 5:1).

DES content (water content)	ISO yield $\pm$ SD <sup>a</sup> ( $\mu\text{g g}^{-1}$ )	% RSD
50% w/w DES (50% w/w water)	885.2 $\pm$ 22.9	2.69%
70% w/w DES (30% w/w water)	945.6 $\pm$ 15.2	1.60%
90% w/w DES (10% w/w water)	693.2 $\pm$ 48.6	7.01%

<sup>a</sup> n = 3.

**Table 3.** Fit summary of the models.

Response <sup>a</sup>	Model	R <sup>2</sup> <sub>adj</sub>	p-value	
Y <sub>1</sub>	Linear	0.3893	0.0961	
	Quadratic	0.6514	0.2354	
	Special cubic	0.9619	0.0372	Suggested
Y <sub>2</sub> <sup>3</sup>	Linear	0.0842	0.3240	
	Quadratic	0.8399	0.0427	Suggested
	Special cubic	0.7707	0.7874	
Y <sub>3</sub>	Linear	0.0132	0.4053	
	Quadratic	0.6864	0.1023	
	Special cubic	0.9645	0.0384	Suggested

<sup>a</sup> Y<sub>1</sub>, antioxidant activity; Y<sub>2</sub>, anti-tyrosinase activity; Y<sub>3</sub>, anti-elastase activity.

**Table 4.** ANOVA results of the established models for each response.

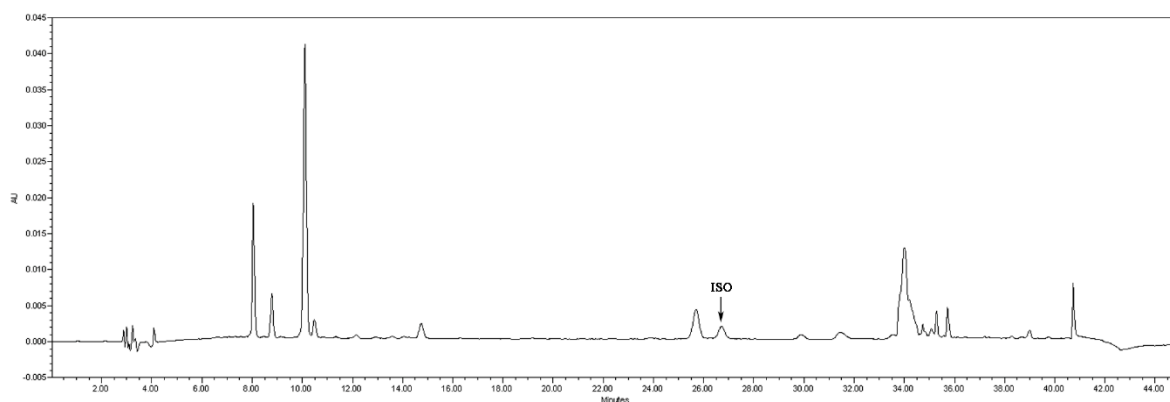
Response <sup>a</sup>	Variation source	SS	df	MS	F-value	p-value
Y <sub>1</sub>	Model	0.0200	6	0.0033	34.62	0.0283
	Linear mixture	0.0110	2	0.0055	56.84	0.0173
	X <sub>1</sub> X <sub>2</sub>	0.0006	1	0.0006	5.81	0.1375
	X <sub>1</sub> X <sub>3</sub>	0.0008	1	0.0008	8.67	0.0986
	X <sub>2</sub> X <sub>3</sub>	0.0013	1	0.0013	13.54	0.0666
	X <sub>1</sub> X <sub>2</sub> X <sub>3</sub>	0.0024	1	0.0024	25.42	0.0372
	Lack of Fit					
	Pure Error	0.0002	2	0.0001		
	Core Total	0.0200	8			
Y <sub>2</sub>	Model	6.7000E+10	5	1.3400E+10	9.39	0.0473
	Linear mixture	2.2320E+10		2.2320E+10	7.82	0.0645
	X <sub>1</sub> X <sub>2</sub>	1.5000E+10		1.5000E+10	10.51	0.0478
	X <sub>1</sub> X <sub>3</sub>	1.0310E+10		1.0310E+10	7.23	0.0745
	X <sub>2</sub> X <sub>3</sub>	2.0230E+10		2.0230E+10	14.18	0.0328
	Residual	4.2800E+09		4.2800E+09		
	Lack of Fit	1.9350E+08	1	1.9350E+08	0.10	0.7874
	Pure Error	4.0870E+09	2	2.0430E+09		
	Cor Total	7.1280E+10	8			
Y <sub>3</sub>	Model	27.3200	6	4.5500	37.26	0.0264
	Linear mixture	7.1600	2	3.5800	29.32	0.0330
	X <sub>1</sub> X <sub>2</sub>	0.0050	1	0.0050	0.04	0.8589
	X <sub>1</sub> X <sub>3</sub>	1.1300	1	1.1300	9.23	0.0934
	X <sub>2</sub> X <sub>3</sub>	15.7700	1	15.7700	129.09	0.0077
	X <sub>1</sub> X <sub>2</sub> X <sub>3</sub>	3.0000	1	3.0000	24.53	0.0384
	Lack of Fit					
	Pure Error	0.24	2	0.12		
	Cor Total	579.0958	9	64.3440		

<sup>a</sup> Y<sub>1</sub>, antioxidant activity; Y<sub>2</sub>, anti-tyrosinase activity; Y<sub>3</sub>, anti-elastase activity.

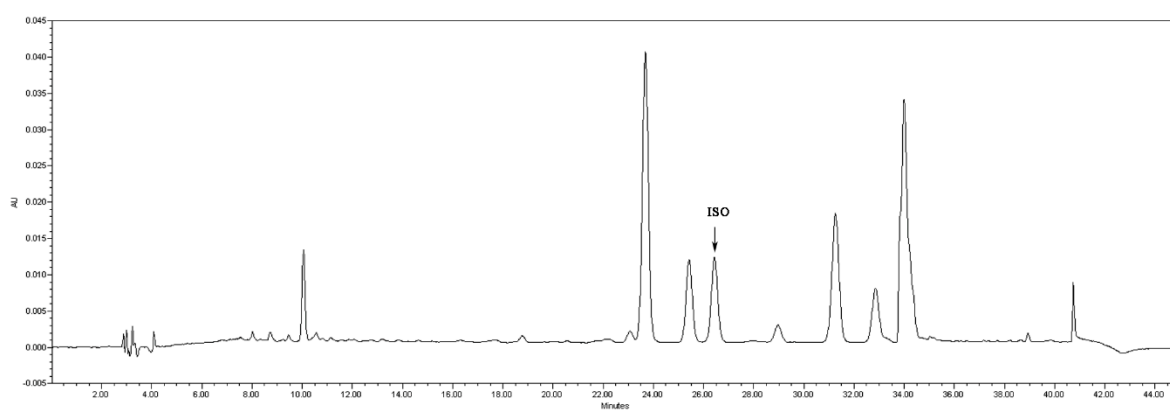
<sup>b</sup> X<sub>1</sub>, Cinnamomum camphora; X<sub>2</sub>, Cryptomeria japonica; X<sub>3</sub>, Ginkgo biloba.

Abbreviations: SS, sum of squares; df, degrees of freedom; MS, mean square..

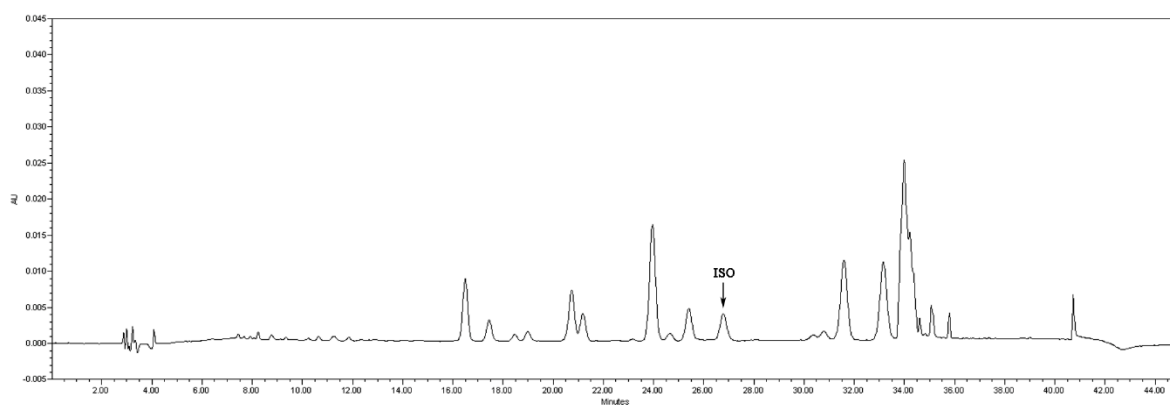
(a)



(b)



(c)



**Figure 1.** Chromatographic profiles of the three extracts of *Ginkgo biloba* (a), *Cinnamomum camphora* (b), and *Cryptomeria japonica* (c) leaves prepared using 70% w/w DES 1. Peak identification: ISO, isoquercetin.