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Tailor-made Deep Eutectic Solvents for Simultaneous Extraction of Five Aromatic Acids from *Ginkgo biloba* Leaves

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1. Supplementary tables

Tabel S1. Standard curves of five aromatic acids.

	Regression Equation	R^2	Concentration Range (μg/mL)	LOD (ug/mL)	LOQ (ug/mL)
SA	y = 917.63x + 21.489	0.9993	203–2030	26.57	80.51
GA	y = 10006x − 1.1782	0.9996	200–200	0.16	0.49
6-HKA	y = 4.9038x − 0.2523	0.9997	14–140	0.72	2.19
PA	y = 3.1713x − 10.06	0.9993	22–220	2.03	6.17
PHBA	y = 4.9761x − 10.141	0.9993	16–160	0.49	1.49

Table S2. List of the prepared binary DESs for initial screening.

Abbreviation	Component 1	Component 2	Molar Ratio	Appearance at 45 °C
ChCl-G	Choline chloride	Glycerol	1:2	Transparent liquid
ChCl-EG	Choline chloride	Ethylene glycol	1:2	Transparent liquid
ChCl-P	Choline chloride	Propylene glycol	1:2	Transparent liquid
ChCl-B	Choline chloride	1,3-Butanediol	1:3	Transparent liquid
ChCl-DS	Choline chloride	D-Sorbitol	1:1	Transparent viscous liquid
ChCl-DG	Choline chloride	D-(+)-Glucose	1:1	Transparent viscous liquid
ChCl-PA	Choline chloride	1,5-Pentanedioic acid	1:1	Transparent liquid
ChCl-GA	Choline chloride	Glycolic acid	1:1	Transparent liquid
ChCl-MA1	Choline chloride	Malonic acid	1:1	Transparent liquid
ChCl-MA2	Choline chloride	DL-Malic acid	1:1	Transparent viscous liquid
ChCl-LA1	Choline chloride	Levulinic acid	1:2	Transparent liquid
ChCl-LA2	Choline chloride	Lactic acid	1:1	Transparent liquid
ChCl-CA	Choline chloride	Citric acid	1:1	Transparent viscous liquid
ChCl-TA	Choline chloride	L(+)-Tartaric acid	2:1	Transparent viscous liquid
ChCl-U	Choline chloride	Urea	1:2	Transparent liquid
BE-G	Betaine	Glycerol	1:2	Transparent liquid
BE-EG	Betaine	Ethylene glycol	1:3	Transparent liquid
BE-P	Betaine	Propylene glycol	1:3	Transparent liquid
BE-B	Betaine	1,3-Butanediol	1:3	Transparent liquid
BE-X	Betaine	Xylitol	1:2	Transparent viscous liquid
BE-DS	Betaine	D-Sorbitol	1:2	Transparent viscous liquid
BE-GA	Betaine	Glycolic acid	1:1	Transparent liquid
BE-MA1	Betaine	Malonic acid	1:2	Transparent viscous liquid
BE-OA	Betaine	Oxalic acid	1:2	Failure of preparation
BE-MA2	Betaine	DL-Malic acid	1:1	Transparent viscous liquid
BE-LA1	Betaine	Levulinic acid	1:2	Transparent liquid
BE-LA2	Betaine	Lactic acid	1:1	Transparent liquid
BE-CA	Betaine	Citric acid	1:1	Transparent viscous liquid
BE-TA	Betaine	L(+)-Tartaric acid	2:1	Failure of preparation
PR-G	2-Pyrrolidinecarboxylic acid	Glycerol	1:1	Failure of preparation
PR-P	2-Pyrrolidinecarboxylic acid	Propylene glycol	1:1	Failure of preparation
PR-B	2-Pyrrolidinecarboxylic acid	1,3-Butanediol	1:1	Failure of preparation
PR-X	2-Pyrrolidinecarboxylic acid	Xylitol	1:1	Failure of preparation
PR-DS	2-Pyrrolidinecarboxylic acid	D-Sorbitol	1:1	Failure of preparation
PR- MA2	2-Pyrrolidinecarboxylic acid	DL-Malic acid	1:1	Transparent viscous liquid
PR-PA	2-Pyrrolidinecarboxylic acid	1,5-Pentanedioic acid	1:1	Failure of preparation
PR-GA	2-Pyrrolidinecarboxylic acid	Glycolic acid	1:1	Transparent liquid
PR-LA1	2-Pyrrolidinecarboxylic acid	Levulinic acid	1:1	Failure of preparation
PR- LA2	2-Pyrrolidinecarboxylic acid	Lactic acid	1:1	Transparent liquid
PR-CA	2-Pyrrolidinecarboxylic acid	Citric acid	1:1	Transparent viscous liquid
B-LA2	1,3-Butanediol	Lactic acid	1:1	Transparent liquid
B-LA1	1,3-Butanediol	Levulinic acid	1:1	Transparent liquid
B-MA2	1,3-Butanediol	DL-Malic acid	1:1	Transparent liquid
B-CA	1,3-Butanediol	Citric acid	1:1	Transparent liquid
B-GA	1,3-Butanediol	Glycolic acid	1:1	Transparent liquid
B-PA	1,3-Butanediol	1,5-Pentanedioic acid	2:1	Transparent liquid
P-LA2	Propylene glycol	Lactic acid	1:1	Transparent liquid
P-LA1	Propylene glycol	Levulinic acid	1:1	Transparent liquid
P-MA2	Propylene glycol	DL-Malic acid	1:1	Transparent liquid
P-CA	Propylene glycol	Citric acid	1:1	Transparent viscous liquid
P-GA	Propylene glycol	Glycolic acid	1:1	Transparent liquid
P-PA	Propylene glycol	1,5-Pentanedioic acid	2:1	Transparent liquid
X-LA2	Xylitol	Lactic acid	1:1	Transparent liquid

X-LA1	Xylitol	Levulinic acid	1:1	Transparent liquid
X-MA2	Xylitol	DL-Malic acid	1:1	Transparent liquid
X-CA	Xylitol	Citric acid	1:1	Transparent liquid
X-GA	Xylitol	Glycolic acid	1:1	Transparent liquid
X-PA	Xylitol	1,5-Pentanedioic acid	2:1	Transparent viscous liquid

Table S3. List of the prepared ternary DESs based on X-GA.

Number	The Third Component	Molar Ratio	Appearance at 45 °C
1-1	DL-Malic acid	1:0:4	Transparent liquid
1-2	DL-Malic acid	1:1:3	Transparent liquid
1-3	DL-Malic acid	1:2:2	Transparent liquid
1-4	DL-Malic acid	1:3:1	Transparent liquid
1-5	DL-Malic acid	1:4:0	Transparent liquid
2-1	Citric acid	1:0:4	Transparent liquid
2-2	Citric acid	1:1:3	Transparent liquid
2-3	Citric acid	1:2:2	Transparent liquid
2-4	Citric acid	1:3:1	Transparent liquid
2-5	Citric acid	1:4:0	Transparent liquid
3-1	Levulinic acid	1:0:4	Transparent liquid
3-2	Levulinic acid	1:1:3	Transparent liquid
3-3	Levulinic acid	1:2:2	Transparent liquid
3-4	Levulinic acid	1:3:1	Transparent liquid
3-5	Levulinic acid	1:4:0	Transparent liquid
4-1	Lactic acid	1:0:4	Transparent liquid
4-2	Lactic acid	1:1:3	Transparent liquid
4-3	Lactic acid	1:2:2	Transparent liquid
4-4	Lactic acid	1:3:1	Transparent liquid
4-5	Lactic acid	1:4:0	Transparent liquid
5-1	Propylene glycol	1:0:4	Transparent liquid
5-2	Propylene glycol	1:1:3	Transparent liquid
5-3	Propylene glycol	1:2:2	Transparent liquid
5-4	Propylene glycol	1:3:1	Transparent liquid
5-5	Propylene glycol	1:4:0	Transparent liquid
6-1	1,5-Pentanedioic acid	1:0:4	Failure of preparation
6-2	1,5-Pentanedioic acid	1:1:3	Failure of preparation
6-3	1,5-Pentanedioic acid	1:2:2	Failure of preparation
6-4	1,5-Pentanedioic acid	1:3:1	Transparent liquid
6-5	1,5-Pentanedioic acid	1:4:0	Transparent liquid
7-1	Malonic acid	1:0:4	Failure of preparation
7-2	Malonic acid	1:1:3	Failure of preparation
7-3	Malonic acid	1:2:2	Transparent liquid
7-4	Malonic acid	1:3:1	Transparent liquid
7-5	Malonic acid	1:4:0	Transparent liquid

Table S4. List of the prepared ternary DESs based on ChCl-MA2.

Number	The Third Component	Molar Ratio	Appearance at 45 °C
8-1	Citric acid	1:0:1	Transparent liquid
8-2	Citric acid	1:0.25:0.75	Transparent liquid
8-3	Citric acid	1:0.5:0.5	Transparent liquid
8-4	Citric acid	1:0.75:0.25	Transparent liquid
8-5	Citric acid	1:1:0	Transparent liquid
9-1	Levulinic acid	1:0:1	Transparent liquid
9-2	Levulinic acid	1:0.25:0.75	Transparent liquid
9-3	Levulinic acid	1:0.5:0.5	Transparent liquid
9-4	Levulinic acid	1:0.75:0.25	Transparent liquid
9-5	Levulinic acid	1:1:0	Transparent liquid
10-1	Lactic acid	1:0:1	Transparent liquid
10-2	Lactic acid	1:0.25:0.75	Transparent liquid
10-3	Lactic acid	1:0.5:0.5	Transparent liquid
10-4	Lactic acid	1:0.75:0.25	Transparent liquid
10-5	Lactic acid	1:1:0	Transparent liquid
11-1	Propylene glycol	1:0:1	Failure of preparation
11-2	Propylene glycol	1:0.25:0.75	Transparent liquid
11-3	Propylene glycol	1:0.5:0.5	Transparent liquid
11-4	Propylene glycol	1:0.75:0.25	Transparent liquid
11-5	Propylene glycol	1:1:0	Transparent liquid

12-1	1,5-Pentanedioic acid	1:0:1	Transparent liquid
12-2	1,5-Pentanedioic acid	1:0.25:0.75	Transparent liquid
12-3	1,5-Pentanedioic acid	1:0.5:0.5	Transparent liquid
12-4	1,5-Pentanedioic acid	1:0.75:0.25	Transparent liquid
12-5	1,5-Pentanedioic acid	1:1:0	Transparent liquid
13-1	Malonic acid	1:0:1	Transparent liquid
13-2	Malonic acid	1:0.25:0.75	Transparent liquid
13-3	Malonic acid	1:0.5:0.5	Transparent liquid
13-4	Malonic acid	1:0.75:0.25	Transparent liquid
13-5	Malonic acid	1:1:0	Transparent liquid

Table S5. List of the prepared ternary DESs based on ChCl-CA.

Number	The Third Component	Molar Ratio	Appearance at 45 °C
14-1	Levulinic acid	1:0:1	Transparent liquid
14-2	Levulinic acid	1:0.25:0.75	Transparent liquid
14-3	Levulinic acid	1:0.5:0.5	Transparent liquid
14-4	Levulinic acid	1:0.75:0.25	Transparent liquid
14-5	Levulinic acid	1:1:0	Transparent liquid
15-1	Lactic acid	1:0:1	Transparent liquid
15-2	Lactic acid	1:0.25:0.75	Transparent liquid
15-3	Lactic acid	1:0.5:0.5	Transparent liquid
15-4	Lactic acid	1:0.75:0.25	Transparent liquid
15-5	Lactic acid	1:1:0	Transparent liquid
16-1	Propylene glycol	1:0:1	Failure of preparation
16-2	Propylene glycol	1:0.25:0.75	Transparent liquid
16-3	Propylene glycol	1:0.5:0.5	Transparent liquid
16-4	Propylene glycol	1:0.75:0.25	Transparent liquid
16-5	Propylene glycol	1:1:0	Transparent liquid
17-1	1,5-Pentanedioic acid	1:0:1	Transparent liquid
17-2	1,5-Pentanedioic acid	1:0.25:0.75	Transparent liquid
17-3	1,5-Pentanedioic acid	1:0.5:0.5	Transparent liquid
17-4	1,5-Pentanedioic acid	1:0.75:0.25	Transparent liquid
17-5	1,5-Pentanedioic acid	1:1:0	Transparent liquid
18-1	Malonic acid	1:0:1	Transparent liquid
18-2	Malonic acid	1:0.25:0.75	Transparent liquid
18-3	Malonic acid	1:0.5:0.5	Transparent liquid
18-4	Malonic acid	1:0.75:0.25	Transparent liquid
18-5	Malonic acid	1:1:0	Transparent liquid

Table S6. List of the prepared ternary DESs based on B-MA2.

Number	The Third Component	Molar Ratio	Appearance at 45 °C
19-1	Citric acid	1:0:1	Transparent liquid
19-2	Citric acid	1:0.25:0.75	Transparent liquid
19-3	Citric acid	1:0.5:0.5	Transparent liquid
19-4	Citric acid	1:0.75:0.25	Transparent liquid
19-5	Citric acid	1:1:0	Transparent liquid
20-1	Levulinic acid	1:0:1	Transparent liquid
20-2	Levulinic acid	1:0.25:0.75	Transparent liquid
20-3	Levulinic acid	1:0.5:0.5	Transparent liquid
20-4	Levulinic acid	1:0.75:0.25	Transparent liquid
20-5	Levulinic acid	1:1:0	Transparent liquid
21-1	Lactic acid	1:0:1	Transparent liquid
21-2	Lactic acid	1:0.25:0.75	Transparent liquid
21-3	Lactic acid	1:0.5:0.5	Transparent liquid
21-4	Lactic acid	1:0.75:0.25	Transparent liquid
21-5	Lactic acid	1:1:0	Transparent liquid
22-1	Propylene glycol	1:0:1	Transparent liquid
22-2	Propylene glycol	1:0.25:0.75	Transparent liquid
22-3	Propylene glycol	1:0.5:0.5	Transparent liquid
22-4	Propylene glycol	1:0.75:0.25	Transparent liquid
22-5	Propylene glycol	1:1:0	Transparent liquid
23-1	1,5-Pentanedioic acid	1:0:1	Failure of preparation
23-2	1,5-Pentanedioic acid	1:0.25:0.75	Transparent liquid
23-3	1,5-Pentanedioic acid	1:0.5:0.5	Transparent liquid
23-4	1,5-Pentanedioic acid	1:0.75:0.25	Transparent liquid
23-5	1,5-Pentanedioic acid	1:1:0	Transparent liquid

24-1	Malonic acid	1:0:1	Transparent liquid
24-2	Malonic acid	1:0.25:0.75	Transparent liquid
24-3	Malonic acid	1:0.5:0.5	Transparent liquid
24-4	Malonic acid	1:0.75:0.25	Transparent liquid
24-5	Malonic acid	1:1:0	Transparent liquid