

Supplementary Materials

Identification of chemical components and serum metabolites in Danggui Buxue Decoction based on UPLC-Q-TOF-MS, UNIFI platform and molecular network

Yanhui Lv^{ab‡}, Xike Xu^{a‡}, Jishun Yang^{c‡}, Yuan Gao^{ab}, Jiayun Xin^{ab}, Wei Chen^a, Li Zhang^b, Jiali Li^b, Jie Wang^b, Yanping Wei^b, Xintong Wei^b, Jixiang He^{*b}, Xianpeng Zu^{*a},

^a Department of Natural Medicinal Chemistry, School of Pharmacy, Naval Medical University, Shanghai, 200433, China

^b Department of Pharmaceutical Analysis, School of Pharmacy, Shandong University of Traditional Chinese Medicine, Jinan, 250355, China

^c Medical Security Center, Naval Medical Center, Naval Medical University, Shanghai 200433, China

[‡] These authors contributed equally to this work.

* Correspondence

Address: Department of Natural Medicinal Chemistry, School of Pharmacy, Naval Medical University, No. 325 Guohe Road, Yangpu District, Shanghai 200433, China.

Corresponding Authors: Dr. Jixiang He, E-mail: 05000044@sdutcm.edu.cn; Dr. Xianpeng Zu, E-mail: zuxianpeng@163.com

Supplementary Figure Legends

Figure S1. Molecular networks from DBD in positive (A) and negative (B) ion modes.

Supplementary Tables

Table S1. Identification of the chemical components in DBD by UPLC-Q-TOF-MS

Table S2. Prototype components of DBD in rat serum by UPLC-Q-TOF-MS

Table S3. Identification of the exogenous metabolites of DBD by UPLC-Q-TOF-MS

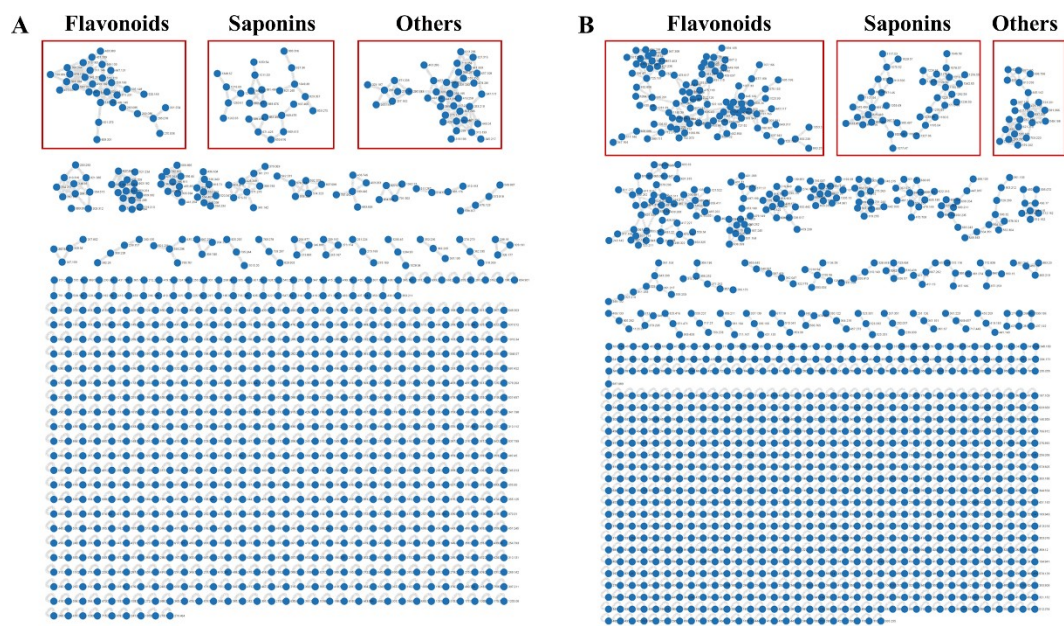


Figure S1. Molecular networks from DBD in positive (A) and negative (B) ion modes.

Table S1. Identification of the chemical components in DBD by UPLC-Q-TOF-MS.

No.	RT (min)	Identification	Formula	MS	Error (ppm)	MS/MS	Classification	Origin
1	0.60	Raffinose	C ₁₈ H ₃₂ O ₁₆	543.1346 [M+K] ⁺	-0.7	381.0835, 363.0745	Others	HQ/DG
2	0.65	Sucrose	C ₁₂ H ₂₂ O ₁₁	365.1068 [M+Na] ⁺	2.1	203.0579, 185.0455	Others	HQ/DG
3	0.66	Cytidine monophosphate	C ₉ H ₁₄ N ₃ O ₈ P	322.0439 [M-H] ⁻	-0.3	110.0348	Others	HQ
4	0.78	Citric acid	C ₆ H ₈ O ₇	191.0185 [M-H] ⁻	–	129.0186, 111.0084, 87.0078	Organic acids	HQ/DG
5	0.85	Uridine monophosphate	C ₉ H ₁₃ N ₂ O ₉ P	323.0262 [M-H] ⁻	–	111.0195	Others	HQ
6	0.87	Guanine	C ₅ H ₅ N ₅ O	152.0672 [M+H] ⁺	0	135.0310, 110.0340	Others	HQ/DG
7	1.02	Malic acid	C ₄ H ₆ O ₅	133.0138 [M-H] ⁻	-3.4	115.0128	Organic acids	HQ/DG
8	1.02	Tyrosine*	C ₉ H ₁₁ NO ₃	182.0826 [M+H] ⁺	4.9	136.0779	Amino acids	HQ/DG
9	1.03	Adenosine*	C ₁₀ H ₁₃ N ₅ O ₄	268.1083 [M+H] ⁺	3.7	136.0626, 119.0392	Others	HQ/DG
10	1.16	Guanosine	C ₁₀ H ₁₃ N ₅ O ₅	282.0824 [M-H] ⁻ 284.0995 [M+H] ⁺	-7 0	150.0413 152.0572, 135.0310, 110.0386	Others	HQ/DG
11	1.18	Inosine*	C ₁₀ H ₁₂ N ₄ O ₅	267.0715 [M-H] ⁻	–	135.0277	Others	DG
12	1.19	Arg-Ile	C ₁₂ H ₂₅ N ₅ O ₃	288.2091 [M+H] ⁺	–	271.1797, 175.1234	Amino acids	HQ/DG

13	1.19	Leucine*	C ₆ H ₁₃ NO ₂	130.0865 [M+H] ⁺	-2.3	–	Amino acids	HQ/DG
14	1.32	Adenine	C ₅ H ₅ N ₅	136.0626 [M+H] ⁺	2.2	119.0345	Others	HQ/DG
15	1.46	Xanthosine	C ₁₀ H ₁₂ N ₄ O ₆	283.0670 [M-H] ⁻	-3.2	151.0250	Others	HQ
16	1.52	Mycose	C ₁₂ H ₂₂ O ₁₁	365.1068 [M+Na] ⁺	2.1	203.0516, 185.0455	Others	HQ/DG
17	1.88	Phenylalanine	C ₉ H ₁₁ NO ₂	166.0852 [M+H] ⁺	2.4	120.0821, 103.0556	Amino acids	HQ/DG
18	1.98	Canavanine	C ₅ H ₁₂ N ₄ O ₃	177.0977 [M+H] ⁺	-3.1	160.0727, 118.0507	Amino acids	HQ
19	2.04	Pyrocatechuic acid	C ₇ H ₆ O ₄	153.0185 [M-H] ⁻	-1.9	109.0275	Organic acids	HQ
20	2.18	Arginine	C ₆ H ₁₄ N ₄ O ₂	175.1183 [M+H] ⁺	-3.9	158.0905, 130.0961, 116.0718	Amino acids	HQ/DG
21	2.20	Pantothenate	C ₉ H ₁₇ NO ₅	218.1016 [M-H] ⁻	-5	146.0810	Organic acids	HQ/DG
22	2.38	4-Hydroxybenzoic acid	C ₇ H ₆ O ₃	137.0235 [M-H] ⁻	–	93.0338	Organic acids	HQ
23	2.40	Piscidic acid	C ₁₁ H ₁₂ O ₇	255.0492 [M-H] ⁻	-5	193.0495, 165.0548	Organic acids	HQ
24	2.42	Succinoadenosine	C ₁₄ H ₁₇ N ₅ O ₈	384.1151 [M+H] ⁺	-1	252.0724, 234.0624, 188.0559, 162.0772	Amino acids	HQ/DG
25	3.22	Chlorogenic acid isomer	C ₁₆ H ₁₈ O ₉	353.0886 [M-H] ⁻	2.3	191.0552, 179.0359, 135.0467	Organic acids	HQ/DG
26	3.34	Indole-3-carboxaldehyde	C ₉ H ₇ NO	146.0600 [M+H] ⁺	-4.1	118.0676, 91.0546	Others	HQ/DG

27	3.35	Tryptophan*	C ₁₁ H ₁₂ N ₂ O ₂	205.0961 [M+H] ⁺	-5	188.0939, 170.0598, 143.0732, 118.0649	Amino acids	DG
28	4.50	Complanatuside	C ₂₈ H ₃₂ O ₁₆	669.1680 [M+HCOO] ⁻ 647.1567 [M+Na] ⁺	1.1 -2.5	461.1098, 299.0564, 284.0321, 255.0304 463.1249, 301.0706	Flavonoids	HQ
29	4.50	Pratensein-7-O-β-D-glucoside	C ₂₂ H ₂₂ O ₁₁	461.1098 [M+H] ⁺ 463.1231 [M-H] ⁻	1.9 -0.7	299.0564, 284.0333, 255.0304 301.0706, 270.0523, 241.0560, 213.0557	Flavonoids	HQ
30	4.58	Vanillin	C ₈ H ₈ O ₃	151.0404 [M-H] ⁻	2.1	137.0236, 121.0287	Others	DG
31	4.84	Phthalic anhydride	C ₈ H ₄ O ₃	149.0231 [M+H] ⁺	-1.3	121.0290	Others	DG
32	4.93	Chlorogenic acid*	C ₁₆ H ₁₈ O ₉	353.0882 [M-H] ⁻	1.1	191.0563, 179.0347, 161.0238, 135.0452	Organic acids	HQ/DG
33	5.12	Guaiacol	C ₇ H ₈ O ₂	123.0455 [M-H] ⁻	2.8	108.0224, 93.0344	Others	DG
34	5.12	Vanillic acid*	C ₈ H ₈ O ₄	167.0356 [M-H] ⁻	3.5	152.0119, 123.0446	Organic acids	DG
35	5.33	3-Indoleacrylic acid	C ₁₁ H ₉ NO ₂	188.0743 [M+H] ⁺	-4.8	170.0598, 142.0644	Others	HQ/DG
36	5.38	Chlorogenic acid isomer	C ₁₆ H ₁₈ O ₉	353.0882 [M-H] ⁻	1.3	191.0571, 179.0347, 135.0454	Organic acids	HQ/DG
37	5.62	Caffeic acid*	C ₉ H ₈ O ₄	179.0361 [M-H] ⁻	–	135.0451	Organic acids	HQ/DG
38	6.02	Icariside F2	C ₁₈ H ₂₆ O ₁₀	401.1457 [M-H] ⁻ 425.1414 [M+Na] ⁺	1 -1	269.1035, 193.0495 –	Others	DG
39	6.13	Aspartic acid	C ₄ H ₇ NO ₄	132.0306 [M-H] ⁻	2.7	88.0397	Amino acids	HQ/DG
40	6.53	Octanoic acid	C ₈ H ₁₆ O ₂	189.1134 [M+HCOO] ⁻	1	85.0290, 71.0133	Organic acids	DG

41	6.70	Apigenin-7-O- β -D-glucoside	C ₂₁ H ₂₀ O ₁₀	431.0993 [M-H] ⁻	2.1	269.0458, 239.0450, 211.0361, 135.0071	Flavonoids	HQ
42	7.14	Riboflavin*	C ₁₇ H ₂₀ N ₄ O ₆	377.1451 [M+H] ⁺	-1.3	243.0882, 198.0667, 172.0923	Others	HQ
43	7.24	7-Methoxycoumarin isomer	C ₁₀ H ₈ O ₃	177.0548 [M+H] ⁺	0.8	149.05594, 145.0269	Coumarins	DG
44	7.60	Hesperetin 7-O-glucoside	C ₂₂ H ₂₄ O ₁₁	463.1253 [M-H] ⁻	1.6	301.0659, 273.0758	Flavonoids	HQ
45	7.66	Dimethyl phthalate	C ₁₀ H ₁₀ O ₄	193.0512 [M-H] ⁻	3	178.0256, 134.0346	Others	DG
46	7.78	5-Feruloylquinic acid	C ₁₇ H ₂₀ O ₉	391.0512 [M+Na] ⁺ 367.1037 [M-H] ⁻	-0.2 0.8	177.0540, 145.0269 191.0542, 173.0469, 134.0352	Organic acids	DG
47	7.88	N-Acetylphenylalanine	C ₁₁ H ₁₃ NO ₃	206.0827 [M-H] ⁻	2.3	164.0700, 147.0429, 103.0535	Amino acids	HQ/DG
48	8.02	Pratensein-Glc-Glc	C ₂₈ H ₃₂ O ₁₆	623.1637 [M-H] ⁻	3.1	461.1096, 299.0537, 284.0333, 255.0304, 135.0071	Flavonoids	HQ
49	8.28	7-Methoxycoumarin isomer	C ₁₀ H ₈ O ₃	177.0543 [M+H] ⁺	-2	149.0594, 145.0297, 134.0386	Coumarins	DG
50	8.52	Umbelliferone*	C ₉ H ₆ O ₃	163.0387 [M+H] ⁺	-1.9	145.0350, 135.0462	Coumarins	DG
51	8.64	Rhamnocitrin 3-neohesperidoside isomer	C ₂₈ H ₃₂ O ₁₅	609.1812 [M+H] ⁺ 653.1739 [M+HCOO] ⁻	-0.4 2.5	285.0760, 270.0523, 225.0584 283.0594, 268.0333, 239.0282	Flavonoids	HQ
52	8.86	4'-O-beta-D-Glucosyl-5-O-methylvisaminol	C ₂₂ H ₂₈ O ₁₀	451.1613 [M-H] ⁻	0.7	289.1013, 271.0976	Flavonoids	HQ
53	9.20	Glycitin*	C ₂₂ H ₂₂ O ₁₀	491.1208 [M+HCOO] ⁻	2.6	445.1145, 283.0594, 268.0405, 239.0350	Flavonoids	HQ
54	9.26	6-Methoxycoumarin	C ₁₀ H ₈ O ₃	177.0547 [M+H] ⁺	0.3	162.0281, 149.0631, 134.0386, 117.0332	Coumarins	DG

55	9.27	Ferulic acid*	C ₁₀ H ₁₀ O ₄	193.0515 [M-H] ⁻	4.4	178.0256, 149.0614, 134.0352	Organic acids	HQ/DG
56	9.41	Sinapic acid	C ₁₁ H ₁₂ O ₅	223.0619 [M-H] ⁻	2.9	208.0334, 193.0149, 149.0232, 121.0288	Organic acids	HQ
57	9.47	Valerosidatum	C ₂₁ H ₃₄ O ₁₁	485.1994 [M+Na] ⁺	0.1	301.1643	Others	DG
58	9.52	Licoagroside D or isomer	C ₂₂ H ₂₄ O ₁₀	447.1300 [M-H] ⁻	0.7	285.0761, 270.0536	Flavonoids	HQ
59	9.62	N-Acetyltryptophan	C ₁₃ H ₁₄ N ₂ O ₃	245.0931 [M-H] ⁻	2	203.0820, 142.0671	Amino acids	HQ/DG
60	9.86	Rhamnocitrin 3-neohesperidoside isomer	C ₂₈ H ₃₂ O ₁₅	607.1682 [M-H] ⁻	2.3	283.0594, 268.0333	Flavonoids	HQ
61	9.87	Liquiritin	C ₂₁ H ₂₂ O ₉	417.1179 [M-H] ⁻	-1.6	255.0674, 135.0071, 119.0480	Flavonoids	HQ
62	10.02	Dimethyl azelate	C ₁₁ H ₂₀ O ₄	261.1350 [M+HCOO] ⁻	2.3	201.1129	Others	DG
63	10.05	Isoferulic Acid*	C ₁₀ H ₁₀ O ₄	193.0512 [M-H] ⁻	3.1	178.0285, 134.0346	Organic acids	HQ/DG
64	10.07	Tamarixin	C ₂₂ H ₂₂ O ₁₂	477.1044 [M-H] ⁻	1.1	315.0457, 300.0211, 271.0230, 151.0025	Flavonoids	HQ
65	10.35	Calycosin-7-O-β-D-glucoside*	C ₂₂ H ₂₂ O ₁₀	447.1293 [M+H] ⁺ 491.1207 [M+HCOO] ⁻	2.4	285.0830, 270.0594, 253.0552, 225.0584, 213.0621, 197.0629, 137.0267 283.0629, 268.0333, 239.0282, 224.0456, 211.0361, 195.0467, 183.0453, 148.0173, 135.0082	Flavonoids	HQ
66	10.44	(+)Lariciresinol-4'-O-β-D-Apiofuranosyl-(1-2)-β-D-Glucopyranosyl	C ₃₁ H ₄₂ O ₁₅	653.2448 [M-H] ⁻	-0.5	329.1366	Lignans	HQ

67	10.57	Salicylic acid*	C ₇ H ₆ O ₃	137.0253 [M-H] ⁻	-	93.0323	Organic acids	HQ
68	10.65	Sissotrin	C ₂₂ H ₂₂ O ₁₀	469.1112 [M+Na] ⁺ 491.1207 [M+HCOO] ⁻	2.4	447.1300, 285.0757, 270.0594 283.0594, 268.0333, 239.0417, 211.0297	Flavonoids	HQ
69	10.96	Astragalin	C ₂₁ H ₂₀ O ₁₁	447.0943 [M-H] ⁻	2.4	285.0392, 256.0378	Flavonoids	HQ
70	11.40	3'-methoxy-5'-hydroxy-isoflavanone-7-O-β-D-glucopyranoside	C ₂₂ H ₂₂ O ₁₀	445.1144 [M-H] ⁻	0.9	283.0594, 268.0373, 239.0350, 135.0071	Flavonoids	HQ
71	11.70	5,8-Di(2,3-dihydroxy-3-methylbutoxy)-psoralen	C ₂₁ H ₂₆ O ₉	445.1473 [M+Na] ⁺	0.8	423.1617	Coumarins	DG
72	11.82	Isomucronulatol-7,3'-di-glucoside	C ₂₈ H ₃₆ O ₁₅	611.1972 [M-H] ⁻	-1.5	449.1463, 287.0930, 272.0669, 135.0436	Flavonoids	HQ
73	12.18	Senkyunolide S	C ₁₂ H ₁₆ O ₅	239.0927 [M-H] ⁻	1	195.1016, 175.0788	Phthalides	DG
74	12.43	9-(2,3-dihydroxypropoxy)-9-oxononanoic acid	C ₁₂ H ₂₂ O ₆	261.1350 [M-H] ⁻	2.5	187.0971, 169.0865, 125.0966	Organic acids	HQ
75	12.60	Z-6,7-epoxyligustilide	C ₁₂ H ₁₄ O ₃	207.1014 [M+H] ⁺	-0.7	189.0927	Phthalides	DG
76	12.62	Hesperidin isomer	C ₂₈ H ₃₄ O ₁₅	609.1832 [M-H] ⁻	1.1	301.0703	Flavonoids	HQ
77	13.22	1,3-Dicaffeoylquinic acid	C ₂₅ H ₂₄ O ₁₂	515.1204 [M-H] ⁻	1.8	353.0887, 335.0825, 191.0552, 179.0343, 173.0447, 161.0242, 135.0457	Organic acids	DG
78	13.24	Licoagroside D or isomer	C ₂₂ H ₂₄ O ₁₀	447.1296 [M-H] ⁻	-0.1	285.0762, 270.0522, 135.0085	Flavonoids	HQ
79	13.36	Azelaic acid	C ₉ H ₁₆ O ₄	187.0985 [M-H] ⁻	4.6	143.1093, 125.0969	Organic acids	HQ/DG

80	13.88	1,4-Dicaffeoylquinic acid	C ₂₅ H ₂₄ O ₁₂	515.1211 [M-H] ⁻	3.1	353.0844, 191.0560, 179.0356, 135.0447	Organic acids	DG
81	13.93	Genistin*	C ₂₁ H ₂₀ O ₁₀	431.0992 [M-H] ⁻	2	268.0370, 239.0340, 211.0404, 151.0064	Flavonoids	HQ
82	13.98	Afrormosin 7-O-glucoside	C ₂₃ H ₂₄ O ₁₀	505.1355 [M+HCOO] ⁻	0.7	297.0752, 282.0511, 267.0288, 239.0334	Flavonoids	HQ
83	14.02	Calycosin-7-O-β-D-glucoside-6"-O-malonate or isomer	C ₂₅ H ₂₄ O ₁₃	533.1302 [M+H] ⁺	2.3	285.0760, 270.0594, 253.0552, 137.0267	Flavonoids	HQ
84	14.03	Senkyunolide I*	C ₁₂ H ₁₆ O ₄	247.0940 [M+Na] ⁺	-0.5	207.1042, 189.0934, 161.0953	Phthalides	DG
85	14.07	(-)-Syringaresinol-4-O-beta-D-apiofuranos	C ₃₃ H ₄₄ O ₁₇	711.2509 [M-H] ⁻	1.2	417.1544, 402.1305, 387.1100, 181.0506, 166.0280, 151.0030	Lignans	HQ
86	14.24	3'-hydroxy-5'-methoxy-isoflavanone-7-O-β-D-glucopyranoside	C ₂₂ H ₂₂ O ₁₀	469.1113 [M+Na] ⁺ 445.1147 [M-H] ⁻	1.2 1.6	285.0760 283.0612, 268.0364, 239.0356, 135.0087	Flavonoids	HQ
87	14.37	(+)-7-epi-Syringaresinol 4'-glucoside	C ₂₈ H ₃₆ O ₁₃	579.2074 [M-H] ⁻	-0.6	417.1447, 402.1284, 387.1038, 181.0478, 166.0248, 151.0023	Lignans	HQ
88	14.57	4'-methoxy-kaempferol-3-O-β-D-glucoside	C ₂₂ H ₂₂ O ₁₁	463.1243 [M+H] ⁺ 507.1149 [M+HCOO] ⁻	1.8 0.9	301.0706, 286.0472, 269.0490, 241.0560, 153.0222 299.0559, 284.0326, 255.0281, 151.0033	Flavonoids	HQ
89	14.64	Calycosin-7-O-β-D-glucoside-6"-O-malonate or isomer	C ₂₅ H ₂₄ O ₁₃	533.1299 [M+H] ⁺	1.8	285.0760, 270.0594, 137.0297	Flavonoids	HQ
90	14.64	Senkyunolide J or isomer	C ₁₂ H ₁₈ O ₄	225.1136 [M-H] ⁻	1.5	207.1032, 181.1250, 163.1122	Phthalides	DG
91	14.79	Isomucronulatol-7,2'-di-glucoside	C ₂₉ H ₃₈ O ₁₅	625.213 [M-H] ⁻	-1.2	463.1619, 301.1081, 286.0881, 271.0626, 121.0289	Flavonoids	HQ

92	14.85	Unknown	C ₃₁ H ₃₄ O ₁₈	695.1813 [M+H] ⁺	-1	285.0755, 270.0526	Flavonoids	HQ
93	15.13	Senkyunolide H-7-Acetate	C ₁₄ H ₁₈ O ₅	265.1062 [M-H] ⁻	-	247.0959, 221.1156	Phthalides	DG
94	15.24	Senkyunolide J or isomer	C ₁₂ H ₁₈ O ₄	225.1138 [M-H] ⁻	2.5	207.1022, 181.1260, 163.1116	Phthalides	DG
95	15.71	3,9-dihydroxygustilide	C ₁₂ H ₁₆ O ₄	247.0936 [M+Na] ⁺	-2.1	207.1042, 189.0927	Phthalides	DG
96	15.84	Hesperidin*	C ₂₈ H ₃₄ O ₁₅	633.1789 [M+Na] ⁺ 609.1831 [M-H] ⁻	-0.1 0.9	303.0883 301.0712	Flavonoids	HQ
97	16.21	3,4-Dicaffeoylquinic acid	C ₂₅ H ₂₄ O ₁₂	515.1206 [M-H] ⁻	2.1	353.0870, 191.0550, 179.0355, 173.0445, 135.0443	Organic acids	DG
98	16.26	Calycosin-7-O-β-D-glucoside-6"-O-malonate or isomer	C ₂₅ H ₂₄ O ₁₃	533.1300 [M+H] ⁺ 1063.2357 [2M-H] ⁻	1.9 -0.3	285.0760, 270.0594, 253.0552, 137.0267 283.0617, 268.0376	Flavonoids	HQ
99	16.55	Ononin-Glc	C ₂₈ H ₃₂ O ₁₄	593.1852 [M+H] ⁺	-3	269.0806, 254.0574, 237.0542, 226.0624, 213.0898	Flavonoids	HQ
100	17.41	Glycyroside	C ₂₇ H ₃₀ O ₁₃	563.1765 [M+H] ⁺ 561.1614 [M-H] ⁻	0 1	269.0816, 254.0563 267.0665, 252.0424	Flavonoids	HQ
101	17.41	Pharsyringaresinol	C ₃₀ H ₃₈ O ₁₄	621.2192 [M-H] ⁻	1.4	417.1536, 402.1324, 387.1068, 181.0508, 166.0270, 151.0034, 137.0251	Lignans	HQ
102	17.45	7-Methoxycoumarin*	C ₁₀ H ₈ O ₃	177.0540 [M+H] ⁺	0.3	145.0269	Coumarins	DG
103	17.46	(+)-Syringaresinol	C ₂₂ H ₂₆ O ₈	417.1568 [M-H] ⁻	3.1	402.1324, 387.1084, 181.0508, 166.0273, 151.0041, 137.0246	Lignans	HQ
104	17.78	Ononin*	C ₂₂ H ₂₂ O ₉	431.1341 [M+H] ⁺ 475.1261 [M+HCOO] ⁻	3.3	269.0810, 254.0574, 237.0545, 226.0629, 213.0910 267.0662, 252.0423, 223.0395	Flavonoids	HQ
105	18.48	Isomucronulatol-7,2'-di-glucoside or isomer	C ₂₉ H ₃₈ O ₁₅	625.2137 [M-H] ⁻	-0.2	463.1608, 301.1068, 286.0849, 121.0289	Flavonoids	HQ

106	18.86	Liquiritigenin*	C ₁₅ H ₁₂ O ₄	257.0807 [M+H] ⁺ 255.0670 [M-H] ⁻	2.7	147.0451, 137.0234 135.0085, 119.0498	Flavonoids	HQ
107	18.90	Daidzein*	C ₁₅ H ₁₀ O ₄	255.0670 [M+H] ⁺ 253.0514 [M-H] ⁻	3.1	137.0244 225.0548, 135.0081	Flavonoids	HQ
108	19.20	Rhamnocitrin 3-O-glucoside	C ₂₂ H ₂₂ O ₁₁	461.1099 [M-H] ⁻	2.2	299.0549, 285.0440, 255.0276	Flavonoids	HQ
109	19.38	Uralene	C ₂₁ H ₂₀ O ₇	383.1138 [M-H] ⁻	0.4	353.0674, 337.0712	Flavonoids	DG
110	19.58	Calycosin-7-O-β-D-(6"-O-acetyl)-glucoside	C ₂₄ H ₂₄ O ₁₁	489.1402 [M+H] ⁺ 533.135 [M+HCOO] ⁻	0.8	285.0762, 270.0533, 137.0244 283.0606, 268.0365, 239.0333	Flavonoids	HQ
111	19.77	3-Hydro-9,10-diMP-Pen-Glc	C ₂₈ H ₃₄ O ₁₄	593.1902 [M-H] ⁻	5	299.0921, 284.0688, 269.0454, 241.0497	Flavonoids	HQ
112	19.80	Prunin	C ₂₁ H ₂₂ O ₁₀	433.1150 [M-H] ⁻	2.3	271.0606, 243.0650	Flavonoids	HQ
113	20.29	Coniferyl ferulate	C ₂₀ H ₂₀ O ₆	401.1242 [M+HCOO] ⁻	0.1	206.0579, 191.0356	Others	DG
114	20.31	Glycitein*	C ₁₆ H ₁₂ O ₅	285.0755 [M+H] ⁺ 283.0618 [M-H] ⁻	-0.8 0.5	270.0528, 253.0493, 137.0241 268.0391, 239.0347, 211.0405, 135.0087	Flavonoids	HQ
115	20.59	Methylinissolin-3-O-β-D-glucoside	C ₂₃ H ₂₆ O ₁₀	485.1421 [M+H] ⁺ 507.1506 [M+HCOO] ⁻	0.6 -0.3	301.1085, 269.0805, 167.0703 299.0913, 284.0675, 269.0440, 241.0488	Flavonoids	HQ
116	20.87	Pratensein	C ₁₆ H ₁₂ O ₆	301.0711 [M+Na] ⁺ 299.0567 [M-H] ⁻	1.6 1.9	286.0467, 269.0457, 241.0491, 153.0172, 134.0367 284.0320, 255.0292, 227.0345	Flavonoids	HQ
117	20.99	Unknown	C ₂₈ H ₃₄ O ₁₄	593.1877 [M-H] ⁻	0.3	505.1706, 417.1552, 402.1307, 387.1073, 181.0502, 166.0269, 151.0031	Lignans	HQ
118	21.14	3,7,8-trihydroxy-4-methoxyisoflavone	C ₁₆ H ₁₂ O ₆	299.0566 [M-H] ⁻	1.7	284.0311, 269.0477, 255.0304, 151.0025	Flavonoids	HQ
119	21.83	Calycosin*	C ₁₆ H ₁₂ O ₅	285.0759 [M+H] ⁺ 283.0618 [M-H] ⁻	0.4 2.1	270.0526, 253.0500, 225.0554, 213.0553, 137.0241 268.0391, 239.0347, 211.0405, 135.0087	Flavonoids	HQ

120	22.62	Isomucronulatol-7-O- β -D-glucoside	C ₂₃ H ₂₈ O ₁₀	487.1581 [M+Na] ⁺ 463.1617 [M-H] ⁻	1.4 1.6	303.1231, 167.0731 301.1080, 286.0837, 271.0603, 179.0696, 164.0471, 135.0447, 121.0290	Flavonoids	HQ
121	23.41	Kumatakenin	C ₁₇ H ₁₄ O ₆	313.0722 [M-H] ⁻	1.4	298.0501, 283.0226, 255.0325, 227.0362	Flavonoids	HQ
122	23.78	Senkyunolide D	C ₁₂ H ₁₄ O ₄	221.0822 [M-H] ⁻	1	177.0915	Phthalides	DG
123	23.86	Formononetin-7-O- β -D-glucoside-6"-O-malonate	C ₂₅ H ₂₄ O ₁₂	517.1347 [M+H] ⁺	1.3	269.0823, 254.0575, 237.0551, 226.0629, 213.0919, 197.0605, 137.0241	Flavonoids	HQ
124	24.62	Odoratin	C ₁₇ H ₁₄ O ₆	313.0726 [M-H] ⁻	2.6	298.0426, 283.0299, 269.0495	Flavonoids	HQ
125	24.98	Dihydrocapsaicin	C ₁₈ H ₂₉ NO ₃	308.2220 [M+H] ⁺	-0.2	290.2122, 262.2155, 136.0758, 122.0603	Others	HQ
126	25.08	Astrapterocarpan-glucoside-6"-O-malonate	C ₂₆ H ₂₈ O ₁₃	571.1426 [M+Na] ⁺	0.7	549.1621, 301.1077, 167.0712	Flavonoids	HQ
127	25.23	Methylnissolin-3-O- β -D-(6'-O-acetyl)-glucoside	C ₂₅ H ₂₈ O ₁₁	549.1624 [M+HCOO] ⁻	2	299.0924, 284.0685, 269.0457, 241.0510	Flavonoids	HQ
128	25.64	Genistein*	C ₁₅ H ₁₀ O ₅	271.0600 [M+H] ⁺	-0.3	153.0172	Flavonoids	HQ
129	26.11	5,7-Dihydroxy-4-methoxyisoflavone	C ₁₆ H ₁₂ O ₅	285.0758 [M+H] ⁺	0.1	270.0535, 253.0478, 225.0549, 213.0552, 137.0248	Flavonoids	HQ
130	26.56	Pendulone	C ₁₇ H ₁₆ O ₆	317.1020 [M+H] ⁺ 315.0880 [M-H] ⁻	0.3 1.7	299.0919, 135.0442 285.0399	Flavonoids	HQ
131	26.89	Isomucronulatol-acetyl-Glc	C ₂₅ H ₃₀ O ₁₁	505.1690 [M-H] ⁻	-3.9	301.1078, 286.0836, 271.0603, 179.0704, 164.0483, 149.0240, 135.0444, 121.0287	Flavonoids	HQ
132	26.98	Afrormosin	C ₁₇ H ₁₄ O ₅	299.0914 [M+H] ⁺	0	283.0594, 255.0662, 237.0570	Flavonoids	HQ

133	27.74	6"-O-acetylononin	C ₂₄ H ₂₄ O ₁₀	473.1446 [M+H] ⁺ 517.1361 [M+HCOO] ⁻	0.7 1.8	269.0812, 254.0571, 237.0546, 226.0629, 213.0909 267.0643, 252.0423	Flavonoids	HQ
134	28.11	Astramembranoside A	C ₄₂ H ₇₀ O ₁₅	813.4633 [M-H] ⁻	-1.1	651.4075, 489.3566	Saponins	HQ
135	28.27	7-Methyl-kaempferol	C ₁₆ H ₁₂ O ₆	301.0710 [M+H] ⁺ 299.0569 [M-H] ⁻	1.3 2.7	286.0471, 269.0450, 241.0503, 153.0185 284.0321, 255.0289, 227.0347	Flavonoids	HQ
136	28.29	Senkyunolide F	C ₁₂ H ₁₄ O ₃	205.0876 [M-H] ⁻	2.7	187.0758, 161.0974	Phthalides	DG
137	28.65	9,12,13-Trihydroxyoctadeca-10,15-dienoic acid	C ₁₈ H ₃₂ O ₅	327.2186 [M-H] ⁻	2.7	309.2066, 291.1954, 239.1648, 211.1333, 171.1022	Organic acids	DG
138	28.97	9,10,11-Trihydroxyoctadeca-12,15-dienoic acid	C ₁₈ H ₃₂ O ₅	327.2181 [M-H] ⁻	1.3	291.1955, 229.1452, 211.1346, 171.1029	Organic acids	DG
139	29.57	Astragaloside IV, V, VI or VII	C ₄₇ H ₇₈ O ₁₉	991.5127 [M+HCOO] ⁻	0.8	945.5035, 783.4551, 765.4337	Saponins	HQ
140	29.84	Astramembranoside B	C ₄₁ H ₇₀ O ₁₄	831.4737 [M+HCOO] ⁻	-1.3	785.4659, 653.4342, 491.3750	Saponins	HQ
141	30.36	Astragaloside IV, V, VI or VII	C ₄₇ H ₇₈ O ₁₉	945.5071 [M-H] ⁻	0.6	783.4514, 651.4105, 621.3971, 489.3550	Saponins	HQ
142	30.44	Astragaloside IV, V, VI or VII	C ₄₇ H ₇₈ O ₁₉	969.5018 [M+Na] ⁺ 991.5126 [M+HCOO] ⁻	-1.2 0.6	473.3618, 455.3630, 437.3375, 419.3280 945.5054, 783.4525, 651.4090, 621.3971, 489.3556	Saponins	HQ
143	30.68	6,7-Epoxyiligustilide	C ₁₂ H ₁₄ O ₃	205.0876 [M-H] ⁻	2.9	161.0955	Phthalides	DG
144	30.69	Formononetin*	C ₁₆ H ₁₂ O ₄	269.0811 [M+H] ⁺ 267.0672 [M-H] ⁻	0.8 3.4	254.0568, 237.0551, 226.0624, 213.0918 252.0422, 223.0392, 195.0449, 135.0082	Flavonoids	HQ
145	31.08	Cycloaraloside E	C ₄₂ H ₇₀ O ₁₅	859.4693 [M+HCOO] ⁻	-0.5	813.4651, 651.4159	Saponins	HQ

146	31.19	9,10,13-trihydroxy-11-octadecenoic acid	C ₁₈ H ₃₄ O ₅	329.2338 [M-H] ⁻	1.3	293.2117, 211.1334, 171.1025	Organic acids	HQ/DG
147	31.32	Methylnissolin	C ₁₇ H ₁₆ O ₅	301.1071 [M+H] ⁺ 299.0929 [M-H] ⁻	0.2 1.3	269.0802, 167.0708 284.0660, 269.0447, 241.0493, 213.0545	Flavonoids	HQ
148	31.34	Cyclocanthoside E	C ₄₁ H ₇₀ O ₁₄	831.4736 [M+HCOO] ⁻	-1.4	785.4650, 623.4155, 491.3721	Saponins	HQ
149	31.55	Isoastragaloside IV	C ₄₁ H ₆₈ O ₁₄	829.4573 [M+HCOO] ⁻ 807.4490 [M+Na] ⁺	-2.2 -1.4	783.4521, 651.4015, 621.3931, 489.3558 627.3904	Saponins	HQ
150	31.86	Agroastragaloside IV	C ₄₉ H ₈₀ O ₂₀	1011.5118 [M+Na] ⁺ 1033.5236 [M+HCOO] ⁻	-1.7 1.1	831.4504, 651.3903 987.5211, 945.5112, 927.4967, 783.4562	Saponins	HQ
151	32.16	Astragaloside IV isomer	C ₄₁ H ₆₈ O ₁₄	807.4482 [M+Na] ⁺ 829.4591 [M+HCOO] ⁻	-2.3 0	473.3618, 455.3530, 437.3414, 419.3280 783.4540, 621.3983	Saponins	HQ
152	32.22	Isocyclocanthosides E	C ₄₁ H ₇₀ O ₁₄	831.4755 [M+HCOO] ⁻	0.9	785.4687, 623.4183, 491.3702	Saponins	HQ
153	32.51	Clethroidoside B	C ₄₉ H ₈₀ O ₂₀	1033.5242 [M+HCOO] ⁻ 1011.5126 [M+Na] ⁺	1.6 -0.9	987.5148, 945.5012, 927.4910, 783.4483 989.5342, 455.3530, 437.3417, 419.3313	Saponins	HQ
154	32.72	(Z)-5,8,11-trihydroxyoctadec-9-enoic acid	C ₁₈ H ₃₄ O ₅	329.2337 [M-H] ⁻	1.1	311.2230, 293.2129, 211.1317, 171.1031	Organic acids	HQ/DG
155	32.94	Astragaloside IV, V, VI or VII	C ₄₇ H ₇₈ O ₁₉	991.5124 [M+HCOO] ⁻ 969.5021 [M+Na] ⁺	0.4 -0.9	945.5060, 783.4525, 651.6053, 621.4000, 489.3554, 471.3450, 453.3347, 435.3416 473.3618, 455.3530, 437.3375, 419.3280	Saponins	HQ
156	33.43	Senkyunolide E or isomer	C ₁₂ H ₁₂ O ₃	205.0858 [M+H] ⁺ 203.0720 [M-H] ⁻	-0.8 3.3	187.0757, 159.0817 173.0235, 160.0168, 145.0277, 132.0217	Phthalides	DG
157	33.70	Agroastragaloside II	C ₄₃ H ₇₂ O ₁₅	873.4848 [M+HCOO] ⁻	-0.1	827.4793, 785.4664, 767.4606, 605.4104	Saponins	HQ
158	33.97	Unknown	C ₄₁ H ₆₅ O ₁₄	781.4388 [M-H] ⁻	1.7	619.3851, 487.3465, 469.3372	Saponins	HQ
159	34.10	Astragaloside II	C ₄₃ H ₇₀ O ₁₅	849.4611 [M+Na] ⁺	0.4	455.3530, 437.3466, 419.3369	Saponins	HQ

160	34.22	Astragaloside IV*	C ₄₁ H ₆₈ O ₁₄	807.4498 [M+Na] ⁺ 829.4604 [M+HCOO] ⁻	-0.4 1.5	473.3618, 455.3530, 437.3375, 419.3280 783.4523, 651.4120, 621.4014, 489.3558	Saponins	HQ
161	34.44	Astragaloside III*	C ₄₁ H ₆₈ O ₁₄	807.4499 [M+Na] ⁺ 829.4595 [M+HCOO] ⁻	-0.3 0.4	455.3530, 437.3375, 419.3280 783.4549, 621.4014, 489.3583, 471.3496, 453.3344	Saponins	HQ
162	35.34	Senkyunolide E or isomer	C ₁₂ H ₁₂ O ₃	203.0723 [M-H] ⁻	4.5	173.0250, 145.0304	Phthalides	DG
163	35.49	Senkyunolide A*	C ₁₂ H ₁₆ O ₂	193.1218 [M+H] ⁺	-2.5	175.1139, 147.1157, 137.0613	Phthalides	DG
164	36.13	3-(4'-O-Malonyl) Rha (1-2) Gal (1-2) GluA- Soyasaponenol B	C ₅₁ H ₈₀ O ₂₁	1027.5107 [M-H] ⁻	-0.6	983.5245	Saponins	HQ
165	36.36	Agroastragaloside III or isomer	C ₅₁ H ₈₂ O ₂₁	1075.5319 [M+HCOO] ⁻	-1.1	987.5076, 969.5118, 945.5029, 927.4930, 765.4378, 747.4249, 489.3515	Saponins	HQ
166	36.49	Astramembrannin II	C ₃₅ H ₅₈ O ₉	645.3974 [M+Na] ⁺	0.1	473.3618, 455.3530, 437.3375	Saponins	HQ
167	36.71	Isoastragaloside II	C ₄₃ H ₇₀ O ₁₅	871.4674 [M+HCOO] ⁻ 849.4604 [M+Na] ⁺	-0.3 -0.3	825.4676, 783.4584, 765.4448, 489.3554 455.3530, 437.3375, 419.3369 923.4985, 879.5089, 795.4513, 615.3879, 457.3662	Saponins	HQ
168	36.95	Soyasaponin I	C ₄₈ H ₇₈ O ₁₈	941.5114 [M-H] ⁻ 965.5074 [M+Na] ⁺	-0.1 -0.7	943.5273, 599.3948, 581.3837, 441.3735, 423.3631, 405.3525	Saponins	HQ
169	37.66	Agroastragaloside III or isomer	C ₅₁ H ₈₂ O ₂₁	1029.5293 [M-H] ⁻	1.6	987.5073, 969.5065, 927.4981, 909.4836, 765.4513	Saponins	HQ
170	38.00	9-Octadecenedioic acid	C ₁₈ H ₃₂ O ₄	311.2237 [M-H] ⁻	2.8	293.2122, 275.2028, 235.1705, 223.1702	Organic acids	HQ
171	38.42	Agroastragaloside I or isomer	C ₄₅ H ₇₄ O ₁₆	915.4972 [M+HCOO] ⁻	1.4	869.4837, 809.4691, 767.4486	Saponins	HQ
172	38.56	Cyclocephaloside II	C ₄₃ H ₇₀ O ₁₅	871.4706 [M+HCOO] ⁻ 849.4603 [M+Na] ⁺	1 -0.4	825.4652, 765.4436 669.3967, 455.3525, 437.3416, 419.3318	Saponins	HQ

173	38.78	1,18-Octadecenedioic acid	C ₁₈ H ₃₂ O ₄	311.2236 [M-H] ⁻	2.5	293.2112, 275.2017, 235.1694, 223.1700	Organic acids	HQ
174	38.96	Astroolesaponins A	C ₄₈ H ₇₆ O ₁₈	939.4962 [M-H] ⁻	0.3	921.4901, 877.4963, 631.3850, 613.3712, 455.3514	Saponins	HQ
175	39.18	Agroastragaloside I or isomer	C ₄₅ H ₇₄ O ₁₆	915.4977 [M+HCOO] ⁻	2	869.4855, 827.4796, 809.4689, 767.4582	Saponins	HQ
176	39.21	Trojanoside A	C ₄₃ H ₇₀ O ₁₅	871.4704 [M+HCOO] ⁻ 849.4604 [M+Na] ⁺	0.8 -0.3	825.4647, 765.4377 669.3947, 455.3530, 437.3375, 419.3280	Saponins	HQ
177	39.54	9,10-dihydroxy-12Z-octadecenoic acid	C ₁₈ H ₃₄ O ₄	313.2395 [M-H] ⁻	3.3	295.2273, 277.2173, 183.1395	Organic acids	HQ/DG
178	39.80	Butylphthalide	C ₁₂ H ₁₄ O ₂	191.1069 [M+H] ⁺	1	173.0967, 163.1127, 145.1013, 117.0704	Phthalides	DG
179	39.99	Astragaloside I*	C ₄₅ H ₇₂ O ₁₆	913.4808 [M+HCOO] ⁻ 891.4702 [M+Na] ⁺	0.6 -1.2	867.4719, 825.4635, 807.4495, 765.4388, 603.3872, 489.3526 689.4226, 671.4134, 653.4082, 455.3530, 437.3375, 419.3280	Saponins	HQ
180	40.12	Cycloastragenol*	C ₃₀ H ₅₀ O ₅	513.3544 [M+Na] ⁺	-1.3	455.3528, 437.3415, 419.3318	Triterpene	HQ
181	40.15	Huangqiyein A	C ₃₇ H ₆₀ O ₁₀	687.4090 [M+Na] ⁺	1.6	453.3378, 435.3256	Saponins	HQ
182	40.53	Isoastragaloside I*	C ₄₅ H ₇₂ O ₁₆	913.4816 [M+HCOO] ⁻ 891.4707 [M+Na] ⁺	1.5 -0.6	867.4763, 825.4608, 807.4488, 783.4554, 765.4444 711.4018, 455.3530, 437.3375, 419.3280 909.4856, 867.4741, 825.4683, 807.4549, 765.4427	Saponins	HQ
183	40.70	Malonylastragaloside I	C ₄₈ H ₇₄ O ₁₉	953.4762 [M-H] ⁻ 977.4712 [M+Na] ⁺	1.1 -1	775.4269, 757.4158, 739.4058, 455.3530, 437.3419, 419.3319	Saponins	HQ
184	41.09	Senkyunolide K	C ₁₂ H ₁₆ O ₃	207.1027 [M-H] ⁻	-0.1	189.0901, 161.0967, 145.0297	Phthalides	DG

185	41.15	Butylphthalide	C ₁₂ H ₁₄ O ₂	191.1066 [M+H] ⁺	-0.1	173.0964, 145.1013	Phthalides	DG
186	41.23	Neoastragaloside I	C ₄₅ H ₇₂ O ₁₆	913.4805 [M+HCOO] ⁻ 891.4707 [M+Na] ⁺	0.3 -0.7	867.4730, 825.4682, 807.4511, 765.4423 689.4262, 671.4155, 653.4050, 455.3522, 437.3414, 419.3315	Saponins	HQ
187	41.42	Z-ligustilide	C ₁₂ H ₁₄ O ₂	191.1064 [M+H] ⁺	-1.2	173.0984, 163.1123, 145.1005	Phthalides	DG
188	41.57	Capsidiol or isomer	C ₁₅ H ₂₄ O ₂	235.1710 [M-H] ⁻	2.8	217.1650	Others	HQ
189	42.22	Senkyunolide G	C ₁₂ H ₁₆ O ₃	207.1026 [M-H] ⁻	-0.1	189.0927, 163.1131, 135.0379	Phthalides	DG
190	42.37	Acetylastragaloside I	C ₄₇ H ₇₄ O ₁₇	955.4917 [M+HCOO] ⁻ 933.4807 [M+Na] ⁺	1 -1.2	909.4814, 867.4686, 825.4712 873.4547, 753.4211, 695.4172, 455.3530, 437.3375, 419.3280	Saponins	HQ
191	42.67	13-Hydroxy-9,11-octadecadienoic acid	C ₁₈ H ₃₂ O ₃	295.2290 [M-H] ⁻ 319.2241 [M+Na] ⁺	3.9 -0.9	277.2183, 195.1395, 171.1033 279.2334, 261.2215	Organic acids	HQ/DG
192	42.79	10-Angeloylbutylphthalide	C ₁₇ H ₂₀ O ₄	311.1250 [M+Na] ⁺	-1.1	189.0927, 161.0953	Phthalides	DG
193	42.90	9-hydroxy-10E,12Z-octadecadienoic acid	C ₁₈ H ₃₂ O ₃	295.2287 [M-H] ⁻	2.8	277.2168, 171.1020	Organic acids	DG
194	42.95	Riligustilide	C ₂₄ H ₂₈ O ₄	403.1880 [M+Na] ⁺	0	381.2086, 191.1085, 173.0984	Phthalides	DG
195	43.09	(9E)-12-hydroxyoctadec-9-enoic acid	C ₁₈ H ₃₄ O ₃	297.2441 [M-H] ⁻	1.9	279.2344, 169.1235	Organic acids	HQ/DG
196	43.13	E, E'-3, 3', 8, 8'-isodiligustilide	C ₂₄ H ₂₆ O ₄	401.1722 [M+Na] ⁺	-0.2	213.0883, 191.1085, 173.0984	Phthalides	DG
197	43.24	Capsidiol or isomer	C ₁₅ H ₂₄ O ₂	235.1708 [M-H] ⁻	1.9	205.1609	Others	HQ

198	43.68	Huangqiyeinins II	C ₃₀ H ₅₀ O ₅	489.3582 [M-H] ⁻	-0.8	471.3503		Triterpene	HQ
199	43.80	Tokinolide C	C ₂₄ H ₂₈ O ₄	403.1879 [M+Na] ⁺	-0.1	213.0883, 191.1085		Phthalides	DG
200	44.01	Tokinolide B	C ₂₄ H ₂₈ O ₄	403.1882 [M+Na] ⁺	0.5	213.0884		Phthalides	DG
201	44.15	Levistolide A*	C ₂₄ H ₂₈ O ₄	403.1886 [M+Na] ⁺	1.4	213.0883, 191.1085, 173.0984		Phthalides	DG
202	45.06	Angelicide	C ₂₄ H ₂₈ O ₄	403.1883 [M+Na] ⁺	0.9	191.1068, 173.0957		Phthalides	DG
203	45.31	Isotokinolide B	C ₂₄ H ₂₈ O ₄	403.1883 [M+Na] ⁺	0.7	191.1064, 173.0967, 145.1014		Phthalides	DG
204	45.42	Ursolic acid*	C ₃₀ H ₄₈ O ₃	455.3536 [M-H] ⁻ 457.3664 [M+H] ⁺	-2.6	409.3478 –		Triterpene	HQ
205	45.46	Linolenic acid	C ₁₈ H ₃₀ O ₂	277.2178 [M-H] ⁻	1.7	–		Organic acids	HQ
206	46.35	Linoleic acid	C ₁₈ H ₃₂ O ₂	279.2339 [M-H] ⁻	3.5	–		Organic acids	HQ/DG
207	47.07	Palmitic acid*	C ₁₆ H ₃₂ O ₂	255.2337 [M-H] ⁻	3	237.2177		Organic acids	HQ

Note: RT: retention time; *: compound with a reference standard; –: not found; HQ: *Astragalus membranaceus* (Fisch.) Bge. var. *mongholicus* (Bge.) Hsiao; DG:

Angelica sinensis (Oliv.) Diels.

Table S2. Prototype components of DBD in rat serum by UPLC-Q-TOF-MS.

No.	RT (min)	Identification	Formula	MS	Error (ppm)	MS/MS	Classification	Origin
1	0.65	Cytidine monophosphate	C ₉ H ₁₄ N ₃ O ₈ P	368.0511 [M+HCOO] ⁻	3	78.9585	Others	HQ
2	2.43	Piscidic acid	C ₁₁ H ₁₂ O ₇	255.0491 [M-H] ⁻	–	193.0495	Organic acids	HQ
3	3.34	Indole-3-carboxaldehyde	C ₉ H ₇ NO	146.0602 [M+H] ⁺	1	118.0676, 91.0539	Others	HQ/DG
4	4.81	Phthalic anhydride	C ₈ H ₄ O ₃	149.0233 [M+H] ⁺	-0.2	121.0309	Others	DG
5	6.0	Icariside F2	C ₁₈ H ₂₆ O ₁₀	425.1425 [M+Na] ⁺	1.6	–	Others	DG
6	7.11	Riboflavin*	C ₁₇ H ₂₀ N ₄ O ₆	377.1455 [M+H] ⁺	-0.2	243.0882	Others	HQ
7	9.22	6-Methoxycoumarin	C ₁₀ H ₈ O ₃	177.0544 [M+H] ⁺	-1	149.0594, 134.0381	Others	DG
8	10.36	Calycosin-7-O-β-D-glucoside*	C ₂₂ H ₂₂ O ₁₀	469.1107 [M+Na] ⁺ 491.1184 [M+HCOO] ⁻	-2.2	285.0760 283.0629, 268.0343	Flavonoids	HQ
9	11.42	3'-methoxy-5'-hydroxy-isoflavanone-7-O-β-D-glucopyranoside	C ₂₂ H ₂₂ O ₁₀	491.1205 [M+HCOO] ⁻	2	267.0345	Flavonoids	HQ
10	14.23	3'-hydroxy-5'-methoxy-isoflavanone-7-O-β-D-glucopyranoside	C ₂₂ H ₂₂ O ₁₀	469.1113 [M+Na] ⁺	-1.6	285.0760, 270.0484	Flavonoids	HQ
11	14.65	Calycosin-7-O-β-D-glucoside-6"-O-malonate or isomer	C ₂₅ H ₂₄ O ₁₃	533.1299 [M+H] ⁺	-1.2	285.0760	Flavonoids	HQ

12	17.68	Ononin*	C ₂₂ H ₂₂ O ₉	453.1153 [M+Na] ⁺	-0.6	269.0810, 254.0554	Flavonoids	HQ
13	18.69	Liquiritigenin*	C ₁₅ H ₁₂ O ₄	255.0665 [M-H] ⁻	0.7	135.0074, 119.0485	Flavonoids	HQ
14	19.35	Daidzein*	C ₁₅ H ₁₀ O ₄	255.0644 [M+H] ⁺ 253.0510 [M-H] ⁻	1.6	255.0650, 137.0256 135.0023	Flavonoids	HQ
15	20.49	Methylinissolin-3-O-β-D-glucoside	C ₂₃ H ₂₆ O ₁₀	485.1420 [M+Na] ⁺	0.5	301.1085, 167.0712	Flavonoids	HQ
16	20.63	Prunin	C ₂₁ H ₂₂ O ₁₀	457.1103 [M+Na] ⁺ 433.1136 [M-H] ⁻	-0.9	435.1225 271.0606	Flavonoids	HQ
17	20.94	Glycitein*	C ₁₆ H ₁₂ O ₅	283.0607 [M-H] ⁻	-1.6	268.0343, 211.0410	Flavonoids	HQ
18	21.74	Calycosin*	C ₁₆ H ₁₂ O ₅	285.0754 [M+H] ⁺	-1.2	270.0555, 225.0633, 137.0256	Flavonoids	HQ
19	25.56	Genistein*	C ₁₅ H ₁₀ O ₅	271.0598 [M+H] ⁺	-1.3	153.0172	Flavonoids	HQ
20	28.67	9,12,13-Trihydroxyoctadeca-10,15-dienoic acid	C ₁₈ H ₃₂ O ₅	327.2185 [M-H] ⁻	2.4	291.2001, 239.1644	Organic acids	DG
21	28.92	9,10,11-Trihydroxyoctadeca-12,15-dienoic acid	C ₁₈ H ₃₂ O ₅	351.2138 [M+Na] ⁺	-1.2	293.2093, 275.2016	Organic acids	DG
22	30.69	Formononetin*	C ₁₆ H ₁₂ O ₄	269.0804 [M+H] ⁺ 267.0671 [M-H] ⁻	3.2	254.0554, 237.0498, 226.0596 252.0414, 223.0348	Flavonoids	HQ
23	31.22	Methylnissolin	C ₁₇ H ₁₆ O ₅	301.1062 [M+H] ⁺	-2.7	269.0810, 167.0712	Flavonoids	HQ
24	34.22	Astragaloside IV*	C ₄₁ H ₆₈ O ₁₄	829.4582 [M+HCOO] ⁻	-1.1	489.3558	Saponins	HQ
25	36.49	Astramembrannin II	C ₃₅ H ₅₈ O ₉	645.3969 [M+Na] ⁺	-0.7	473.3618, 455.3530, 437.3375	Saponins	HQ

26	36.65	Isoastragaloside II	C ₄₃ H ₇₀ O ₁₅	871.4706 [M+HCOO] ⁻	1.1	489.3448	Saponins	HQ
27	41.06	Butylphthalide	C ₁₂ H ₁₄ O ₂	191.1060 [M+H] ⁺	-3.3	173.0927, 163.1123, 145.1005	Phthalides	DG
28	44.11	Levistolide A*	C ₂₄ H ₂₈ O ₄	403.1879 [M+Na] ⁺	-0.2	191.1025	Phthalides	DG
29	45.42	Ursolic acid*	C ₃₀ H ₄₈ O ₃	455.3521 [M-H] ⁻	-2.1	–	Triterpene	HQ

Note: RT: retention time; *: compound with a reference standard; –: not found; HQ: *Astragalus membranaceus* (Fisch.) Bge. var. *mongholicus* (Bge.) Hsiao; DG: *Angelica sinensis* (Oliv.) Diels.

Table S3. Identification of the exogenous metabolites of DBD by UPLC-Q-TOF-MS.

No.	RT (min)	Identification	Formula	MS	Error (ppm)	MS/MS	Classification	Origin
M1	3.32	Glycitein-H ₂ +O ₂ +CH ₂	C ₁₇ H ₁₂ O ₇	363.0268 [M+Cl] ⁻	-2.7	225.0606, 165.0148, 117.0327	Flavonoids	HQ
M2	3.33	Prunin-O+H ₂	C ₂₁ H ₂₄ O ₉	455.1134 [M+Cl] ⁻	4.2	151.0010	Flavonoids	HQ
M3	6.06	Piscidic acid+CH ₂ +H ₂ O	C ₇ H ₁₄ O ₉	287.0632 [M+HCOO] ⁻	3.7	193.0495	Organic acids	HQ
M4	9.64	Astragaloside IV- C ₅ H ₈ O ₅ +SO ₃	C ₃₆ H ₆₀ O ₁₂ S	755.3423 [M+K] ⁺	-1.9	–	Saponins	HQ
M5	10.72	Glycitein+O-H ₂ -H ₂	C ₁₆ H ₈ O ₆	331.0027 [M+Cl] ⁻	3.6	268.0414	Flavonoids	HQ
M6	11.58	Calycosin-7-O-β-D- glucoside-CH ₂	C ₂₁ H ₂₀ O ₁₀	431.0981 [M-H] ⁻	-0.6	239.0312, 211.0410	Flavonoids	HQ
M7	11.58	Genistein+C ₆ H ₁₀ O ₅	C ₂₁ H ₂₀ O ₁₀	431.0981 [M-H] ⁻	-0.5	269.0430, 241.0536, 151.0025	Flavonoids	HQ
M8	11.58	Ononin-CH ₂ +O	C ₂₁ H ₂₀ O ₁₀	431.0981 [M-H] ⁻	-0.6	429.1183, 252.0414, 195.0442, 267.0631,	Flavonoids	HQ
M9	12.53	Calycosin-CH ₂ +C ₆ H ₈ O ₆	C ₂₁ H ₁₈ O ₁₁	445.0770 [M-H] ⁻	-1.4	283.0629	Flavonoids	HQ
M10	12.53	Daidzein+O	C ₁₅ H ₁₀ O ₅	269.0452 [M-H] ⁻	-1.2	253.0531, 225.0540	Flavonoids	HQ
M11	12.53	Formononetin+H ₂ +C ₆ H ₈ O ₆	C ₂₁ H ₁₈ O ₁₁	445.0770 [M-H] ⁻	-1.4	267.0702	Flavonoids	HQ
M12	13.99	Butylphthalide+H ₂ O+O	C ₁₂ H ₁₆ O ₄	247.0934 [M+Na] ⁺	-2.7	191.1025, 163.1179, 135.0455, 173.0927, 117.0691	Phthalides	DG

M13	13.99	Butylphthalide+O	C ₁₂ H ₁₄ O ₃	207.1010 [M+H] ⁺	-2.8	191.1025, 163.1179, 135.0455,	173.0927, 117.0691	Phthalides	DG
M14	14.97	Calycosin+C ₆ H ₈ O ₆	C ₂₂ H ₂₀ O ₁₁	459.0943 [M-H] ⁻	2.2	268.0343, 211.0410, 135.0074	239.0312,	Flavonoids	HQ
M15	14.97	Formononetin- CH ₂ +C ₆ H ₁₀ O ₅	C ₂₁ H ₁₈ O ₉	459.0943 [M+HCOO] ⁻	2.3	135.0074		Flavonoids	HQ
M16	14.97	Formononetin+O	C ₁₆ H ₁₂ O ₅	283.0619 [M-H] ⁻	2.6	135.0074		Flavonoids	HQ
M17	15.41	Calycosin+SO ₃	C ₁₆ H ₁₂ O ₈ S	363.0185 [M-H] ⁻	1.4	283.0556, 211.0410, 135.0074	239.0312,	Flavonoids	HQ
M18	16.27	Glycitein+H ₂ +C ₆ H ₁₀ O ₅	C ₂₂ H ₂₄ O ₁₀	447.1297 [M-H] ⁻	0.1	283.0629, 268.0414, 239.0379, 165.0260	255.0653,	Flavonoids	HQ
M19	18.28	Calycosin-7-O-β-D- glucoside-H ₂	C ₂₂ H ₂₀ O ₁₀	443.0983 [M-H] ⁻	-0.1	239.0312, 135.0074		Flavonoids	HQ
M20	18.28	Glycitein-H ₂ +C ₆ H ₁₀ O ₅	C ₂₂ H ₂₀ O ₁₀	443.0983 [M-H] ⁻	-0.1	255.0653, 239.0312		Flavonoids	HQ
M21	18.28	Ononin+O-H ₂	C ₂₂ H ₂₀ O ₁₀	443.0983 [M-H] ⁻	-0.1	267.0631, 135.0074		Flavonoids	HQ
M22	18.69	Daidzein+H ₂	C ₁₅ H ₁₂ O ₄	255.0665 [M-H] ⁻	0.5	135.0074		Flavonoids	HQ
M23	18.69	Genistein-O+H ₂	C ₁₅ H ₁₂ O ₄	255.0665 [M-H] ⁻	0.5	241.0536, 151.0025		Flavonoids	HQ
M24	20.63	Daidzein+H ₂ O+C ₆ H ₁₀ O ₅	C ₂₁ H ₂₂ O ₁₀	433.1136 [M-H] ⁻	-1	135.0074		Flavonoids	HQ
M25	20.94	Genistein+CH ₂	C ₁₆ H ₁₂ O ₅	283.0607 [M-H] ⁻	-1.8	269.0430, 241.0468, 151.0025		Flavonoids	HQ
M26	21.62	Formononetin+C ₆ H ₁₀ O ₅	C ₂₂ H ₂₂ O ₉	475.1248 [M+HCOO] ⁻	0.4	252.0414, 195.0442		Flavonoids	HQ

M27	22.00	Methylnissolin+C ₆ H ₁₀ O ₅	C ₂₃ H ₂₆ O ₁₀	507.1510 [M+HCOO] ⁻	0.2	269.043	Flavonoids	HQ
M28	23.20	Calycosin-7-O-β-D-glucoside+H ₂ O+CH ₂	C ₂₃ H ₂₆ O ₁₁	477.1399 [M-H] ⁻	-0.9	283.0556, 211.0410	Flavonoids	HQ
M29	24.64	Daidzein+CH ₂	C ₁₆ H ₁₂ O ₄	267.0662 [M-H] ⁻	-0.6	225.0540	Flavonoids	HQ
M30	24.64	Formononetin+SO ₃	C ₁₆ H ₁₂ O ₇ S	347.0227 [M-H] ⁻	-1.1	252.0414, 223.0413, 195.0442	Flavonoids	HQ
M31	24.64	Ononin-C ₆ H ₁₀ O ₅ +SO ₃	C ₁₆ H ₁₂ O ₇ S	347.0227 [M-H] ⁻	-1.1	252.0414, 223.0413, 195.0442	Flavonoids	HQ
M32	25.70	Butylphthalide+C ₆ H ₈ O ₆	C ₁₈ H ₂₂ O ₈	405.0943 [M+K] ⁺	-0.9	173.0927, 163.1179, 145.1005	Phthalides	HQ
M33	25.89	Prunin-C ₆ H ₁₀ O ₅ -H ₂	C ₁₅ H ₁₀ O ₅	269.0455 [M-H] ⁻	0	215.0683	Flavonoids	HQ
M34	28.10	Butylphthalide-H ₂	C ₁₂ H ₁₂ O ₂	189.0906 [M+H] ⁺	-1.8	191.1025, 173.0927, 145.1005, 135.0404, 117.0691	Phthalides	DG
M35	29.57	Liquiritigenin+H ₂	C ₁₅ H ₁₄ O ₄	257.0819 [M-H] ⁻	-0.4	135.0074	Flavonoids	HQ
M36	30.20	Butylphthalide+C ₅ H ₇ NO ₃ S	C ₁₇ H ₂₁ NO ₅ S	374.1030 [M+Na] ⁺	-0.8	191.1025, 173.0984, 163.1123, 145.1005, 117.0691	Phthalides	DG
M37	30.69	Glycitein-H ₂ O+H ₂	C ₁₆ H ₁₂ O ₄	267.0671 [M-H] ⁻	3.1	267.0631, 239.0379, 211.0410	Flavonoids	HQ
M38	33.94	Butylphthalide+H ₂ O+H ₂	C ₁₂ H ₁₈ O ₃	233.1160 [M+Na] ⁺	4.8	191.1025, 173.0984, 163.1179, 145.1005, 117.0691	Phthalides	DG
M39	40.99	Calycosin-H ₂ O+SO ₃ +CH ₂	C ₁₇ H ₁₂ O ₇ S	395.0012 [M+Cl] ⁻	3.7	283.0629, 268.0343, 135.0074	Flavonoids	HQ
M40	41.06	Levistolide A+H ₂ O	C ₂₄ H ₃₀ O ₅	421.1983 [M+Na] ⁺	-0.7	381.2086, 213.0819, 191.1085, 173.0984, 145.1005	Phthalides	DG

M41	41.16	Levistolide A+O	C ₂₄ H ₂₈ O ₅	397.2007 [M+H] ⁺	-0.5	381.3086, 213.0883	Phthalides	DG
M42	41.73	Levistolide A+H ₂ +C ₁₀ H ₁₅ N ₃ O ₅ S	C ₃₄ H ₄₅ N ₃ O ₉ S	672.2959 [M+H] ⁺	1.5	381.2086, 213.0883, 191.1085, 173.0984, 145.1005	Phthalides	DG
M43	43.08	Methylnissoлин- H ₂ +O ₂ +SO ₃	C ₁₇ H ₁₄ O ₁₀ S	445.0012 [M+Cl] ⁻	2.1	–	Flavonoids	HQ
M44	45.02	Astragaloside IV- C ₆ H ₁₀ O ₅ (cleavage)	C ₃₅ H ₅₈ O ₉	645.3973 [M+Na] ⁺	0	491.3715, 473.3428, 455.3530	Saponins	HQ
M45	46.34	Isoastragaloside II- C ₇ H ₁₀ O ₆ (cleavage)-O ₂ +H ₂	C ₃₆ H ₆₂ O ₇	641.4182 [M+Cl] ⁻	-1.1	491.3715, 473.3428	Saponins	HQ
M46	46.43	Astragaloside IV- C ₆ H ₁₀ O ₆ (cleavage)	C ₃₅ H ₅₈ O ₈	629.4029 [M+Na] ⁺	0.8	623.4166, 473.3428	Saponins	HQ
M47	46.57	Astragaloside IV- C ₅ H ₈ O ₅ (cleavage)-O ₂ +H ₂	C ₃₆ H ₆₂ O ₇	607.4561 [M+H] ⁺	-1.1	437.3466	Saponins	HQ
M48	47.03	Daidzein+SO ₃ +CH ₂	C ₁₆ H ₁₂ O ₇ S	383.0002 [M+Cl] ⁻	0.9	135.0074	Flavonoids	HQ
M49	47.41	Calycosin- H ₂ +SO ₃ +C ₆ H ₈ O ₆	C ₂₂ H ₁₈ O ₁₄ S	573.0093 [M+Cl] ⁻	-3	239.0312, 135.0074	Flavonoids	HQ
M50	47.64	Astragaloside IV+O	C ₄₁ H ₆₈ O ₁₅	801.4612 [M+H] ⁺	-2.4	491.3715	Saponins	HQ
M51	47.75	Astragaloside IV+H ₂ +CH ₂	C ₄₂ H ₇₂ O ₁₄	823.4821 [M+Na] ⁺	0.7	623.4166, 491.3715, 473.3523, 455.3530	Saponins	HQ

Note: RT: retention time; *: compound with a reference standard; –: not found; HQ: *Astragalus membranaceus* (Fisch.) Bge. var. *mongholicus* (Bge.) Hsiao; DG:

Angelica sinensis (Oliv.) Diels

