

Supporting Information

Biosynthesis-Based Quantitative Analysis of 151 Secondary Metabolites of Licorice to Differentiate Medicinal *Glycyrrhiza* Species and Their Hybrids

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Part I. Supplemental tables and figures (Tables S1-S5; Figures S1-S8).

Part II. Method development for quantitative analysis.

Part III. Contents of 151 secondary metabolites in 95 licorice samples ($\mu\text{g/g}$).

Part I. Supplementary tables and figures.

Table S1. Sample information and identification results based on DNA barcodes.

No.	Code	Collection time		Origin	Genotype			Species claimed	Species identified by DNA barcoding
					ITS	<i>trnH-psbA</i>	<i>trnV-ndhC</i>		
1	US-1	2012.09	cultivated	Inner Mongolia	I-3	/	/	U	U
2	US-2	2012.09	cultivated	Inner Mongolia	I-3	/	/	U	U
3	US-3	2012.09	cultivated	Inner Mongolia	I-3	/	/	U	U
4	US-4	2008.01	cultivated	Inner Mongolia	I-3	/	/	U	U
5	US-5	2007.12	cultivated	Inner Mongolia	I-3	/	/	U	U
6	US-6	2007.12	cultivated	Inner Mongolia	I-3	/	/	U	U
7	US-7	2008.02	cultivated	Inner Mongolia	I-3	/	/	U	U
8	US-8	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
9	US-9	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
10	US-10	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
11	US-11	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
12	US-12	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
13	US-13	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
14	US-14	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
15	US-15	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
16	US-16	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
17	US-17	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
18	US-18	2008.03	cultivated	Inner Mongolia	I-3	/	/	U	U
19	US-19	2008.03	cultivated	Xinjiang	I-3	/	/	U	U
20	US-20	2008.03	cultivated	Xinjiang	I-3	/	/	U	U
21	US-21	2008.09	cultivated	Xinjiang	I-3	/	/	U	U
22	US-22	2008.09	cultivated	Xinjiang	I-3	/	/	U	U
23	US-23	2008.09	cultivated	Xinjiang	I-3	/	/	U	U
24	US-25	2008.02	cultivated	Xinjiang	I-3	/	/	U	U
25	US-26	2007.12	cultivated	Gansu	I-3	/	/	U	U
26	US-27	2009.01	cultivated	Gansu	I-3	/	/	U	U
27	US-28	2008.02	cultivated	Anhui	I-3	/	/	U	U
28	US-29	2008.02	cultivated	Anhui	I-3	/	/	U	U
29	US-30	2008.02	cultivated	Anhui	I-3	/	/	U	U
30	US-31	2008.02	cultivated	Heilongjiang	I-3	/	/	U	U
31	US-32	2008.02	cultivated	Heilongjiang	I-3	/	/	U	U
32	US-33	2008.02	cultivated	Liaoning	I-3	/	/	U	U
33	US-34	2008.02	cultivated	Liaoning	I-3	/	/	U	U
34	US-35	2009.01	cultivated	Hubei	I-3	/	/	U	U
35	US-36	2009.01	cultivated	Beijing	I-3	/	/	U	U
36	US-37	2008.02	cultivated	Xinjiang	I-3	/	/	U	U
37	US-39	2008.02	cultivated	Xinjiang	I-3	/	/	U	U
38	UC-1	2011.08	wild	Inner Mongolia	I-3	/		U	U
39	UC-2	2011.08	wild	Inner Mongolia	I-3	/		U	U

40	UC-3	2011.08	wild	Inner Mongolia	I-3	/		U	U
41	UC-4	2011.08	wild	Inner Mongolia	I-3	/	/	U	U
42	UC-5	2011.08	wild	Inner Mongolia	I-3	/	/	U	U
43	UC-6	2011.08	wild	Inner Mongolia	I-3	/	/	U	U
44	UC-7	2011.01	wild	Shanxi	I-3	/	/	U	U
45	UC-8	2011.01	wild	Shanxi	I-3	/	/	U	U
46	UC-9	2011.09	wild	Gansu	I-3	/	/	U	U
47	UC-10	2010.09	wild	Ningxia	I-3	/	/	U	U
48	UC-11	2010.09	wild	Ningxia	I-3	/	/	U	U
49	UC-12	2011.08	wild	Xinjiang	H (1+3)	TP-1	/	U	OxU
50	UC-13	2012.09	wild	Xinjiang	H (2+3)	TP-1	/	U	(G or In)×U*
51	UC-14	2012.09	wild	Xinjiang	H (2+3)	TP-1	/	U	(G or In)×U*
52	UC-15	2011.08	wild	Xinjiang	I-3	/	/	U	U
53	UC-16	2011.08	wild	Xinjiang	I-3	/	/	U	U
54	UC-17	2011.08	wild	Xinjiang	I-3	/	/	U	U
55	UC-18	2011.08	wild	Xinjiang	I-3	/	/	U	U
56	UC-19	2011.08	wild	Xinjiang	I-3	/	/	U	U
57	UC-20	2011.08	wild	Xinjiang	I-3	/	/	U	U
58	UC-21	2011.08	wild	Xinjiang	I-3	/	/	U	U
59	UC-22	2011.08	wild	Xinjiang	H (1+3)	TP-1	/	U	OxU
60	UC-23	2011.07	wild	Ningxia	I-3	/	/	U	U
61	UC-24	2011.07	wild	Ningxia	I-3	/	/	U	U
62	UC-25	2010.01	wild	Inner Mongolia	I-3	/		U	U
63	UC-26	2010.01	wild	Inner Mongolia	I-3	/	/	U	U
64	UC-27	2011.08	wild	Inner Mongolia	H (2+3)	TP-1	/	U	(G or In) ×U*
65	UC-28	2011.08	wild	Inner Mongolia	I-3	/	/	U	U
66	G-1	2008.09	wild	Xinjiang	I-2	TP-2	TN-2	G	G
67	G-2	2011.08	wild	Xinjiang	I-2	TP-2	TN-2	G	G
68	G-3	2011.08	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
69	G-4	2011.08	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
70	G-6	2012.09	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
71	G-7	2012.09	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
72	G-8	2012.09	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
73	G-9	2012.09	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
74	G-10	2012.09	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
75	G-11	2012.09	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
76	G-12	2012.09	wild	Xinjiang	I-2	TP-2	TN-2	G	G
77	G-13	2012.09	wild	Xinjiang	I-2	TP-2	TN-2	G	G
78	G-14	2012.09	wild	Xinjiang	I-2	TP-2	TN-2	G	G
79	G-15	2010.09	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
80	G-17	2010.09	wild	Xinjiang	H (2+3)	TP-2	/	G	U×G [#]
81	IN-1	2008.09	wild	Xinjiang	I-2	TP-3	TN-1	In	In
82	IN-5	2012.09	wild	Xinjiang	I-2	TP-3	TN-1	In	In
83	IN-6	2012.09	wild	Xinjiang	I-2	TP-3	TN-1	In	In

84	IN-7	2012.09	wild	Xinjiang	I-2	TP-3	TN-1	In	In
85	IN-8	2012.09	wild	Xinjiang	H (2+3)	TP-3	/	In	U×In
86	IN-9	2012.09	wild	Xinjiang	I-2	TP-3	TN-1	In	In
87	IN-10	2012.09	wild	Xinjiang	I-2	TP-3	TN-1	In	In
88	IN-11	2012.09	wild	Xinjiang	I-2	TP-3	TN-1	In	In
89	IN-12	2010.09	wild	Gansu	I-2	TP-1	TN-1	In	In
90	IN-13	2010.09	wild	Gansu	I-2	TP-1	TN-1	In	In
91	IN-14	2010.09	wild	Gansu	I-2	TP-1	TN-1	In	In
92	IN-15	2010.09	wild	Gansu	I-2	TP-3	TN-1	In	In
93	IN-16	2010.09	wild	Gansu	H (1+2)	TP-3	/	In	O×In
94	IN-17	2011.08	wild	Gansu	H (1+2)	TP-3	/	In	O×In
95	IN-18	2010.09	wild	Gansu	H (2+3)	TP-3	/	In	U×In
	YN-1	2008.11	wild	Yunnan	I-1			Y	
	CG-1	2015.05	wild	Hubei	I-1			P	

Species: U, *G. uralensis*; G, *G. glabra*; In, *G. inflata*; O, other non-medicinal *Glycyrrhiza* species; Y, *G. yunnanensis*; P, *G. pallidiflora*.

Single nucleotide polymorphism (SNP) sites: I-1, 159 T, 383-385 TGC; I-2, 159 T, 383-385 CAA; I-3, 159 C, 383-385 TGC; H (2+3), hybrid species indicated by overlapped SNPs of I-2 and I-3; H (1+2), hybrid species indicated by overlapped SNPs of I-1 and I-2; H (1+3), hybrid species indicated by overlapped SNPs of I-1 and I-3; TN-1, 487 T; TN-2, 487 A; TP-1, 72 C, 125 A, 171 T; TP-2, 72 C, 125 A, 171 G; TP-3, 72 T, 125 A, 171 T; TP-4, 72 C, 125 G, 171 T.

* Identified as ×U (accounts for 92% probability, while × G and × In accounts for 5% and 3%, respectively). # Identified as U×G (accounts for 75% probability, while G×U accounts for 25%).

Table S2. PCR primers to screen DNA barcodes of *Glycyrrhiza* species.

Pair No.	Primer name	Sequences (5'→3')
1	rbcL-f	TAGCTGCTGCTTGTGAGGTATGGA
	accD-r	AAATACTAGGCCCACTAAAGG
2	accD-f	GGTAAAAGAGTAATTGAACAAAC
	psaI-r	GGAAATACTAAGCCCACTAAAGGCACA
3	atpH-f	AACAAAAGGATTTCGCAAATAAAAG
	atpI-r	AGTTGTTGTTCTTGTTCCTTTAGT
4	clpP-f	GCTTGGGCTTCTCTTGCTGACAT
	clpP-r	TCCTAATCAACCGACTTTATCGAG
5	ndhA-f	TCAACTATATCAACTGTACTTGAAC
	ndhA-r	CGAGCTGCTGCTCAATCGAT
6	ndhC-f	AGACCATTCGAATGCCCCCTTTCGCC
	trnV-r	GTTCGAGTCCGTATAGCCCTA
7	petA-f	GGATTTGGTCAGGGAGATGC
	psbJ-r	ATGGCCGATACTACTGGAAGG
8	petN-f	ATGGATATAGTAAGTCTCGCTTGG
	psbM-r	ATGGAAGTAAATATTCTTGCAT
9	psbM-f	TTTGACTGACTGTTTTTACGTA
	trnD-r	CAGAGCACCGCCCTGTCAAG
10	petB-f	CAATCCACTTTGACTCGTTTT
	petD-r	GGTTCACCAATCATTGATGGTTC
11	psbE-f	ATCTACTAAATTCATCGAGTTGTTCC
	petL-r	TATCTTGCTCAGACCAATAAATAGA
12	rpl32-f	GCGTATTCGTAAAAATATTTGGAA
	trnL-r	TTCCTAAGAGCAGCGTGTCTACC
13	rpoB-f	ACAAAATCCTTCAAATTGTATCTGA
	trnC-r	TTTGTTAATCAGGCGACACCCGG
14	trnT-f	GCCCTTTTAACTCAGTGGTAGAG
	psbD-r	CCAAATAGGAACTGGCCAATC
15	trnW-f	TCTACCGAACTGAACTAAGAGCGC
	psaJ-r	CGATTAATCTCTATCAATAGACCTGC

Table S3. Quantification methods for compounds **1-151**.

Main procedure	Approach	Method	Number of analytes			Separated within (min)	Internal standard	Method validation
			Flavonoid glycosides	Triterpenoid saponins	Phenolic aglycones			
I	UPLC/UV	1-a	10	/	/	10	None	A
		1-b	/	5	/	15	None	A
II	UHPLC/MS/MS	2-a	/	11	/	11	None	A
		2-b	/	/	45	17	chrysophanol	A
		2-c	/	/	31	19	chrysophanol	A
		2-d	/	/	20	19	chrysophanol	A
III	UHPLC/MS/MS	3	8	7	15	32	chrysophanol	B

Table S4. Methanolic extraction yield and Nrf2 activation of seven licorice samples.

Batch No.	Extraction yield (mg/g)	Chalcones (14)	Isoprenylated-isoflavones (28)	$\Delta^{3,4}$ Isoflavanes (3)	Nrf2 activation (fold)		
G-1	151.8	85.67	325.15	215.92	1.16	±	0.08
G-2	158.5	490.88	180.99	22.06	1.72	±	0.03
US-2	197.5	424.19	1343.38	318.26	1.31	±	0.16
US-1	262.0	533.89	2059.58	73.74	1.39	±	0.36
US-6	203.0	256.65	2755.91	493.72	2.50	±	0.46
In-5	156.7	4601.85	485.40	32.14	2.89	±	0.05
In-6	129.0	6393.49	377.51	222.93	3.03	±	0.13
tBHQ	-	-	-	-	4.22	±	0.10
DMSO	-	-	-	-	1.00	±	0.03

Contents of major compounds were consistent with the data in Part III.

Chalcones (14): **65-78**.

Isoprenylated-isoflavones (28): **113-130, 135, 137-141, 143, 144, 147, 148**.

$\Delta^{3,4}$ Isoflavanes (3): **100, 105, 107**.

Table S5. Contents of 27 species-specific chemical markers for the three *Glycyrrhiza* species, and their significant testing results using different statistical methods.

Markers for	No.	Name	content in <i>G. uralensis</i>		content in <i>G. inflata</i>		content in <i>G. glabra</i>		<i>U</i> -test (<i>p</i> value)				<i>t</i> -test (<i>p</i> value)			
			(μg/g)		(μg/g)		(μg/g)		U-In	U-G	In-G	<i>p</i> <0.05	U-In	U-G	In-G	<i>p</i> <0.05
<i>G. uralensis</i>	47	licoflavonol	44.44	42.86	N.D.	/	N.D.	/	0.000	0.000		Y	0.000	0.002		Y
	50	isolicoflavonol	196.72	194.46	0.47	1.55	N.D.	/	0.000	0.000		Y	0.000	0.000		Y
	81	glycyrol	123.25	81.62	0.87	1.97	1.20	2.10	0.000	0.000		Y	0.000	0.000		Y
	82	glycycomarin	343.21	225.61	3.80	4.73	3.70	5.47	0.000	0.000		Y	0.000	0.000		Y
	86	glycyuralin E	11.35	8.39	N.D.	/	N.D.	/	0.000	0.000		Y	0.000	0.000		Y
	102	glyasperin D	185.66	98.55	2.59	4.61	2.26	3.17	0.000	0.000		Y	0.000	0.000		Y
	117	licoricone	69.53	47.84	0.89	0.62	0.26	0.50	0.000	0.000		Y	0.000	0.000		Y
	119	glicoricone	41.91	27.21	0.43	0.65	0.27	0.60	0.000	0.000		Y	0.000	0.000		Y
	125	isoangustone A	128.95	90.81	6.49	7.81	4.41	1.53	0.000	0.000		Y	0.000	0.000		Y
	126	7- <i>O</i> -methylfluteone	22.95	13.34	0.53	0.81	0.84	0.67	0.000	0.000		Y	0.000	0.000		Y
	140	6,8-diprenylgenistein	60.59	40.55	1.24	2.14	0.68	1.52	0.000	0.000		Y	0.000	0.000		Y
	149	glicophenone	60.35	45.45	N.D.	/	N.D.	/	0.000	0.000		Y	0.000	0.000		Y
<i>G. glabra</i>	56	3-hydroxy-glabrol	0.12	0.33	2.38	2.30	65.28	47.79		0.000	0.002	Y		0.038	0.042	Y
	103	glabridin	0.86	2.28	0.98	3.25	590.13	230.46		0.000	0.000	Y		0.005	0.005	Y
	108	hispaglabridin B	0.35	0.68	0.55	0.63	46.72	22.23		0.000	0.002	Y		0.010	0.010	Y
	109	4'- <i>O</i> -methylglabridin	2.69	4.96	N.D.	/	161.60	102.58		0.000	0.000	Y		0.026	0.024	Y
	110	3'-hydroxy-4'- <i>O</i> -methylglabridin	N.D.	/	N.D.	/	44.33	36.80		0.000	0.000	Y		0.054	0.054	
	111	hispaglabridin A	N.D.	/	N.D.	/	95.80	24.50		0.000	0.000	Y		0.001	0.001	Y
	148	parvisoflavones-A	0.26	1.00	0.54	0.76	16.20	6.12		0.000	0.002	Y		0.004	0.004	Y
	150	glycybridin C	N.D.	/	1.63	2.78	35.26	19.21		0.000	0.001	Y		0.015	0.017	Y
	151	erybacin B	N.D.	/	N.D.	/	64.55	66.77		0.000	0.000	Y		0.097	0.097	
<i>G. inflata</i>	68	licochalcone A	8.99	15.69	1467.95	1007.54	5.45	8.56	0.000		0.002	Y	0.001		0.001	Y
	69	licochalcone C	0.03	0.14	119.23	65.64	N.D.	/	0.000		0.002	Y	0.000		0.000	Y
	70	5-(1,1-dimethylallyl)-3,4,4'-trihydroxy-2-methoxychalcone	1.82	4.00	108.18	99.18	N.D.	/	0.000		0.002	Y	0.005		0.005	Y
	71	licochalcone E	0.08	0.60	69.18	47.67	N.D.	/	0.000		0.002	Y	0.001		0.001	Y
	72	licoagrochalcone C	1.74	2.47	217.61	103.68	6.84	4.49	0.000		0.002	Y	0.000		0.000	Y
	105	3,4-didehydroglabridin	N.D.	/	52.43	60.54	N.D.	/	0.000		0.002	Y	0.017		0.078	

N.D., not detected; /, not available. U, *G. uralensis*; G, *G. glabra*; In, *G. inflata*.

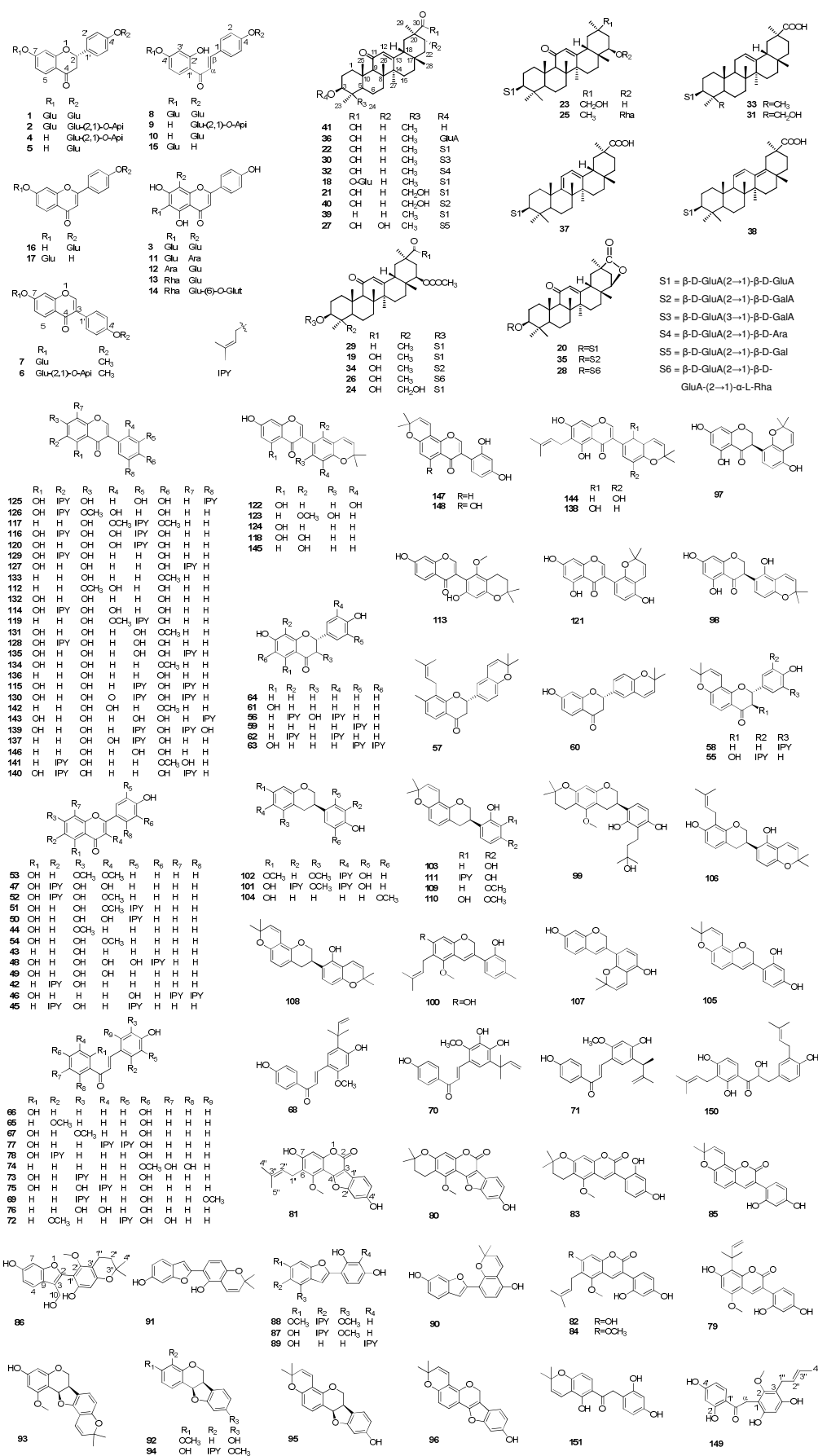


Figure S1. Chemical structures for compounds 1-151.

Note: Detailed information for compounds **1-151**.

No.	Name	Formula	M. W.	CAS No.	Structural type
1	liquiritigenin-7,4'-diglucoside	C ₂₇ H ₃₂ O ₁₄	580	93446-18-5	flavanone glycoside
2	glucoliquiritin apioside	C ₃₂ H ₄₀ O ₁₈	712	157226-47-6	flavanone glycoside
3	vicenin	C ₂₇ H ₃₀ O ₁₅	594	23666-13-9	flavone/isoflavone glycoside
4	liquiritin apioside	C ₂₆ H ₃₀ O ₁₃	550	74639-14-8	flavanone glycoside
5	liquiritin	C ₂₁ H ₂₂ O ₉	418	551-15-5	flavanone glycoside
6	glycyroside	C ₂₇ H ₃₀ O ₁₃	562	125310-04-5	flavone/isoflavone glycoside
7	ononin	C ₂₂ H ₂₂ O ₉	430	486-62-4	flavone/isoflavone glycoside
8	isoliquiritigenin-4,4'-diglucoside	C ₂₇ H ₃₂ O ₁₄	580	69262-36-8	chalcone glycoside
9	isoliquiritin apioside	C ₂₆ H ₃₀ O ₁₃	550	120926-46-7	chalcone glycoside
10	isoliquiritin	C ₂₁ H ₂₂ O ₉	418	5041-81-6	chalcone glycoside
11	schaftoside	C ₂₆ H ₂₈ O ₁₄	564	51938-32-0	flavone/isoflavone glycoside
12	isoschaftoside	C ₂₆ H ₂₈ O ₁₄	564	52012-29-0	flavone/isoflavone glycoside
13	isoviolanthin	C ₂₇ H ₃₀ O ₁₄	578	40788-84-9	flavone/isoflavone glycoside
14	Apigenin 6-C- α -L-rha-8-C-[6'''-(3-hydroxy-3-methylglutaryl)- β -D-glucopyranoside]	C ₃₃ H ₃₈ O ₁₈	722	156998-79-7	flavone/isoflavone glycoside
15	neoisoliquiritin	C ₂₁ H ₂₂ O ₉	418	59122-93-9	chalcone glycoside
16	sophoraflavone B	C ₂₁ H ₂₀ O ₉	416	22052-75-1	flavone/isoflavone glycoside
17	7,4'-Dihydroxyflavone 7-O-glucoside	C ₂₁ H ₂₀ O ₉	416	20633-86-7	flavone/isoflavone glycoside
18	licorice-saponin A3	C ₄₈ H ₇₂ O ₂₁	984	1262326-47-5	triterpenoid saponin
19	22 β -Acetoxyl-glycyrrhizin	C ₄₄ H ₆₄ O ₁₈	880	938042-17-2	triterpenoid saponin
20	licorice-saponin E2	C ₄₂ H ₆₀ O ₁₆	820	119417-96-8	triterpenoid saponin
21	licorice-saponin G2	C ₄₂ H ₆₂ O ₁₇	838	118441-84-2	triterpenoid saponin
22	glycyrrhizin	C ₄₂ H ₆₂ O ₁₆	822	103000-77-7	triterpenoid saponin
23	uralsaponin C	C ₄₂ H ₆₄ O ₁₆	824	1262326-46-4	triterpenoid saponin
24	uralsaponin F	C ₄₄ H ₆₄ O ₁₉	896	1208004-79-8	triterpenoid saponin
25	uralsaponin T	C ₄₈ H ₇₄ O ₁₉	954	1616062-85-1	triterpenoid saponin
26	uralsaponin X	C ₅₀ H ₇₄ O ₂₂	1026	1616062-89-5	triterpenoid saponin
27	uralsaponin P	C ₄₂ H ₆₄ O ₁₆	824	1616062-81-7	triterpenoid saponin
28	uralsaponin Y	C ₄₈ H ₇₀ O ₂₀	966	1616062-90-8	triterpenoid saponin
29	22 β -acetoxyl-glycyrrhaldehyde	C ₄₄ H ₆₄ O ₁₇	864	N. A.	triterpenoid saponin
30	uralsaponin B	C ₄₂ H ₆₂ O ₁₆	822	105038-43-5	triterpenoid saponin
31	licorice-saponin J2	C ₄₂ H ₆₄ O ₁₆	824	938042-18-3	triterpenoid saponin
32	araboglycyrrhizin	C ₄₁ H ₆₂ O ₁₄	778	121687-83-0	triterpenoid saponin
33	licorice-saponin B2	C ₄₂ H ₆₄ O ₁₅	808	118536-86-0	triterpenoid saponin
34	uralsaponin M	C ₄₄ H ₆₄ O ₁₈	880	1616062-78-2	triterpenoid saponin
35	uralsaponin O	C ₄₂ H ₆₀ O ₁₆	820	1616062-80-6	triterpenoid saponin
36	3-O- β -D-glucuronopyranosyl-glycyrrhetic acid	C ₃₆ H ₅₄ O ₁₀	646	34096-83-8	triterpenoid saponin
37	3 β -O-[β -D-glucuronopyranosyl-(1 $\rightarrow$ 2)- β -D-glucuronopyranosyl]-olean-9,12-diene-30-oic-acid	C ₄₂ H ₆₂ O ₁₅	806	N. A.	triterpenoid saponin
38	uralsaponin V	C ₄₂ H ₆₂ O ₁₅	806	1616062-87-3	triterpenoid saponin
39	uralsaponin W	C ₄₂ H ₆₂ O ₁₅	806	1616062-88-4	triterpenoid saponin
40	uralsaponin N	C ₄₂ H ₆₂ O ₁₇	838	1616062-79-3	triterpenoid saponin
41	glycyrrhetic acid	C ₃₀ H ₄₆ O ₄	470	471-53-4	triterpenoid
42	licoflavone A	C ₂₀ H ₁₈ O ₄	322	61153-77-3	flavone
43	kumatakenin B	C ₁₅ H ₁₀ O ₄	254	2196-14-7	flavone
44	genkwanin	C ₁₆ H ₁₂ O ₅	284	437-64-9	flavone
45	licoflavone B	C ₂₅ H ₂₆ O ₄	390	91433-17-9	flavone
46	5,3',4'-trihydroxy-8,6'-di-(3-methyl-2-butenyl)-flavone	C ₂₅ H ₂₆ O ₅	406	134958-52-4	flavone
47	licoflavonol	C ₂₀ H ₁₈ O ₆	354	60197-60-6	flavonol
48	uralenol	C ₂₀ H ₁₈ O ₇	370	139163-15-8	flavonol
49	kaempferol	C ₁₅ H ₁₀ O ₆	286	520-18-3	flavonol
50	isolicoflavonol	C ₂₀ H ₁₈ O ₆	354	94805-83-1	flavonol
51	5,7,4'-trihydroxy-3'(3-methylbut-2-enyl)-3-methoxy flavone	C ₂₁ H ₂₀ O ₆	368	1307578-72-8	flavonol
52	topazolin	C ₂₁ H ₂₀ O ₆	368	109605-79-0	flavonol
53	kumatakenin	C ₁₇ H ₁₄ O ₆	314	3301-49-3	flavonol
54	kaempferol 3-O-methyl ether	C ₁₆ H ₁₂ O ₆	300	1592-70-7	flavonol
55	kanzonol Z	C ₂₅ H ₂₆ O ₅	406	220860-37-7	flavanone (flavanol)
56	3-OH glabrol	C ₂₅ H ₂₈ O ₅	408	74148-41-7	flavanone (flavanol)
57	euchrenone A5	C ₂₅ H ₂₆ O ₄	390	125140-20-7	flavanone
58	shinflavanone	C ₂₅ H ₂₆ O ₄	390	157414-03-4	flavanone

59	abyssinone II	C ₂₀ H ₂₀ O ₄	324	77263-08-2	flavanone
60	(2 <i>S</i>)-abyssinone I	C ₂₀ H ₁₈ O ₄	322	1184961-91-8	flavanone
61	naringin	C ₁₅ H ₁₂ O ₅	272	480-41-1	flavanone
62	glabrol	C ₂₅ H ₂₈ O ₄	392	59870-65-4	flavanone
63	paratocarpin L	C ₂₅ H ₂₈ O ₅	408	97134-79-7	flavanone
64	liquiritigenin	C ₁₅ H ₁₂ O ₄	256	578-86-9	flavanone
65	echinatin	C ₁₆ H ₁₄ O ₄	270	34221-41-5	chalcone
66	isoliquiritigenin	C ₁₅ H ₁₂ O ₄	256	961-29-5	chalcone
67	homobutein	C ₁₆ H ₁₄ O ₅	286	34000-39-0	chalcone
68	licochalcone A	C ₂₁ H ₂₂ O ₄	338	58749-22-7	chalcone
69	licochalcone C	C ₂₁ H ₂₂ O ₄	338	144506-14-9	chalcone
70	5-(1,1-dimethylallyl)-3,4,4'-trihydroxy-2-met hoxychalcone	C ₂₁ H ₂₂ O ₅	354	1083200-74-1	chalcone
71	licochalcone E	C ₂₁ H ₂₂ O ₄	338	864232-34-8	chalcone
72	licoagrochalcone C	C ₂₁ H ₂₂ O ₅	354	325144-68-1	chalcone
73	1-(2,4-dihydroxy-phenyl)-3-[4-hydroxy-3-(3- methyl-but-2-enyl)-phenyl]-propenone	C ₂₀ H ₂₀ O ₄	324	202815-28-9	chalcone
74	4,2',3'-trihydroxy-4'-methoxy-chalcone	C ₂₀ H ₁₈ O ₄	286	360068-14-0	chalcone
75	corylifol B	C ₂₀ H ₂₀ O ₅	340	775351-90-1	chalcone
76	3,4,3',4'-Tetrahydroxychalcone	C ₁₅ H ₁₂ O ₅	272	106593-04-8	chalcone
77	kanzonol C	C ₂₅ H ₂₈ O ₄	392	151135-83-0	chalcone
78	isobavachalcone	C ₂₀ H ₂₀ O ₄	324	20784-50-3	chalcone
79	licoarylcoumarin	C ₂₁ H ₂₀ O ₆	368	125709-31-1	coumarin
80	isoglycyrol	C ₂₁ H ₁₈ O ₆	366	23013-86-7	coumarin
81	glycyrol	C ₂₁ H ₁₈ O ₆	366	23013-84-5	coumarin
82	glycy coumarin	C ₂₁ H ₂₀ O ₆	368	94805-82-0	coumarin
83	isoglycy coumarin	C ₂₁ H ₂₀ O ₆	368	117038-82-1	coumarin
84	glycyrin	C ₂₂ H ₂₂ O ₆	382	66056-18-6	coumarin
85	kanzonol W	C ₂₀ H ₁₆ O ₅	336	184584-82-5	coumarin
86	glycyuralin E	C ₂₁ H ₂₂ O ₆	370	1879910-26-5	coumarone
87	licocoumarone	C ₂₀ H ₂₀ O ₅	340	118524-14-4	coumarone
88	gancaonin I	C ₂₁ H ₂₂ O ₅	354	126716-36-7	coumarone
89	2'- <i>O</i> -demethybidwillol B	C ₁₉ H ₁₈ O ₄	310	945937-11-1	coumarone
90	kanzonol U	C ₁₉ H ₁₆ O ₄	308	178330-48-8	coumarone
91	glyinflanin	C ₁₉ H ₁₆ O ₄	308	164123-54-0	coumarone
92	3-methoxy-9-hydroxy-pterocarpin	C ₁₆ H ₁₄ O ₄	270	74560-05-7	pterocarpin
93	1-methoxyphaseollin	C ₂₁ H ₂₀ O ₅	352	157226-48-7	pterocarpin
94	licoagrocarpin	C ₂₁ H ₂₂ O ₄	338	202815-29-0	pterocarpin
95	shinpterocarpin	C ₂₀ H ₁₈ O ₄	322	57103-57-8	pterocarpin
96	dehydroglyceollin I	C ₂₀ H ₁₆ O ₄	320	59901-97-2	pterocarpin
97	glyasperin F	C ₂₀ H ₁₈ O ₆	354	145382-61-2	isoflavanone
98	licoisoflavanone	C ₂₀ H ₁₈ O ₆	354	66067-26-3	isoflavanone
99	glycyuralin A	C ₂₆ H ₃₄ O ₆	442	1879910-22-1	isoflavan
100	dehydroglyasperin C	C ₂₁ H ₂₂ O ₅	354	199331-35-6	isoflavan
101	licoricidin	C ₂₆ H ₃₂ O ₅	424	30508-27-1	isoflavan
102	glyasperin D	C ₂₂ H ₂₆ O ₅	370	142561-10-2	isoflavan
103	glabridin	C ₂₀ H ₂₀ O ₄	324	59870-68-7	isoflavan
104	7,4'-dihydroxy-3'-methoxyisoflavan	C ₁₆ H ₁₆ O ₄	272	202345-78-6	isoflavan
105	3,4-didehydroglabridin	C ₂₀ H ₁₈ O ₄	322	214283-58-6	isoflavan
106	8-prenyl-phaseollinisoflavan	C ₂₅ H ₂₈ O ₄	392	175554-12-8	isoflavan
107	glabrene	C ₂₀ H ₁₈ O ₄	322	60008-03-9	isoflavan
108	hispaglabridin B	C ₂₅ H ₂₆ O ₄	390	68978-02-9	isoflavan
109	4'- <i>O</i> -methylglabridin	C ₂₁ H ₂₂ O ₄	338	68978-09-6	isoflavan
110	3'-hydroxy-4'- <i>O</i> -methylglabridin	C ₂₁ H ₂₂ O ₅	354	175554-11-7	isoflavan
111	hispaglabridin A	C ₂₅ H ₂₈ O ₄	392	68978-03-0	isoflavan
112	7-methoxy-2',4'-dihydroxy isoflavone	C ₁₆ H ₁₂ O ₅	284	7622-53-9	isoflavone
113	glycyrrhiza-isoflavone C	C ₂₁ H ₂₀ O ₆	368	161014-35-3	isoflavone
114	luteone	C ₂₀ H ₁₈ O ₆	354	41743-56-0	isoflavone
115	isolupalbigenin	C ₂₅ H ₂₆ O ₅	406	162616-70-8	isoflavone
116	angustone A	C ₂₅ H ₂₆ O ₆	422	90686-13-8	isoflavone
117	licoricone	C ₂₂ H ₂₂ O ₆	382	51847-92-8	isoflavone
118	licoisoflavone B	C ₂₀ H ₁₆ O ₆	352	66056-30-2	isoflavone
119	glicoricone	C ₂₁ H ₂₀ O ₆	368	161099-37-2	isoflavone
120	licoisoflavone A	C ₂₀ H ₁₈ O ₆	354	66056-19-7	isoflavone
121	allolicoisoflavone B	C ₂₀ H ₁₆ O ₆	352	117204-81-6	isoflavone
122	semilicoisoflavone B	C ₂₀ H ₁₆ O ₆	352	129280-33-7	isoflavone
123	hirtellanine I	C ₂₁ H ₁₈ O ₆	366	1369378-20-0	isoflavone

124	isoderrone	C ₂₀ H ₁₆ O ₅	336	121747-89-5	isoflavone
125	isoangustone A	C ₂₅ H ₂₆ O ₆	422	129280-34-8	isoflavone
126	7- <i>O</i> -Methyluteone	C ₂₁ H ₂₀ O ₆	368	122290-50-0	isoflavone
127	lupiwighteone	C ₂₀ H ₁₈ O ₅	338	104691-86-3	isoflavone
128	6- <i>C</i> -prenylorobol	C ₂₀ H ₁₈ O ₆	354	66777-71-7	isoflavone
129	wighteone	C ₂₀ H ₁₈ O ₅	338	51225-30-0	isoflavone
130	2'-hydroxyisupalbigenin	C ₂₅ H ₂₆ O ₆	422	121747-94-2	isoflavone
131	pratensein	C ₁₆ H ₁₂ O ₆	300	2284-31-3	isoflavone
132	genistein	C ₁₅ H ₁₀ O ₅	270	446-72-0	isoflavone
133	formononetin	C ₁₆ H ₁₂ O ₄	268	485-72-3	isoflavone
134	abiochanin A	C ₁₆ H ₁₂ O ₅	284	491-80-5	isoflavone
135	gancaonin L	C ₂₀ H ₁₈ O ₆	354	129145-50-2	isoflavone
136	daidzein	C ₁₅ H ₁₀ O ₄	254	486-66-8	isoflavone
137	eurycarpin A	C ₂₀ H ₁₈ O ₅	338	166547-20-2	isoflavone
138	angustone B	C ₂₅ H ₂₄ O ₆	420	100462-54-2	isoflavone
139	glyurallin B	C ₂₀ H ₁₈ O ₆	422	199331-53-8	isoflavone
140	6,8-diprenylgenistein	C ₂₅ H ₂₆ O ₅	406	51225-28-6	isoflavone
141	7,8-dihydroxy-4'-methoxy-6-prenylisoflavone	C ₂₁ H ₂₀ O ₅	352	938190-32-0	isoflavone
142	4'-methoxy-7, 2'-dihydroxy isoflavone	C ₁₆ H ₁₂ O ₅	284	1890-99-9	isoflavone
143	glycyrrhisoflavone	C ₂₀ H ₁₈ O ₆	354	116709-70-7	isoflavone
144	gancaonin H	C ₂₅ H ₂₄ O ₆	420	126716-35-6	isoflavone
145	glabrone	C ₂₀ H ₁₆ O ₅	336	60008-02-8	isoflavone
146	7,3',4'-trihydroxyisoflavone	C ₁₅ H ₁₀ O ₅	270	485-63-2	isoflavone
147	isoglabrone	C ₂₀ H ₁₆ O ₅	336	1115012-65-1	isoflavone
148	parvisoflavones-A	C ₂₀ H ₁₆ O ₆	352	50277-01-5	isoflavone
149	glicophenone	C ₂₀ H ₂₂ O ₆	358	303175-66-8	other
150	3,3'- bis(γ , γ -dimethylallyl)-4,2',4'-trihydroxyl- α -tridroxyl-dihydrochalcone	C ₂₅ H ₃₀ O ₅	410	N.A.	other
151	erybacin B	C ₁₉ H ₁₈ O ₅	326	1314877-89-8	other

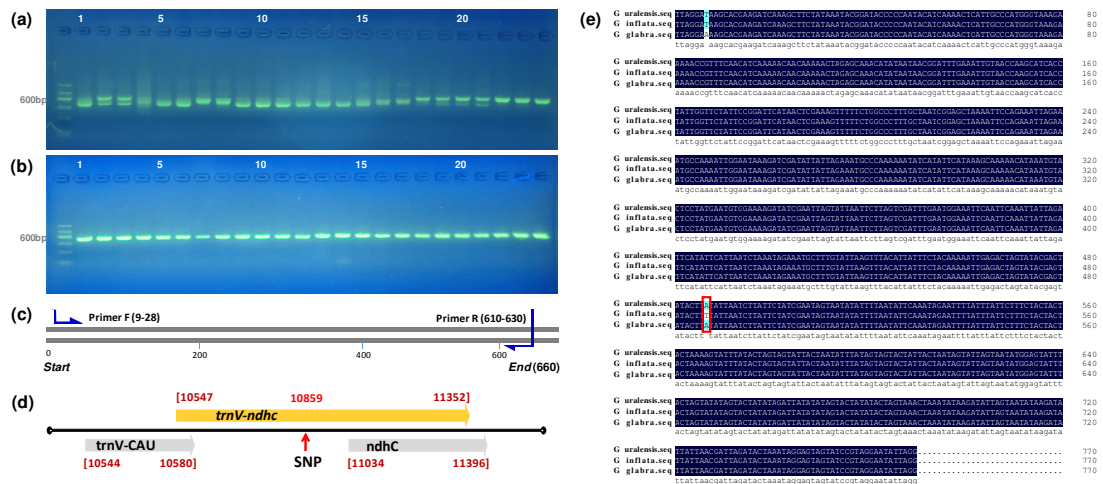
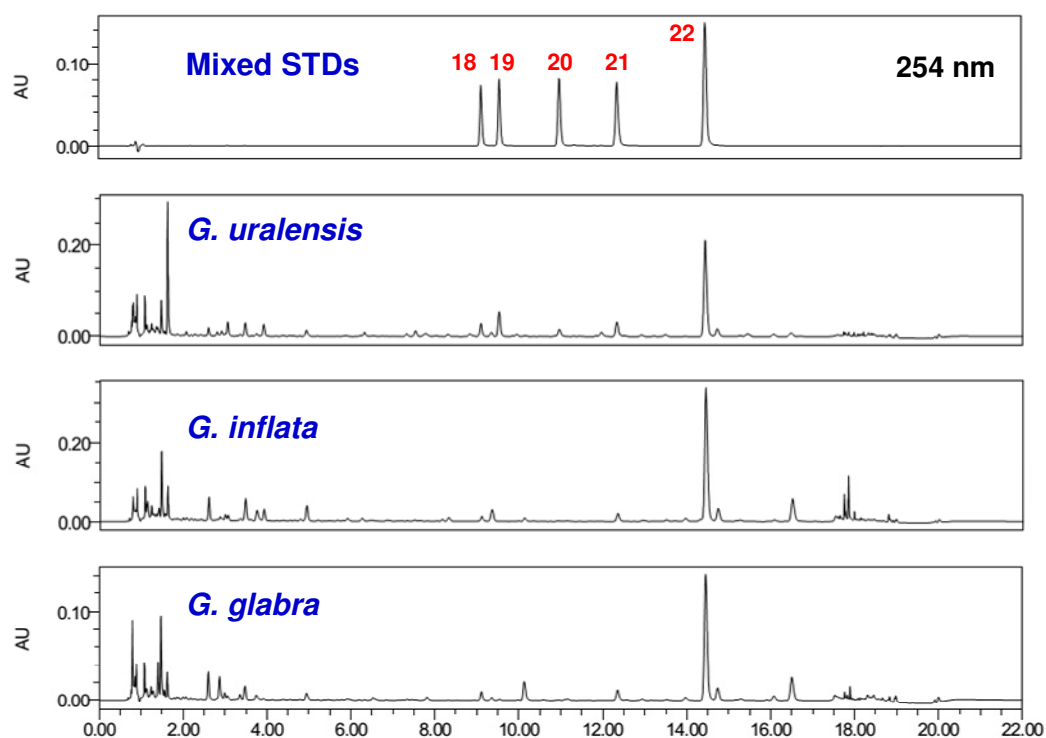


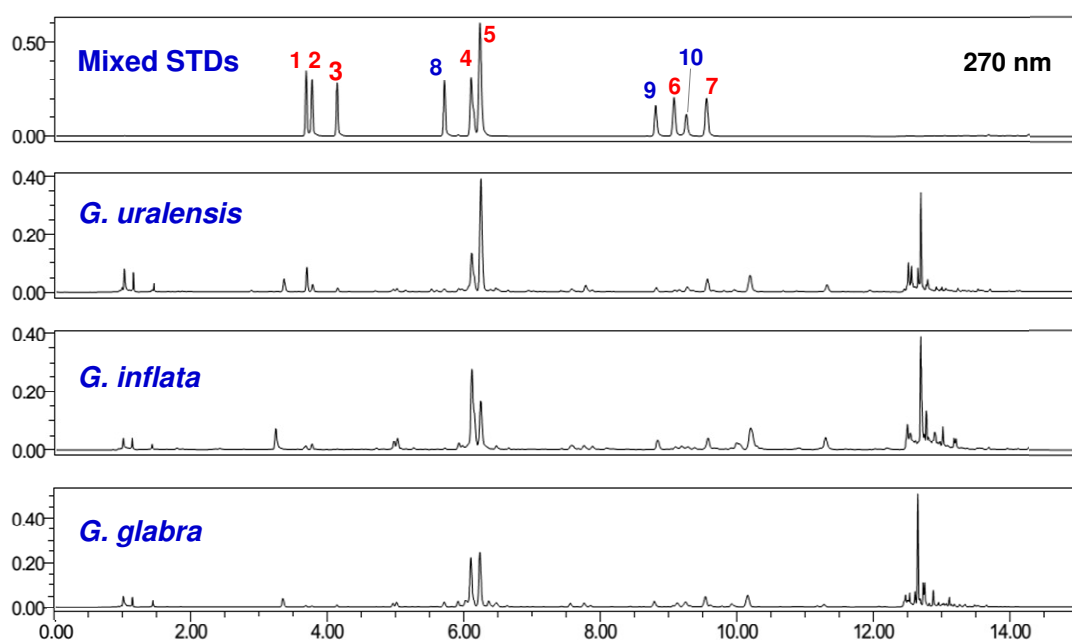
Figure S2. DNA barcoding of ITS and *trnV-ndhC* intergenic regions to identify *Glycyrrhiza* species.

(a) The electrophoretogram of PCR products amplified with the universal ITS primers ITS4/5; (b) The electrophoretogram of PCR products amplified with *Glycyrrhiza*-specific ITS primers (ITS-G-F and ITS-G-R) designed by the authors; (c) Position of primers ITS-G-F and ITS-G-R on the rDNA ITS sequence (AB649775.1); (d) Position of the *trnV-ndhC* intergenic region and the stable SNP (single nucleotide polymorphism) site for species identification of *G. inflata* and *G. glabra* on complete genome of *Glycyrrhiza glabra* chloroplast (KF201590.1); (e) The *trnV* gene (partial sequence), *trnV-ndhC* intergenic spacer (complete sequence), and *ndhC* gene (partial sequence) of *G. uralensis*, *G. glabra*, and *G. inflata*. The red box highlights the stable SNP site for species identification of *G. inflata* and *G. glabra*. *G. inflata* could be distinguished from *G. glabra* as *trnV-ndhC* genotype TN-1, while *G. glabra* and *G. uralensis* shared the same *trnV-ndhC* genotype TN-2.

The PCR mixture (20 μ L) contained template DNA 0.5 μ L, forward primer (10 μ M) 1.0 μ L, reverse primer (10 μ M) 1.0 μ L, 5 $\times$ TransStart KD Plus Buffer 4.0 μ L, TransStart KD Plus DNA polymerase 0.4 μ L, dNTP (2.5 mM) 0.4 μ L, and ddH₂O 12.7 μ L. The PCR conditions were 94 $^{\circ}$ C for 3 min, then 35 cycles at 94 $^{\circ}$ C for 30 s, 56 $^{\circ}$ C for 30 s and 68 $^{\circ}$ C for 60 s, ended by incubating at 68 $^{\circ}$ C for 10 min. The PCR products were examined by 1.5% agarose gel electrophoresis before bi-directional DNA sequencing on a 3730XL sequencer (Applied Biosystems, USA). Sequence alignment and analysis of single nucleotide polymorphism on nucleotide chromatography were performed with DNAMAN (version 8.0, Lynnon Biosoft, USA) and BioEdit (version 7.0.0) software, respectively.

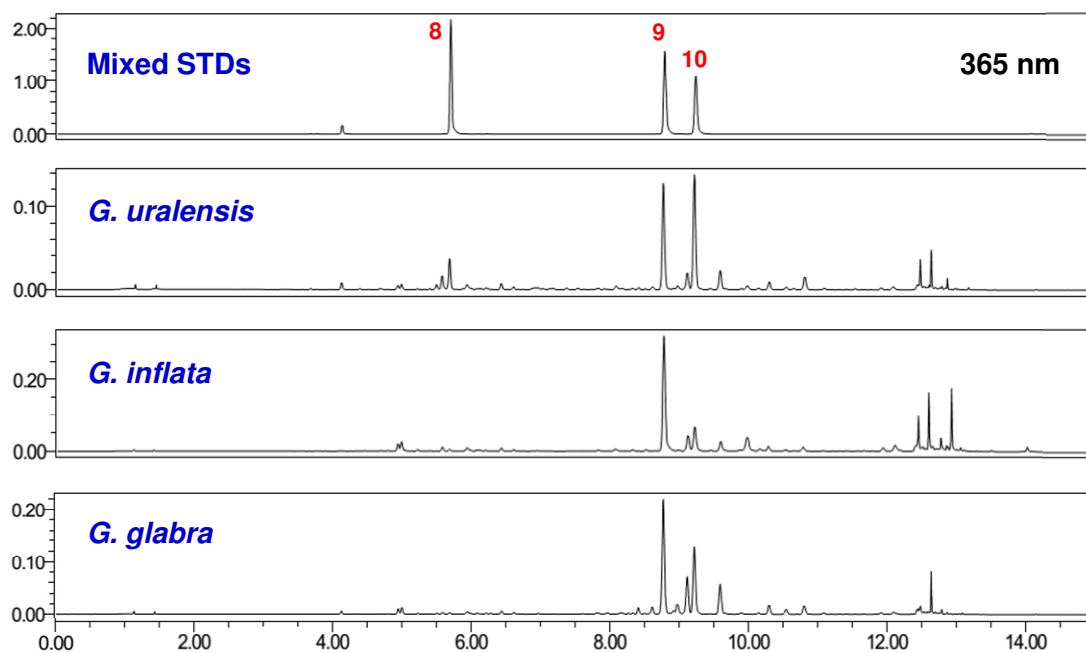


UPLC/UV chromatograms of five saponins in Method 1-a (254 nm).

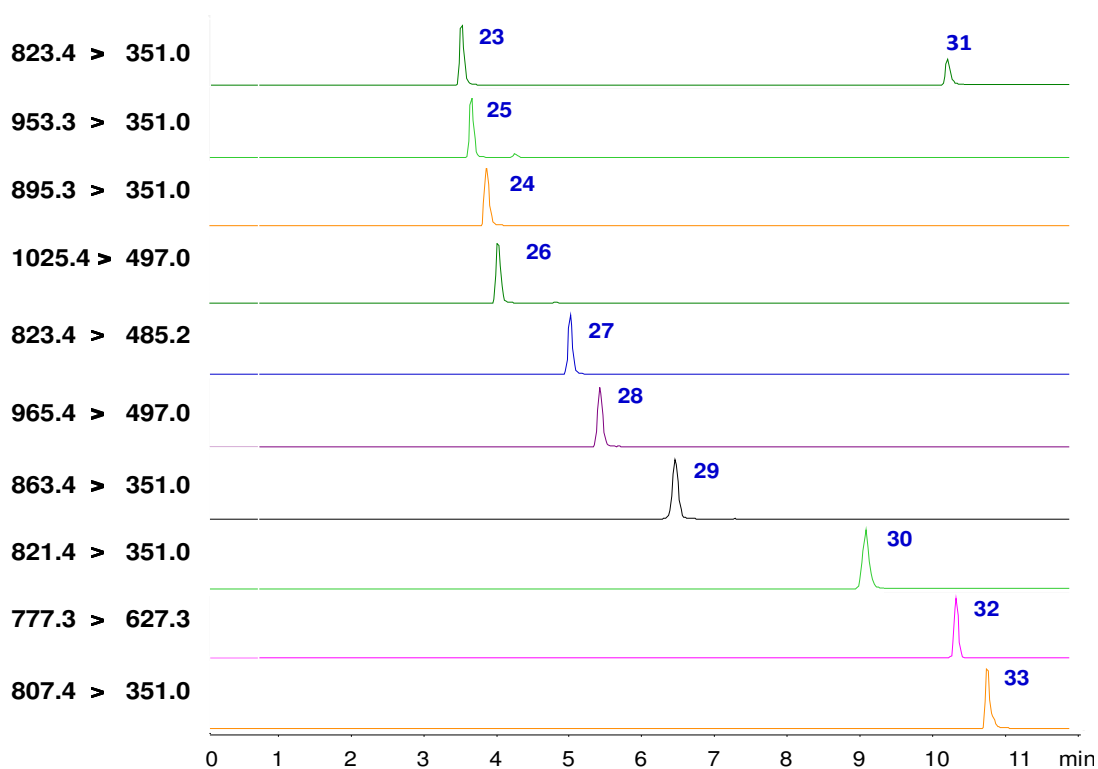


UPLC/UV chromatograms of 10 flavonoid glycosides in Method 1-b (270 nm).

Figure S3. UPLC/UV and UHPLC/MS/MS chromatograms for the quantitation of 151 analytes.

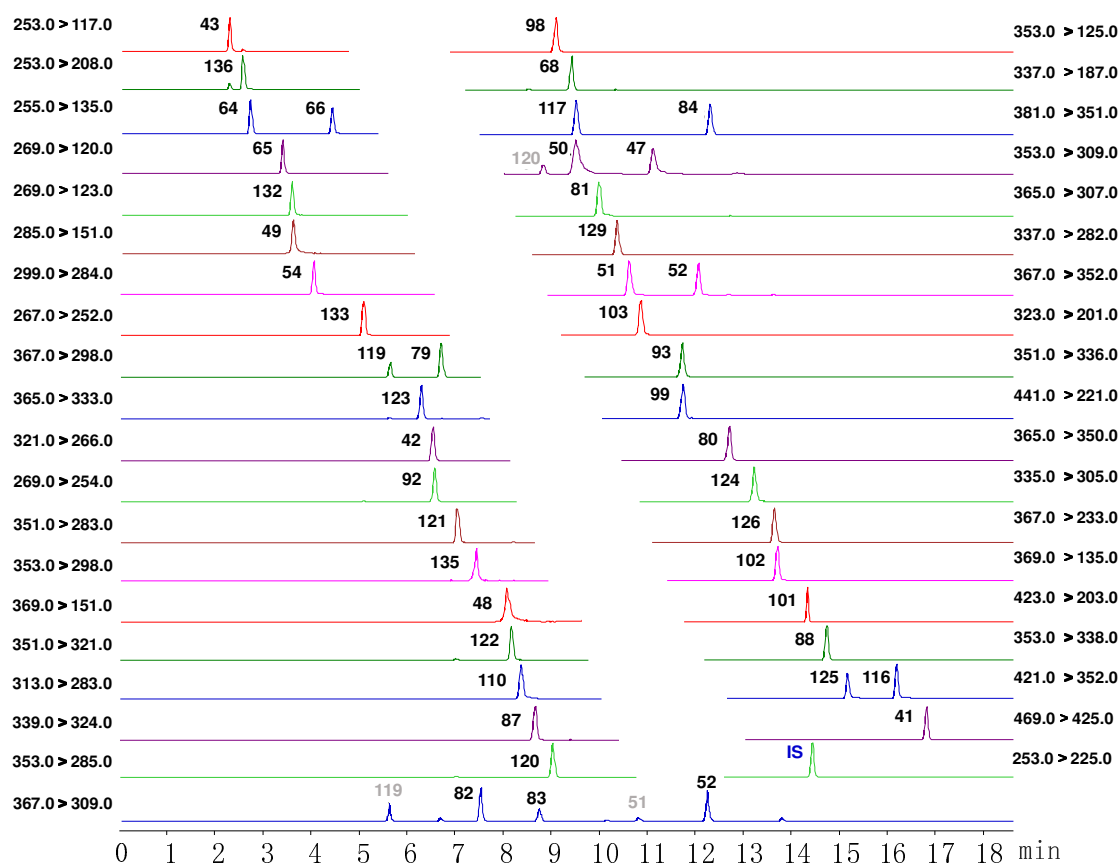


UPLC/UV chromatograms of 10 flavonoid glycosides in Method 1-b (365 nm).

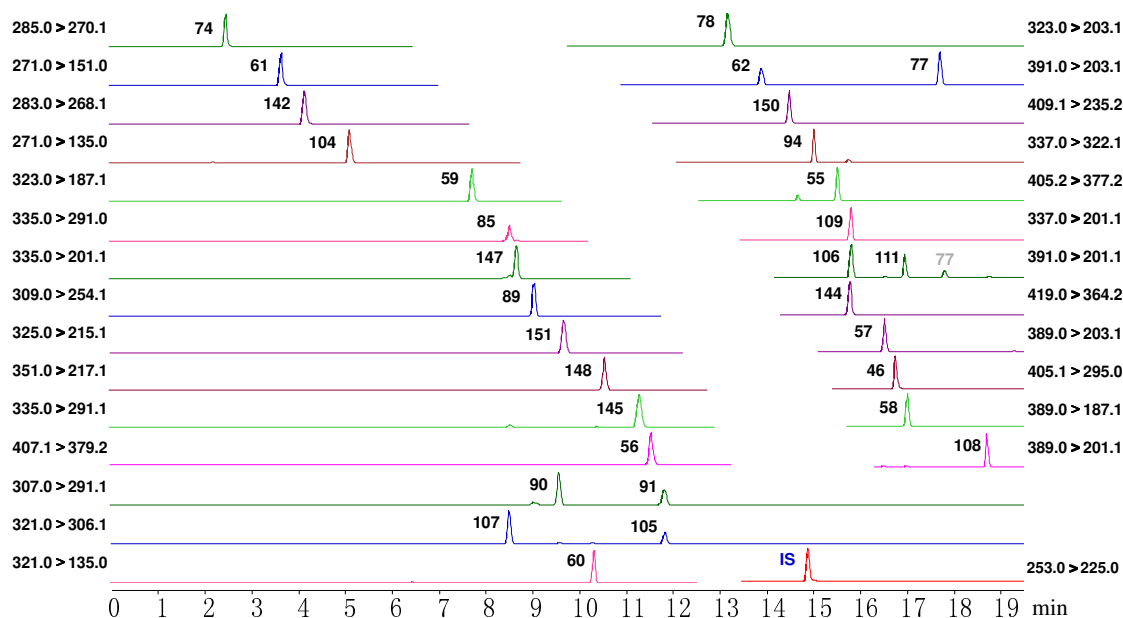


LC/MRM-MS chromatograms of 11 triterpenoid saponins in Method 2-a.

Figure S3 (continued). UPLC/UV and UHPLC/MS/MS chromatograms for the quantitation of 151 analytes.

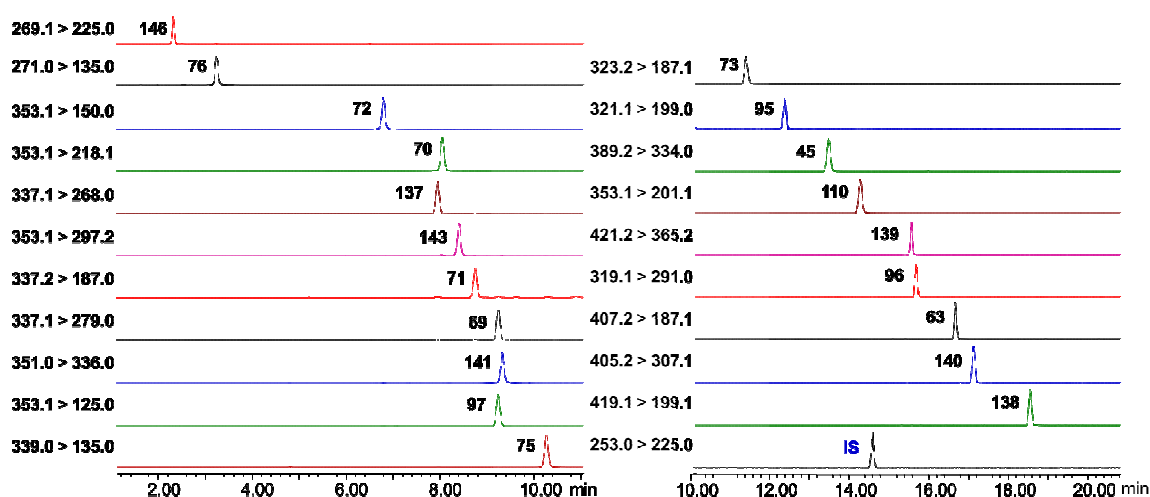


LC/MRM-MS chromatograms of 45 analytes in Method 2-b.

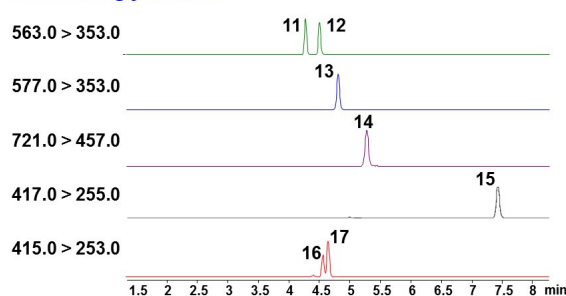


LC/MRM-MS chromatograms of 31 analytes in Method 2-c.

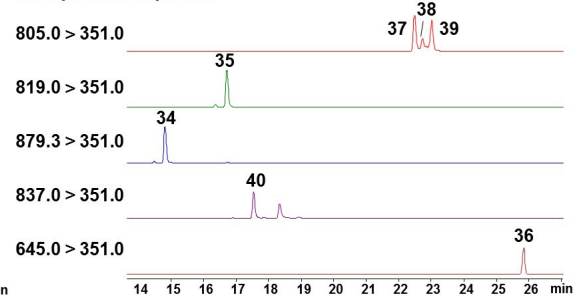
Figure S3 (continued). UPLC/UV and UHPLC/MS/MS chromatograms for the quantitation of 151 analytes.



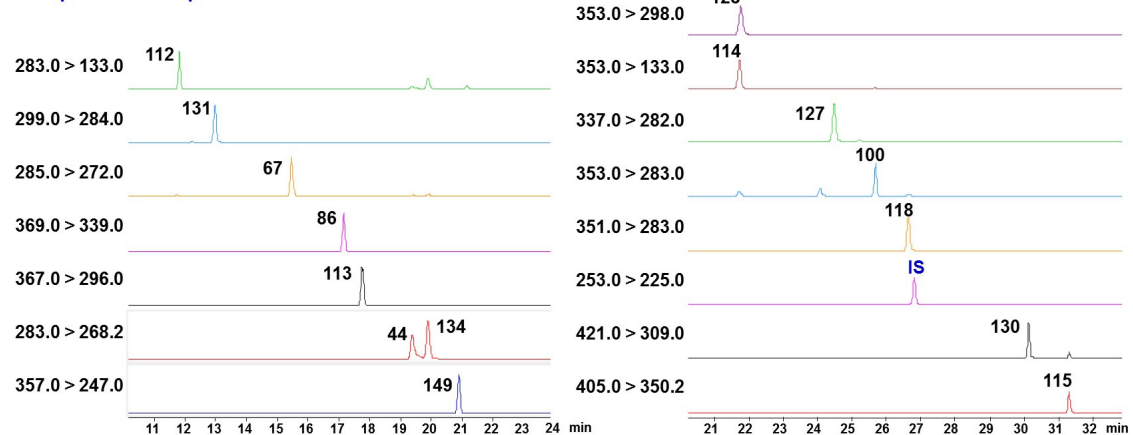
Flavonoid glycosides



Triterpenoid saponins



Free phenolic compounds



LC/MRM-MS chromatograms of 29 analytes in Method 3.

Figure S3 (continued). UPLC/UV and UHPLC/MS/MS chromatograms for the quantitation of 151 analytes.

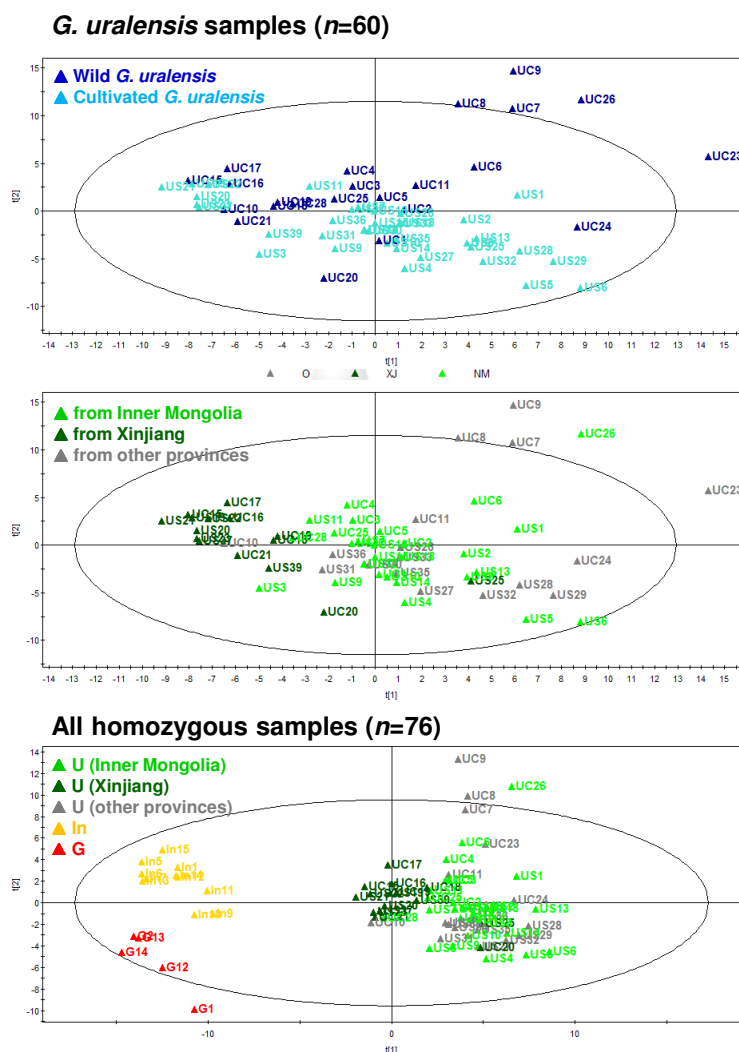


Figure S4. Impact of growing area on the contents of secondary metabolites is much weaker than that of species variation.
 UC, wild-growing *G. uralensis*; US, cultivated *G. uralensis*; G, *G. glabra*; In, *G. inflata*.

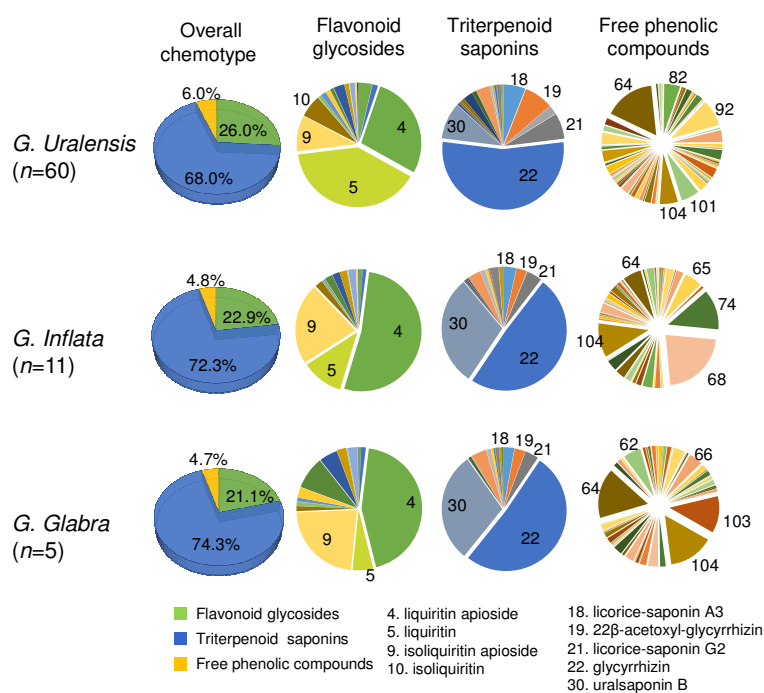


Figure S5. Content ratio of different structural types and selected compounds in the three *Glycyrrhiza* species. Glabrol (**62**), liquiritigenin (**64**), echinatin (**65**), isoliquiritigenin (**66**), licochalcone A (**68**), 4,2',3'-trihydroxy-4'-methoxy-chalcone (**74**), glycy coumarin (**82**), 3-methoxy-9-hydroxy-pterocarpan (**92**), licoricidin (**101**), glabridin (**103**), and 7,4'-dihydroxy-3'-methoxyisoflavan (**104**).

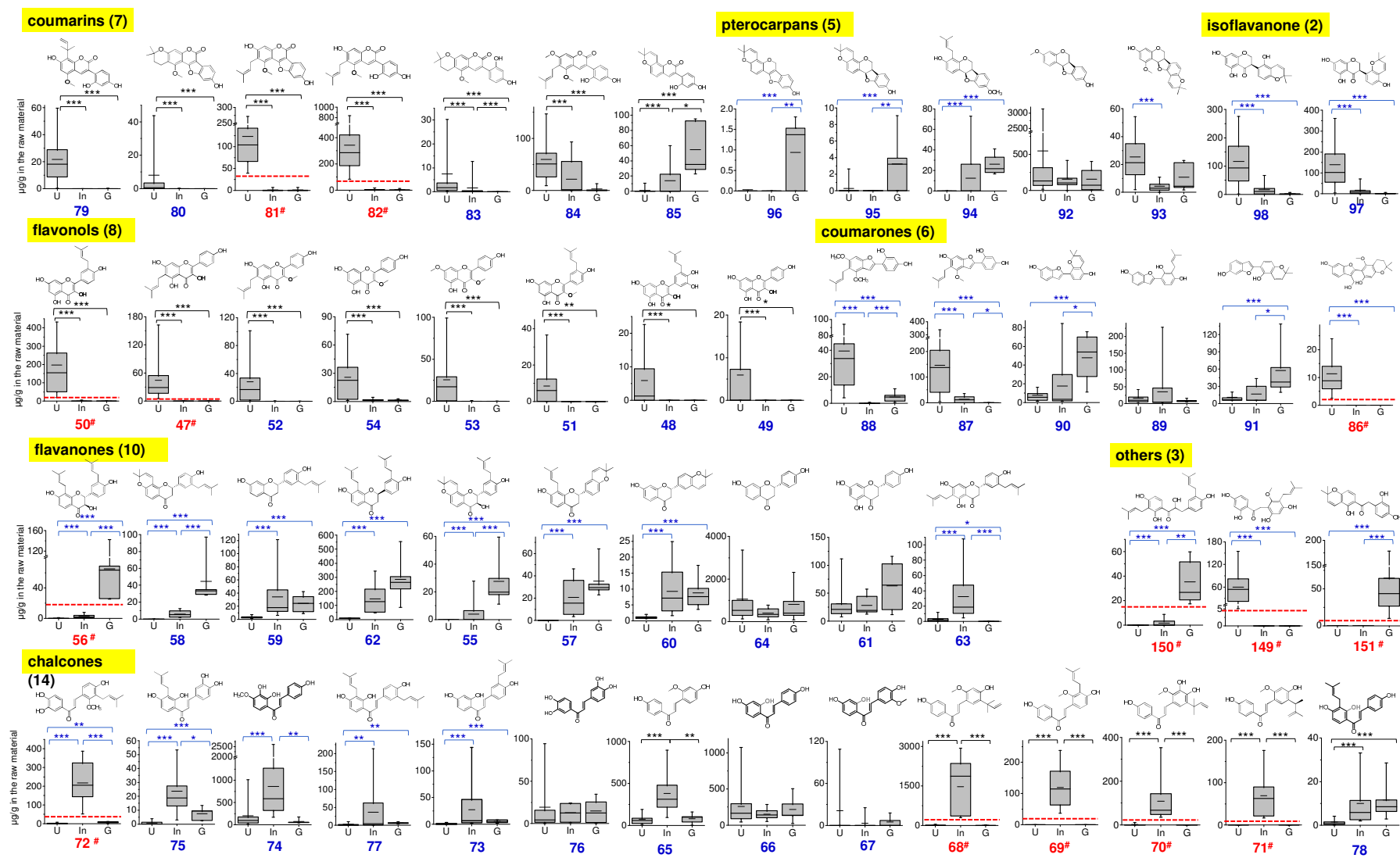


Figure S6. Contents (µg/g) of free phenolic compounds in the three homozygous *Glycyrrhiza* species.

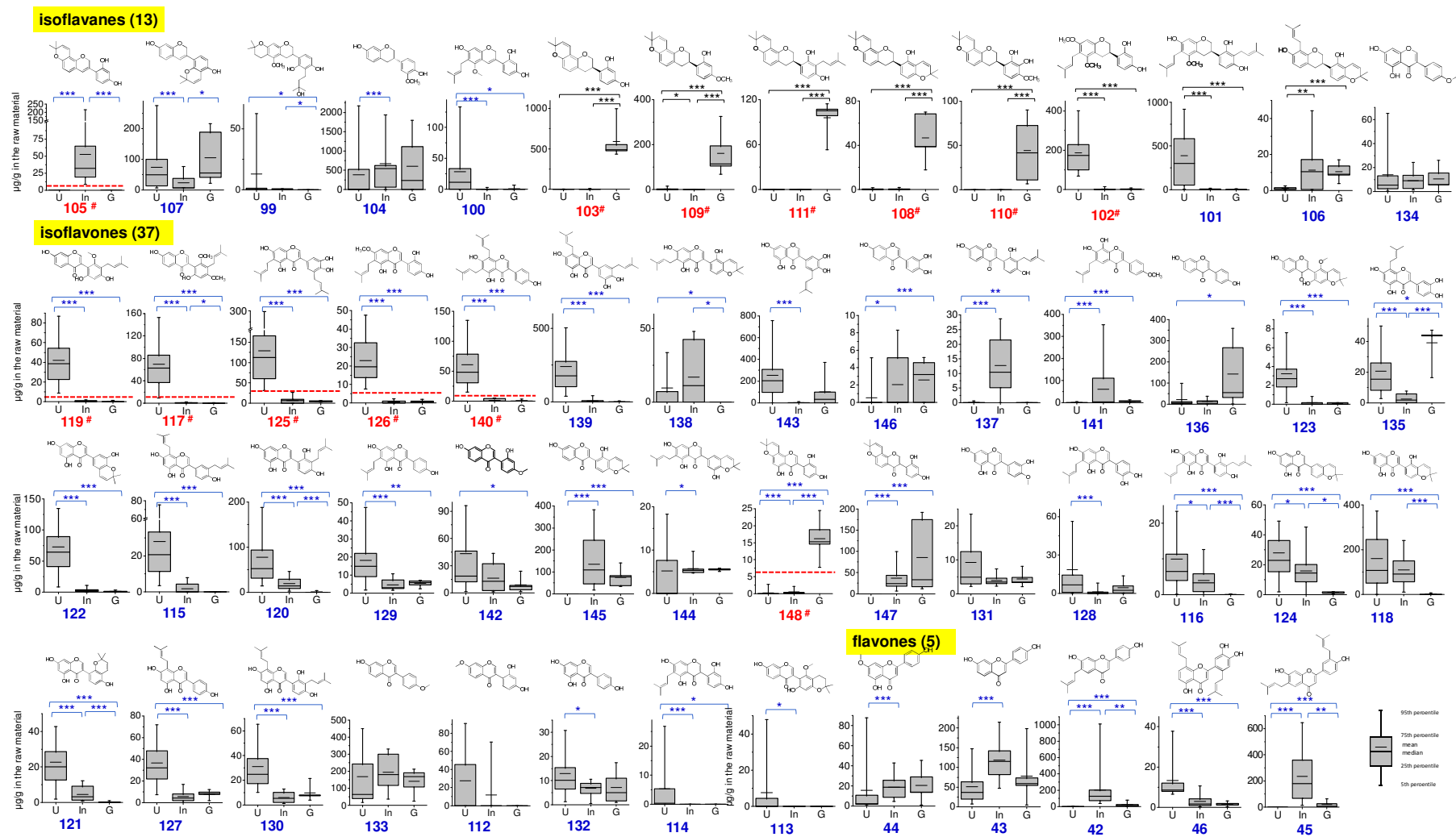
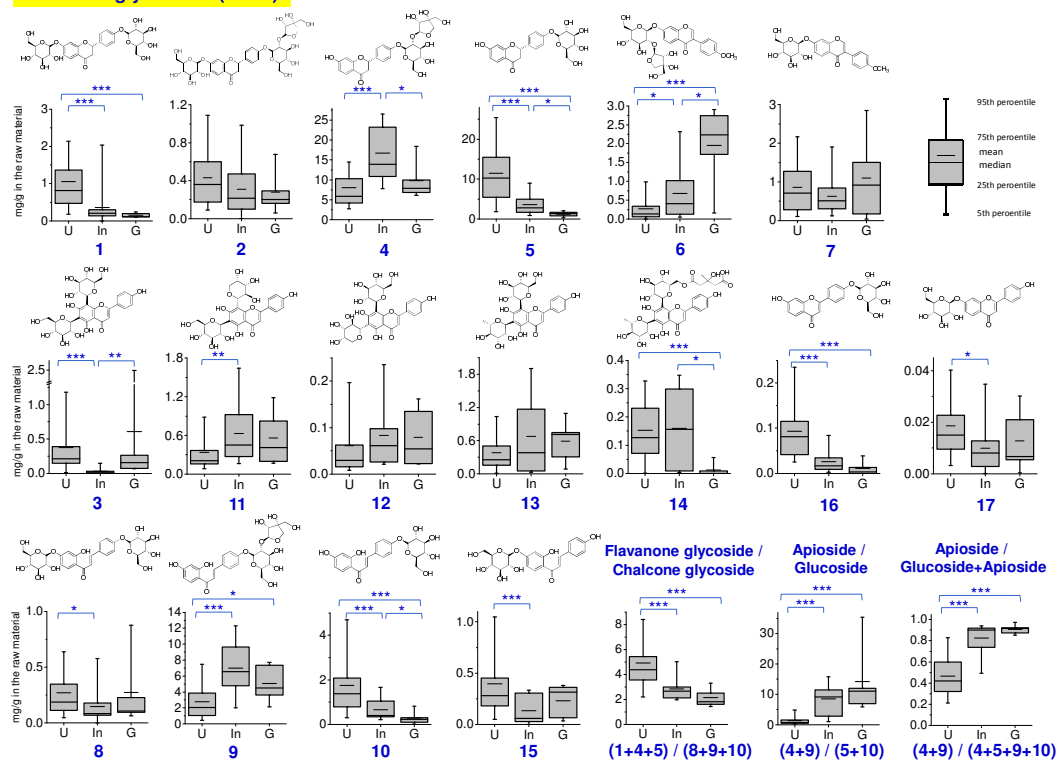


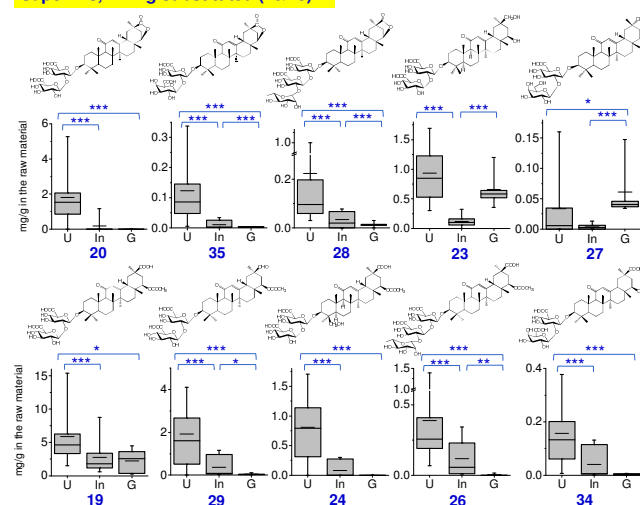
Figure S6 (continued). Contents (µg/g) of free phenolic compounds in the three homozygous *Glycyrrhiza* species.

Species-specific marker compounds were marked in red. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.005$ (Mann-Whitney *U*-test).

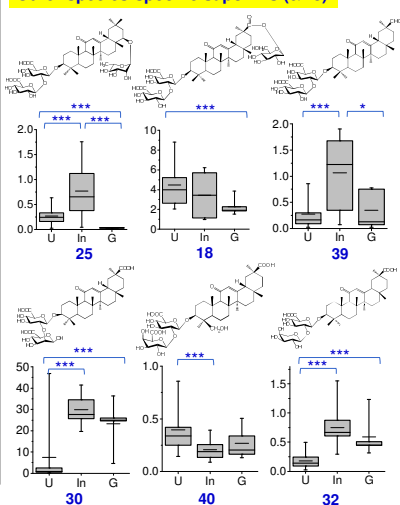
Flavonoid glycosides (17/17)



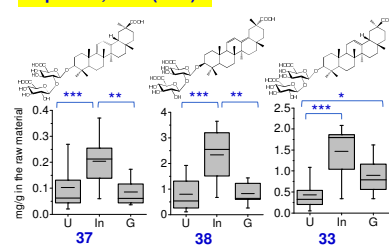
Saponins, E-ring substituted (10/23)



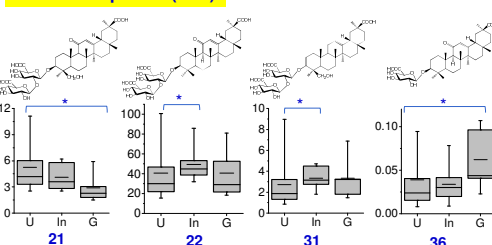
Other species-specific saponins (6/23)



Saponins, 11-H (3/23)



Common saponins (4/23)



Triterpenoid (1/1)

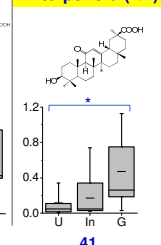


Figure S7. Contents (µg/g) of flavonoids and triterpenoids in the three homozygous *Glycyrrhiza* species. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.005$ (Mann-Whitney U -test).

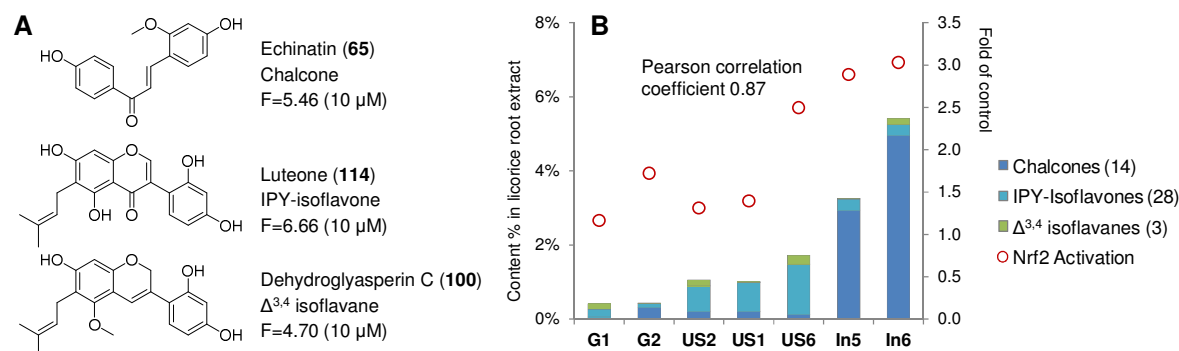


Figure S8. Nrf2 activation activities of licorice root extracts were positively correlated with the contents of bioactive compounds. A, Potent Nrf2 activators in licorice; B, Contents of 45 compounds of the same structural types in different licorice samples, and the Nrf2 activation activities of different licorice extracts (25 μ g/mL). tBHQ (50 μ M, F=4.22) was used as the positive control. IPY, isoprenylated; F, fold of control.

Nrf2 activation assay

Nrf2 (nuclear factor erythroid 2-related factor 2) transcription activation activities were evaluated using a luciferase reporter assay in HepG2 human hepatocellular carcinoma cells stably transfected with Nrf2 luciferase reporter (HepG2C8 cells). The method was adopted from our recent report^[1]. HepG2 cells were obtained from American Type Culture Collection (ATCC; Manassas, MD, USA) and were identified using short tandem repeat analysis. Mycoplasma contamination was detected by PCR assay. tert-Butylhydroquinone (tBHQ, Sigma-Aldrich, St. Louis, MO, USA) was used as the positive control.

^[1] Ji, S.; Li, Z.; Song, W.; Wang, R.; Liang, W.; Li, K.; Tang, S.; Wang, Q.; Qiao, X.; Zhou, D.; Yu, S.; Ye, M. *J. Nat. Prod.* **2016**, 79, 281-292.

Part II. Method development for quantitative analysis

1. UPLC/UV analysis

1.1 method optimization

Optimization for sample preparation. For efficient extraction of the target compounds, extraction methods (ultrasonic bath and maceration) and different solvents (water, 50%, 75%, and 100% methanol, 50%, 75%, and 95% ethanol) were optimized (Figure S9). As a result, ultrasonic bath showed better extraction efficiency. 50% methanol was chosen for extraction of flavonoid glycosides and triterpenoids saponins (Method 1-a, 1-b, and 2-a), while 100% methanol was chosen for extraction of free phenolic compounds (Method 2-b, 2-c, 2-d, and 3). Different extraction time and solvent volume were also compared (Figure S10). The optimized method for sample preparation was conducted as described in experimental section.

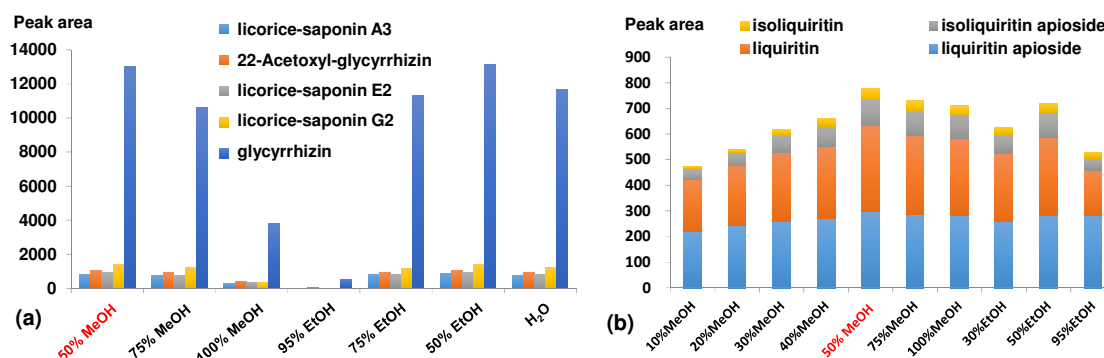


Figure S9. Optimization of the extraction solvent for triterpenoid saponins (a) and flavonoid glycosides (b).

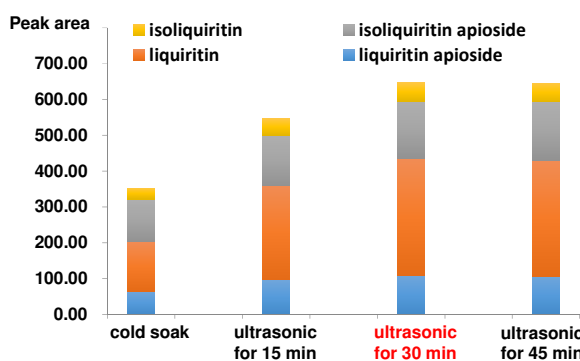


Figure S10. Optimization of the extraction method and extraction time (take major flavonoid glycosides as example).

Optimization of the chromatographic conditions. On account of the very similar polarities and relative low resolutions of the licorice saponins, the chromatographic method for determination of the major saponins (Method 1-a) was fully optimized. For desirable separation, different kinds of mobile phase (methanol–water, acetonitrile–water, and acetonitrile–methanol–water in different proportions) were examined systematically. Acetonitrile was better than methanol. What’s more, adding a certain percentage (10%–20%) of methanol to acetonitrile could dramatically improve peak resolutions of the triterpenoids saponins. As shown in [Figure S11](#), baseline separation of licorice-saponin E2 (**20**) and licorice-saponin G2 (**21**) was hard to achieve in acetonitrile–water system. When the three-component mobile phase (acetonitrile–methanol–water) was used, they were eluted in reverse order and totally separated. In addition, 0.1% formic acid in water (v/v) could improve peak shape. Different types of columns (Zorbax SB-C18, Agilent; Zorbax Extend-C18, Agilent; XTerra, Waters; Atlantis dC18, Waters) were also compared by HPLC analysis ([Figure S12](#)). Waters Atlantis dC18 (250mm×4.6mm, 5μm) showed the best peak resolution, especially for licorice saponin A3. ACQUITY UPLC HSS T3 column (150 mm ×2.1 mm, 1.8μm, Waters, MA, USA) was then adopted for all UPLC/UV analysis and the subsequent UHPLC/MS/MS analysis in this study. Method for determination of the major flavonoid glycosides (Method 1-b) was optimized. Unlike triterpenoid saponins, the flavonoid glycosides in licorice showed satisfactory separation when eluted with acetonitrile and water containing 0.1% (v/v) formic acid. The detection wavelengths were selected in accordance with the maximum absorption of the analytes. Typical UPLC/UV chromatography of the mixed standards, *G. uralensis*, *G. inflata*, and *G. glabra* are shown in [Figure S3](#).

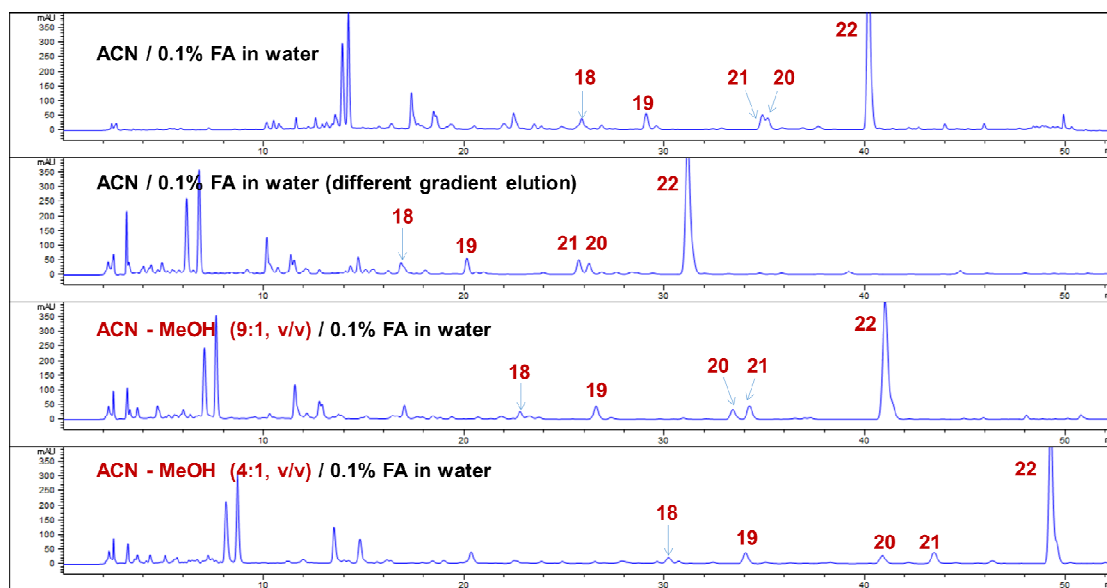


Figure S11. Optimization of liquid chromatography mobile phase (acetonitrile–water, acetonitrile–methanol–water in different proportions) for Method 1-a.

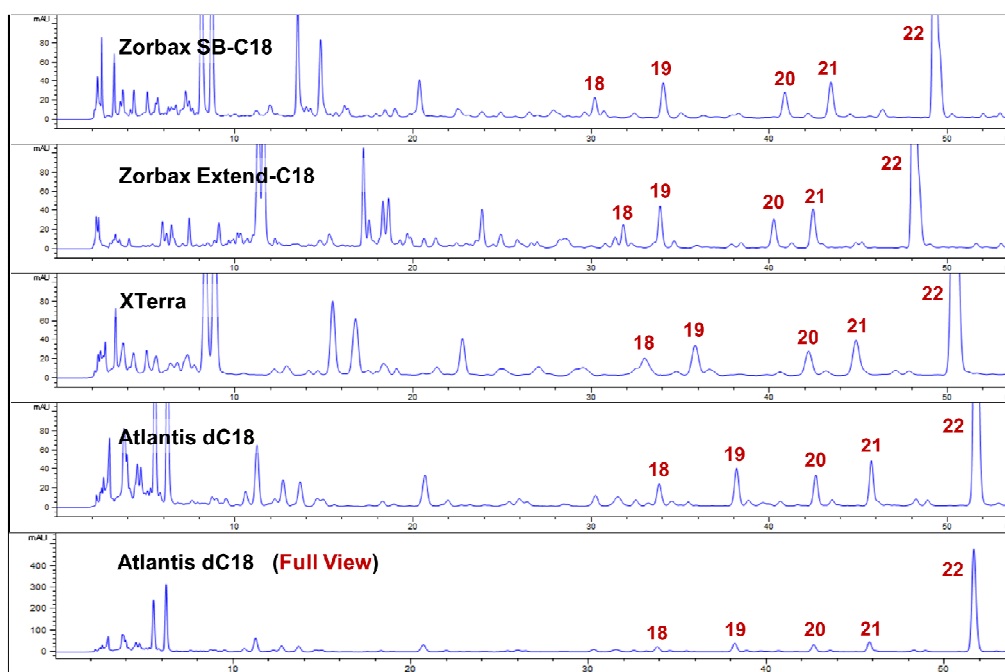


Figure S12. Optimization of different types of columns (Zorbax SB-C₁₈, Agilent; Zorbax Extend-C₁₈, Agilent; XTerra, Waters; Atlantis dC₁₈, Waters).

1.2 Quantitation of five triterpenoid saponins (Method 1-a)

UPLC/UV conditions. The mobile phase consisted of acetonitrile-methanol (4:1, v/v, A) and water containing 0.1% formic acid (v/v, B). The following linear elution gradient was used: 0–1 min, 30% A; 1–8 min, 30–40% A; 8–16 min, 40–52% A;

16.2–17.6min, 100% A. The flow rate was 0.40 mL/min. The column temperature was maintained at 55°C. The sample tray temperature was maintained at 15°C. The detection wavelength was set from 190 to 600 nm, and the samples were detected at 254 nm in accordance with the maximum absorption of the analytes.

Preparation of standard solutions. Five reference compounds (**18-22**) were completely dissolved in 50% methanol (for **18, 19, and 21**) or 75 % methanol (for **20 and 22**) to make their individual stock solutions (accur. 5 mg/mL for each analyte). Then 200 µL of stock solutions of **18-21**, 1000 µL of stock solution of **22**, and 200 µL of 50% methanol were well mixed to make the final concentrations of 0.5 mg/mL for **18-21**, 2.5 mg/mL for **22**. The mixed stock solution was further diluted with 50% methanol to obtain a series of standard working solutions for the establishment of the calibration curves (dilution factor = 1, 1.25, 2.5, 5, 10, 20, 40, 80, and 160). The limit of detection (LOD) and limit of quantitation (LOQ) were determined by injecting a series of diluted standard solutions until the signal-to-noise (S/N) ratio was 3 for LOD and 10 for LOQ in all quantitative analysis.

1.3 Quantitation of ten flavonoid glycosides (Method 1-b)

UPLC/UV conditions. The mobile phase consisted of acetonitrile (A) and water containing 0.1% formic acid (v/v, B). A linear elution gradient was used: 0 min, 10% A; 1 min, 15% A; 6 min, 25% A; 8.5 min, 30% A; 10min, 32% A. The flow rate was 0.30 mL/min. The column temperature was maintained at 50°C. The sample tray temperature was maintained at 15°C. The detection wavelength was set from 190 to 600 nm, and the samples were detected at 365 nm (for compounds **8, 9, and 10**) and 270 nm (for compounds **1-7**) and in accordance with the maximum absorption of the analytes.

Preparation of standard solutions. Ten reference compounds, **1-10**, were dissolved in 50% methanol, separately, to make their respective stock solutions (accur. 3 mg/mL). Then 60 µL of each of the stock solutions of **1, 2, 3, 6, and 8**, and 140 µL of each of the stock solution of **4, 5, 7, 9, and 10**, were well mixed to make 1 ml of the mixed stock solution (0.18 mg/mL for **1, 2, 3, 6, 8**, and 0.42 mg/mL for **4, 5, 7, 9, 10**). The mixed solution was further diluted with 50% methanol to obtain a series of standard

working solutions for the establishment of the calibration curves.

1.4 UPLC/UV method validation

To measure accuracy of the method, recovery test was carried out by standard addition at three concentration levels (low, medium, and high). The mixed standard solutions at three different concentration levels (50%, 100%, and 150%) were added to the known amounts of licorice sample (US-1). For Method 1-a, the concentrations of compounds **18–22** at 100% level were 34.0, 32.0, 24.0, 36.0, and 340.0 µg/mL, respectively. For Method 1-b, the concentrations of compounds **1–10** at 100% level were 9.0, 3.2, 1.0, 32.0, 52.0, 1.4, 3.0, 2.0, 9.0, and 7.0 µg/mL, respectively. The mixtures were then extracted and analyzed in triplicate at each level. Recoveries were calculated by the formula: recovery (%) = (found amount – original amount) / spiked amount × 100%. Precision, repeatability, and stability of the method were also evaluated. To evaluate the intra- and inter-day precisions, the same sample was analyzed for six times within one day and on three consecutive days. The repeatability of the developed method was confirmed by parallel analysis of six independent samples from the same batch of crude drug. For stability test, the same sample solution was analyzed at 0, 4, 8, 12, 24, 36, and 48 hours after prepared. The variations were presented in relative standard deviations (RSD, %).

The validation results of the five triterpenoid saponins and ten flavonoid glycosides in Method 1a and 1b were summarized in [Table S6](#) and [Table S7](#). All analytes showed good linearity ($r^2 > 0.9993$) within test ranges. The UPLC/UV method showed high sensitivity with relative low LODs (0.01–0.12 µg/mL) and LOQs (0.03–0.60 µg/mL) of the 15 analytes. The intra- and inter-day RSDs were less than 2.32% and 2.97%, respectively, demonstrating high precision of the method. The repeatability of the developed method was good with RSDs less than 4.16%. The stability test suggested that the investigated compounds were stable within three days at 25°C (RSDs ≤ 2.58%). The mean recoveries of the 15 compounds at three spiking levels were 95.95–110.36% with RSDs ≤ 4.16%, revealing acceptable accuracy of the method.

Table S6. UPLC/UV detection parameters, regression equations, sensitivity, precision, repeatability, and stability of the 15 analytes determined by Method 1-a and Method 1-b.

No.	Analytes	Formula	Method No.	t_R (min)	UV λ (nm) for determination	Regression equation	r^2	Linear range ($\mu\text{g/mL}$)	LOD ($\mu\text{g/mL}$)	LOQ ($\mu\text{g/mL}$)	Precision		Repeatability (n=6)	Stability (0-72h)
											intraday (n=6)	interday (n=3)		
18	licorice-saponin A3	$\text{C}_{48}\text{H}_{72}\text{O}_{21}$	1-a	9.1	254	$y = 983.5 x + 1386.1$	0.9998	12.5–500	0.12	0.60	0.61	0.43	1.28	1.58
19	22 β -Acetoxyl-glycyrrhizin	$\text{C}_{44}\text{H}_{64}\text{O}_{18}$	1-a	9.7	254	$y = 1789.0 x + 1971.2$	0.9997	12.5–500	0.05	0.22	0.65	0.34	0.92	1.15
20	licorice-saponin E2	$\text{C}_{42}\text{H}_{60}\text{O}_{16}$	1-a	11.0	254	$y = 1947.2 x + 2018.3$	0.9998	12.5–500	0.07	0.45	0.42	0.05	0.79	0.51
21	licorice-saponin G2	$\text{C}_{42}\text{H}_{62}\text{O}_{17}$	1-a	12.4	254	$y = 1674.2 x + 4217.7$	0.9998	25.0–500	0.06	0.41	0.41	0.20	0.73	0.66
22	glycyrrhizin	$\text{C}_{42}\text{H}_{62}\text{O}_{16}$	1-a	14.5	254	$y = 1596.5 x + 10388.0$	0.9999	62.5–2500	0.06	0.40	0.27	0.03	0.79	0.30
1	liquiritigenin-7,4'-diglucoside	$\text{C}_{27}\text{H}_{32}\text{O}_{14}$	1-b	3.7	270	$y = 4541.2 x$	0.9997	1.00-90	0.02	0.08	0.60	0.34	0.56	0.26
2	glucoliquiritin apioside	$\text{C}_{32}\text{H}_{40}\text{O}_{18}$	1-b	3.8	270	$y = 4236.7 x + 2445.0$	0.9999	1.00-90	0.03	0.10	0.55	1.04	0.74	1.09
3	vicenin	$\text{C}_{27}\text{H}_{30}\text{O}_{15}$	1-b	4.1	270	$y = 5718.0 x + 3388.8$	0.9999	1.00-6.00	0.03	0.10	2.32	2.97	0.69	2.57
4	liquiritin apioside	$\text{C}_{26}\text{H}_{30}\text{O}_{13}$	1-b	6.1	270	$y = 4043.7 x + 1411.3$	0.9999	2.33-840	0.02	0.08	0.50	0.41	0.76	0.96
5	liquiritin	$\text{C}_{21}\text{H}_{22}\text{O}_9$	1-b	6.3	270	$y = 5699.2 x + 5985.3$	0.9999	2.33-840	0.01	0.04	0.46	0.18	0.86	0.37
6	glycyroside	$\text{C}_{27}\text{H}_{30}\text{O}_{13}$	1-b	9.0	270	$y = 4196.7 x + 2949.7$	0.9999	1.00-90	0.03	0.10	0.89	2.78	0.66	2.58
7	ononin	$\text{C}_{22}\text{H}_{22}\text{O}_9$	1-b	9.6	270	$y = 9424.1 x + 11616$	0.9996	2.33-70	0.01	0.03	1.04	2.67	1.20	2.21
8	isoliquiritigenin-4,4'-diglucoside	$\text{C}_{27}\text{H}_{32}\text{O}_{14}$	1-b	5.7	365	$y = 10925.0 x + 6247.2$	0.9993	1.00-22.50	0.05	0.15	0.44	1.34	3.18	1.41
9	isoliquiritin apioside	$\text{C}_{26}\text{H}_{30}\text{O}_{13}$	1-b	8.7	365	$y = 9727.5 x + 30067.0$	0.9995	2.33-210	0.02	0.05	0.42	0.17	2.76	0.53
10	isoliquiritin	$\text{C}_{21}\text{H}_{22}\text{O}_9$	1-b	9.2	365	$y = 1447.01 x + 23135.0$	0.9999	2.33-210	0.03	0.10	0.36	0.37	4.16	0.83

Note: In the regression equation, x is the peak area, y the concentration of each analyte ($\mu\text{g/mL}$), and r the correlation coefficient. LOD, limit of detection (S/N=3), LOQ, limit of quantification (S/N=10). Intra-, inter-day precision, repeatability, and stability are shown in RSD (%).

Table S7. Recoveries of the standard addition test of the 15 analytes determined by Method 1-a and Method 1-b.

Analytes	50% spiking			100% spiking			150% spiking			Mean Recovery (%)	RSD (%, n=3)
	Found (n=3, mg)	Spiked (mg)	Recovery (%)	Found (n=3, mg)	Spiked (mg)	Recovery (%)	Found (n=3, mg)	Spiked (mg)	Recovery (%)		
18	0.0169	0.0170	99.41	0.0335	0.0340	98.53	0.0505	0.0510	99.02	98.99	0.45
19	0.0161	0.0160	100.63	0.0316	0.0320	98.75	0.0478	0.0480	99.58	99.65	0.95
20	0.0125	0.0120	104.17	0.0245	0.0240	102.08	0.0368	0.0360	102.22	102.82	1.14
21	0.0191	0.0180	106.11	0.0378	0.0360	105.00	0.0568	0.0540	105.19	105.43	0.56
22	0.0165	0.1700	97.06	0.0324	0.3400	95.29	0.0487	0.5100	95.49	95.95	1.01
1	0.0029	0.0027	107.07	0.0563	0.0540	104.32	0.0085	0.0081	104.98	105.56	1.37
2	0.0101	0.0096	104.69	0.0181	0.0192	94.45	0.0299	0.0288	103.89	101.01	0.82
3	0.0032	0.0030	107.20	0.0065	0.0060	108.18	0.0087	0.0090	96.41	103.39	2.28
4	0.0968	0.0960	100.82	0.1903	0.1920	99.09	0.2801	0.2880	97.25	99.05	1.80
5	0.1635	0.1560	104.78	0.3228	0.3120	103.45	0.4759	0.4680	101.68	103.30	1.51
6	0.0046	0.0042	110.31	0.0092	0.0084	109.95	0.0140	0.0126	110.81	110.36	0.39
7	0.0095	0.0090	105.00	0.0188	0.0180	104.27	0.0265	0.0270	98.04	102.44	3.74
8	0.0061	0.0060	100.98	0.0122	0.0120	101.26	0.0183	0.0180	101.48	101.24	0.25
9	0.0400	0.0270	102.39	0.0536	0.0540	99.24	0.0789	0.0810	97.35	99.66	2.56
10	0.0215	0.0210	102.41	0.0426	0.0420	101.51	0.0630	0.0630	99.94	101.29	1.23

2. UHPLC/MS/MS analysis

2.1 Method Optimization

Internal standard. Chrysophanol was used as the internal standard (IS) for the UHPLC/MS/MS quantitative analysis. As shown in Figure S13, it showed good sensitivity in the negative mode of electrospray ionization (ESI) source, and no interference was detected in licorice samples at the same retention time.

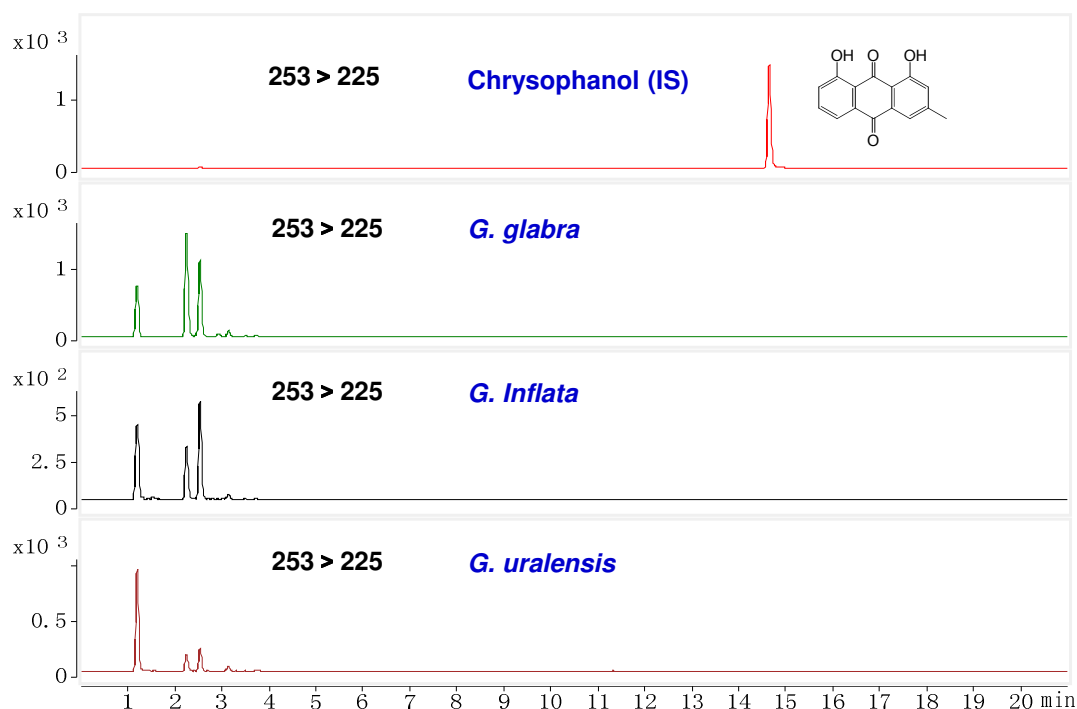


Figure S13. SRM (253 > 225) chromatography of the IS and licorice samples

Optimization of MS conditions. The individual solutions of all standard compounds and the internal standard (5 µg/mL in methanol) were injected into the ESI source in the negative ion mode respectively. In the full-scan spectra, the most abundant ions were deprotonated molecules $[M-H]^-$ for all the analytes. Thus the $[M-H]^-$ ions were used as the precursor ion of all SRM transitions. Two SRM transitions were ultimately set for each analyte, one for quantitation, and the other one for exclusion of false positive signals. Two fragment ions with the highest relative abundance in the MS/MS spectra were used as the precursor ions of the two SRM transitions. As shown in Table S8, collision energy (CE) was optimized for each transition. Typical MRM chromatograms of the 136 analytes determined by UHPLC/MS/MS analysis are given in Figure S3.

2.2 Quantitation of the 11 minor triterpenoid saponins (Method 2-a)

UHPLC/MS/MS conditions. An Agilent 6495 Triple Quadrupole mass spectrometer equipped with an Agilent series 1290 UHPLC instrument via Jet Stream ESI interface (Agilent Technologies, Waldbronn, Germany) was employed for all UHPLC/MS/MS quantitation except for the 20 analytes in Method 2-d. The UHPLC system consisted of an autosampler, a binary pump, a diode-array detector, and a column compartment. Chromatographic separation was achieved on an ACQUITY UPLC HSS T3 column (150 mm × 2.1 mm, 1.8 μm, Waters, MA, USA) at 50°C with 0.1% (v/v) formic acid in water (solvent A) and acetonitrile (solvent B) as the mobile phase. The flow rate was 0.2 mL/min and the gradient program was as follows: 0–1 min, 30–40% B; 1–7 min, 40–44% B; 7–8 min, 44–50% B; 8–10 min, 50–90% B; 10–12 min, 90–100% B. For MS detection, The ESI source was operated in the negative ion mode. High-purity nitrogen (N₂) was used as the sheath gas (11 L/min, 350°C) and the nebulizer (12 L/min, 200°C, 25 psi). The capillary voltage was set at 4000 V, nozzle voltage at 1000 V, and delta EMV at 150 V. Quantitative analyses were monitored in the MRM mode. The MRM ion pair transitions and their collision energy (CE) were listed in [Table S8](#). Data were analyzed by MassHunter software 08.00 (Agilent).

Preparation of standard solutions. Eleven reference standards, **23–33**, were dissolved in 50% methanol, separately, to make their individual stock solutions with the concentration of 1 mg/mL. Then 25 μL of compound **31**, 25 μL of compound **33**, and 50 μL of each of the other 9 stock solutions were mixed to make the mixed stock solution. The mixed stock solution was diluted with 50% methanol to produce serial concentrations of working solutions.

2.3 Quantitation of the 96 free phenolic compounds (Method 2-b, 2-c, and 2-d)

General procedure. For convenience and accuracy, the 96 free phenolic compounds were divided into three groups and determined in separate procedures. Among them, 45 compounds mainly isolated from *Glycyrrhiza uralensis* were determined simultaneously by Method 2-b; 31 compounds mainly isolated from *G. inflata* and *G. glabra* were determined by Method 2-c; the other 20 compounds mainly from *G.*

inflata were determined by Method 2-d (Table S8). In particular, The LC/MS/MS system of method 2-d consisted of a Waters ACQUITY UPLC system, including a quaternary pump solvent manager, an autosampler, and a column heater, and a Triple Quadrupole mass spectrometer equipped with an electrospray ionization (ESI) source controlled by Masslynx V4.1 workstation (Waters, MA, USA).

UHPLC/MS/MS conditions. For UHPLC separation, an ACQUITY UPLC HSS T3 column (150 mm × 2.1 mm, 1.8 μm, Waters, MA, USA) was employed. The analytes of the three groups were eluted with the same gradient program as follows: 0 min, 40% B; 6 min, 50% B; 12 min, 60% B; 12.8 min, 70% B; 16.5 min, 78% B; 17.5 min, 100% B (A, 0.1% (v/v) formic acid in water; B, acetonitrile). The flow rate was 0.25 mL/min and the column temperature was 50°C. For MS detection of Method 2-b and 2-c, the MS source parameters was identical with that of Method 2-a, except for the capillary voltage (3500 V), nozzle voltage (1500 V) and delta EMV (100 V). For Method 2-d, MS source parameters were set as follows: capillary voltage 3.0 kV; source temperature 150°C; desolvation temperature 450°C; cone gas flow 50 L/hour; desolvation gas flow 550 L/hour. Multiple reaction monitoring (MRM) parameters, including cone voltage and collision energy were optimized for each analyte. The MRM transitions and the selected parameter values for the 96 analytes were listed in Table S8.

Preparation of standard solutions. Appropriate amount of the 96 pure standards were weighed and dissolved in methanol, respectively, to make their individual stock solutions at concentration of 1 mg/mL for all analytes. The internal standard (IS) solution was prepared at concentration of 2.90 μg/mL. Then 100 μL of each of the 45 stock solutions was mixed, dried under nitrogen, and re-dissolved in 1mL of the IS solution to make the mixed stock solution of Method 2-b. The mixed stock solutions of Method 2-c and 2-d were prepared in the same way. Then the three mixed stock solutions were serially diluted, respectively, to produce calibration standard solutions and evaluate the LOD, LOQ, liner range of each analyte.

2.4 simultaneous quantitation of the other 29 compounds (Method 3)

UHPLC/MS/MS conditions. Another 29 compounds, included both glycosides and

free phenolic compounds, were determined simultaneously using Method 3. Most of these minor compounds showed unsatisfactory separation with their isomers in licorice sample solutions using previous elution program. Thus, a more time-consuming gradient program (0 min, 10% B; 0.75 min, 15% B; 3 min, 25% B; 15 min, 38% B; 22 min, 47% B; 26 min, 57% B; 30 min, 75% B; 32 min, 80% B) was used with flow rate of 0.35 mL/min and column temperature at 55°C. The composition of mobile phase A and B was identical with that used in Method 2-a. For MS detection, the source parameters were the same as that in Method 2-b and 2-c. MRM transitions and their collision energy were optimized for all analytes and the final values were listed in [Table S8](#).

Preparation of standard solutions. Appropriate amount of the 29 standard compounds was weighed and dissolved in 50% methanol (glycosides, **11-17** and **34-40**) or methanol (free phenolic compounds, **44, 67, 86, 100, 112, 113, 114, 115, 118, 127, 128, 131, 130, 134, and 149**), respectively, to make their individual stock solutions with concentration of 1 mg/mL for all analytes. The internal standard solution was prepared in a concentration of 2.90 µg/mL. Then 100 µL of each of the 29 stock solutions were mixed, dried under nitrogen, and re-dissolved in 1 mL of the IS solution to make the mixed stock solution. The mixed stock solutions were serially diluted to produce calibration standard solutions.

2.5 LC/MS/MS method validation

Method validation for UHPLC/MS/MS analysis was carried out in terms of linear, sensitivity (LOD and LOQ), accuracy (recovery test), intra- and inter-day precision, repeatability, and stability. The validation procedure was consistent with that for UPLC/UV analysis. Sample solution of US-1 was employed for validation of Method 2-a, 2-b, and 3. Sample solutions of G-2 and In-1 were used for validation of Method 2-c and 2-d, respectively. For recovery test, the added amounts and the recoveries of the analytes were demonstrated in [Table S9](#). Particularly, the recovery test of the 29 compounds in Method 3 was not conducted due to insufficient amounts of standards or the low amounts of analytes in licorice samples.

As a result, 11 triterpenoid saponins and 96 free phenolic compounds were well

separated and determined within 11 min and 20 min using Method 2a and 2c-2d. Comparing the MRM chromatograms of the standard solution and licorice samples, no interference peak was found at the retention time of the analytes and the IS. The other 29 compounds determined by Method 3 also showed satisfactory resolution with other analytes and interference peaks. All analytes showed satisfactory linearity with $r^2 \geq 0.9907$ over relatively wide concentration ranges. The LODs and LOQs for all compounds were 0.02-20 and 0.1-50 ng/mL, respectively, showing high sensitivity of the method. The RSD values of intra- and inter-day precision, repeatability and stability of all analytes were less than 16.84%, 13.95%, 16.78%, and 18.65%, respectively (Table S8). The mean recoveries were between 70.12% and 117.29% with RSD less than 18.13% (Table S9). The results indicated that the developed method was qualified for quantitative analysis of the targeted compounds.

Table S8. LC/MS/MS parameters, regression equations, sensitivity, precision, repeatability, and stability of Methods 2-a, 2-b, 2-c, 2-d and Method 3.

Method	No.	Analytes	Formula	t_R (min)	Precurs or ion (m/z) [M-H] ⁺	Product ion 1 (m/z)	CE (V)	Product ion 2 (m/z)	CE (V)	Regression equation	r^2	Range (ng/mL)	LOD (ng/mL)	LOQ (ng/mL)	Precision		Repeatability (n=6)	Stability (0-72 h)
															intraday (n=6)	interday (n=3)		
2-a	23	Uralsaponin C	C ₄₂ H ₆₄ O ₁₆	3.5	823.4	351.0	45	193.0	50	y=87.77x+312.9	0.9991	50-5000	0.04	0.2	2.94	0.74	2.02	2.41
	25	uralsaponin T	C ₄₈ H ₇₄ O ₁₉	3.6	953.3	351.0	50	193.0	55	y=70.97x-431.6	0.9994	50-5000	0.02	0.1	1.98	1.37	4.85	3.47
	24	uralsaponin F	C ₄₄ H ₆₄ O ₁₉	3.8	895.3	351.0	45	193.0	50	y=158.9x+6392	0.9981	50-2000	0.1	0.5	1.65	0.70	3.53	2.72
	26	uralsaponin X	C ₅₀ H ₇₄ O ₂₂	4.0	1025.4	497.0	50	321.0	55	y=52.41x-11.66	0.9992	50-5000	0.1	0.5	2.32	1.39	3.61	3.47
	27	uralsaponin P	C ₄₂ H ₆₄ O ₁₆	5.0	823.4	485.2	45	643.3	55	y=96.50x+251.5	0.9982	5-1000	0.15	0.7	5.61	1.22	5.26	5.08
	28	uralsaponin Y	C ₄₈ H ₇₀ O ₂₀	5.4	965.4	497.0	50	321.0	50	y=52.00x+18.19	0.9996	50-2000	0.15	0.6	1.76	0.96	2.97	4.27
	29	22 β -acetoxyl-glycyrrhaldehyde	C ₄₄ H ₆₄ O ₁₇	6.4	863.4	351.0	45	193.0	50	y=81.36x-1878	0.9978	50-5000	0.05	0.2	4.94	1.76	3.17	3.80
	30	uralsaponin B	C ₄₂ H ₆₂ O ₁₆	9.0	821.4	351.0	45	193.0	50	y=196.7x-6018	0.9990	100-5000	0.05	0.2	2.44	0.78	4.49	2.17
	31	licorice-saponin J2	C ₄₂ H ₆₄ O ₁₆	10.1	823.4	351.0	40	193.0	50	y=97.48x-1189	0.9999	250-10000	0.06	0.3	1.25	0.12	3.52	2.54
	32	araboglycyrrhizin	C ₄₁ H ₆₂ O ₁₄	10.3	777.3	627.3	50	715.4	50	y=142.6x+3890	0.9979	10-2000	0.1	0.5	1.86	0.73	2.37	5.10
	33	licorice-saponin B2	C ₄₂ H ₆₄ O ₁₅	10.7	807.4	351	45	193	50	y=350.3 x+15613	0.9972	25-25000	0.02	0.1	2.42	1.64	7.78	2.06
2-b	43	kumatakenin B	C ₁₅ H ₁₀ O ₄	2.3	253.0	117.0	40	135.0	20	y=0.001173x+0.0007548	0.9993	1-1000	0.3	1	3.61	3.28	7.25	4.05
	136	daidzein	C ₁₅ H ₁₀ O ₄	2.6	253.0	208.0	35	224.0	30	y=0.0003537x+0.0005267	0.9973	1-800	0.3	1	12.25	6.62	8.71	10.16
	64	liquiritigenin	C ₁₅ H ₁₂ O ₄	2.7	255.0	135.0	15	119.0	35	y=0.001894x+0.01074	0.9995	5-2000	1	3	7.76	7.45	5.87	9.86
	65	echinatin	C ₁₆ H ₁₄ O ₄	3.4	269.0	120.0	25	237.0	20	y=0.0008299x+0.001291	0.9993	2-1000	0.2	1	5.42	4.99	4.17	7.41
	132	genistein	C ₁₅ H ₁₀ O ₅	3.6	269.0	123.0	35	159.0	35	y=0.0002814x+0.0004454	0.9992	2-500	0.5	2	3.81	1.27	5.40	11.55
	49	kaempferol	C ₁₅ H ₁₀ O ₆	3.6	285.0	151.0	15	229.0	25	y=0.00006443x+0.00004984	0.9999	0.5-500	0.1	0.4	-	-	-	-
	54	kaempferol-3-O-methyl ether	C ₁₆ H ₁₂ O ₆	4.1	299.0	284.0	15	255.0	30	y=0.003867x+0.0006863	0.9986	1-800	0.2	0.5	4.39	8.27	7.25	9.23
	66	isoliquiritigenin	C ₁₅ H ₁₂ O ₄	4.4	255.0	119.0	35	135.0	15	y=0.002672x+0.0004985	0.9975	2-2000	0.5	2	5.40	6.99	9.54	8.73
	133	formononetin	C ₁₆ H ₁₂ O ₄	5.1	267.0	252.0	20	223.0	40	y=0.007653x+0.001019	0.9979	1-800	0.3	1	5.08	1.59	8.11	9.62
	119	glicoricone	C ₂₁ H ₂₀ O ₆	5.6	367.0	309.0	25	298.0	25	y=0.002424x+0.0002163	0.9982	0.5-200	0.15	0.5	4.34	3.20	4.71	3.72

123	hirtellanine I	C ₂₁ H ₁₈ O ₆	6.3	365.0	333.0	30	350.0	20	y=0.0002295x+0.000004572	0.9995	1-200	0.3	1	6.63	2.19	6.41	8.00
42	licoflavone A	C ₂₀ H ₁₈ O ₄	6.5	321.0	266.0	25	117.0	35	y=0.002235x+0.0007894	0.9993	1-500	0.3	1	5.61	2.73	5.78	3.12
92	3-methoxy-9-hydroxy-pterocarpin	C ₁₆ H ₁₄ O ₄	6.5	269.0	254.0	15	209.0	35	y=0.003479x+0.006233	0.9920	5-2000	1	3	5.10	2.44	9.75	3.48
79	licoarylcoumarin	C ₂₁ H ₂₀ O ₆	6.7	367.0	337.0	30	298.0	20	y=0.003408x+0.001269	0.9963	1-500	0.3	1	5.50	4.97	3.30	9.22
121	allicoisoflavone B	C ₂₀ H ₁₆ O ₆	7.0	351.0	283.0	25	199.0	40	y=0.002025x+0.0007040	0.9996	0.5-1000	0.1	0.3	5.00	5.67	6.90	11.27
135	gancaonin L	C ₂₀ H ₁₈ O ₆	7.5	353.0	298.0	25	189.0	35	y=0.0002164x+0.0001751	0.9971	5-800	2	5	8.31	7.91	4.88	7.84
82	glycycoumarin	C ₂₁ H ₂₀ O ₆	7.5	367.0	297.0	30	309.0	30	y=0.0008642x+0.002339	0.9979	2-2000	0.5	2	3.67	2.52	8.10	3.06
48	uralenol	C ₂₀ H ₁₈ O ₇	8.1	369.0	151.0	30	179.0	25	y=0.00009071x+0.0001640	0.9996	2-200	0.5	2	-	-	-	-
122	semilicoisoflavone B	C ₂₀ H ₁₆ O ₆	8.2	351.0	321.0	40	333.0	35	y=0.0009188x+0.00009469	0.9991	1-500	0.3	1	3.97	4.48	4.82	7.10
53	kumatakenin	C ₁₇ H ₁₄ O ₆	8.4	313.0	283.0	30	225.0	40	y=0.006418x+0.0007488	0.9993	0.5-500	0.15	0.5	3.85	2.80	3.54	4.42
83	isoglycycoumarin	C ₂₁ H ₂₀ O ₆	8.8	367.0	309.0	35	351.0	20	y=0.002513x+0.0003179	0.9994	0.5-200	0.15	0.5	5.99	4.73	7.68	7.55
87	licocoumarone	C ₂₀ H ₂₀ O ₅	8.8	339.0	324.0	20	281.0	30	y=0.0002247x+0.0006217	0.9993	2-2000	0.3	1	-	-	-	-
120	licoisoflavone A	C ₂₀ H ₁₈ O ₆	9.1	353.0	285.0	25	216.0	30	y=0.002366x+0.002485	0.9965	2-1000	0.5	2	3.28	1.43	5.20	4.04
98	licoisoflavanone	C ₂₀ H ₁₈ O ₆	9.3	353.0	125.0	25	227.0	25	y=0.006771x+0.001224	0.9991	0.5-1000	0.1	0.5	4.15	3.87	5.41	7.16
68	licochalcone A	C ₂₁ H ₂₂ O ₄	9.6	337.0	187.0	35	120.0	30	y=0.0007630x+0.001322	0.9983	2-800	0.5	2	4.15	2.76	7.84	10.91
117	licoricone	C ₂₂ H ₂₂ O ₆	9.7	381.0	323.0	30	351.0	25	y=0.003144x+0.0003151	0.9976	0.5-500	0.15	0.5	4.50	2.25	7.66	2.29
50	isolicoflavonol	C ₂₀ H ₁₈ O ₆	9.7	353.0	297.0	35	309.0	35	y=0.0003227x+0.0008821	0.9971	5-1000	1	3	4.61	2.73	5.27	6.91
81	glycyrol	C ₂₁ H ₁₈ O ₆	10.4	365.0	307.0	30	295.0	35	y = 0.004732 x+0.00039954	0.9976	1-500	0.2	1	5.34	3.00	5.91	6.86
129	wighteone	C ₂₀ H ₁₈ O ₅	10.6	337.0	282.0	25	293.0	35	y=0.002721x+0.001508	0.9989	1-800	0.3	1	5.51	3.10	7.45	9.21
51	5,7,4'-trihydroxy-3'(3-methylbut-2-enyl)-3-methoxy flavone	C ₂₁ H ₂₀ O ₆	10.8	367.0	323.0	35	352.0	20	y=0.001243x+0.0001098	0.9994	1-200	0.1	0.5	4.11	4.69	10.18	9.91
103	glabridin	C ₂₀ H ₂₀ O ₄	11.0	323.0	201.0	20	135.0	15	y=0.0008779x+0.0003514	0.9985	1-1000	0.3	1	-	-	-	-
47	licoflavonol	C ₂₀ H ₁₈ O ₆	11.4	353.0	241.0	50	309.0	35	y=0.0004336x-0.0001878	0.9991	5-800	1.2	5	6.03	6.30	7.31	8.82
93	1-methoxyphaseollin	C ₂₁ H ₂₀ O ₅	11.9	351.0	336.0	20	293.0	35	y=0.001248x+0.0001623	0.9992	1-500	0.3	1	5.28	5.07	9.66	7.20
99	glycyuralin A	C ₂₁ H ₂₄ O ₅	11.9	441.0	221.0	40	353.0	40	y=0.0005360x+0.000005870	0.9991	1-500	0.3	1	4.24	3.08	8.88	5.68

	52	topazolin	C ₂₁ H ₂₀ O ₆	12.3	367.0	352.0	15	309.0	35	y=0.004909x+0.001426	0.9988	1-1000	0.3	1	3.63	1.48	8.45	2.53
	84	glycyrin	C ₂₂ H ₂₂ O ₆	12.5	381.0	351.0	25	366.0	20	y=0.0009151x+0.00005877	0.9996	1-1000	0.3	1	5.00	3.76	6.03	6.11
	80	isoglycyrol	C ₂₁ H ₁₈ O ₆	12.9	365.0	350.0	20	294.0	40	y=0.007068x+0.001521	0.9973	0.5-500	0.15	0.5	4.46	2.97	4.46	7.93
	124	isoderrone	C ₂₀ H ₁₆ O ₅	13.4	335.0	305.0	35	319.0	35	y=0.002153x+0.0004971	0.9990	1-500	0.3	1	4.36	5.95	6.01	7.48
	126	7-O-Methyluteone	C ₂₁ H ₂₀ O ₆	13.8	367.0	233.0	20	309.0	30	y=0.0009160x-0.00004286	0.9982	2-800	0.05	2	5.60	4.67	4.96	6.28
	102	glyasperin D	C ₂₂ H ₂₆ O ₅	13.9	369.0	135.0	25	339.0	30	y=0.0006855x+0.0002863	0.9985	2-1000	0.2	1	6.13	5.56	6.95	3.49
	101	licoricidin	C ₂₆ H ₃₂ O ₅	14.5	423.0	203.0	30	233.0	25	y=0.0003194x+0.0004239	0.9983	5-2000	0.5	2	5.56	1.89	5.04	6.88
	88	gancaonin I	C ₂₁ H ₂₂ O ₅	14.9	353.0	338.0	20	323.0	30	y=0.001616x+0.0006003	0.9990	0.5-500	0.15	0.5	3.40	4.39	4.82	3.50
	125	isoangustone A	C ₂₅ H ₂₆ O ₆	15.2	421.0	309.0	40	352.0	30	y = 0.0006655 x + 0.0002491	0.9967	1-500	0.2	1	6.96	4.36	4.66	8.57
	116	angustone A	C ₂₅ H ₂₆ O ₆	16.2	421.0	219.0	30	352.0	25	y=0.001321x+0.001126	0.9994	0.5-200	0.1	0.3	6.23	8.07	7.50	10.16
	41	glycyrrhetic acid	C ₃₀ H ₄₆ O ₄	17.0	469.0	425.0	45	355.0	55	y=0.00009191x+0.0002731	0.9983	1-2000	0.3	1	8.06	3.81	4.03	7.62
	IS	chrysophanol	C ₁₅ H ₁₀ O ₄	14.7	253.0	225.0	30	182.0	50									
2-c	74	4,2',3'-trihydroxy-4'-methoxy-chalcone	C ₁₆ H ₁₄ O ₅	2.5	285.0	270.1	15	150.1	25	y=0.03679x-0.1997	0.9982	5-1000	2	5	1.44	2.75	8.35	5.12
	61	naringin	C ₁₅ H ₁₂ O ₅	3.7	271.0	151.0	20	119.1	25	y=0.03360x-0.03347	0.9988	1-500	0.1	0.5	3.45	6.95	5.32	12.43
	142	4'-methoxy-7,2'-dihydroxyisoflavone	C ₁₆ H ₁₂ O ₅	4.2	283.0	268.1	20	224.1	25	y=0.1793x+0.4167	0.9985	1-250	0.2	1	8.76	3.53	8.34	7.23
	104	7,4'-dihydroxy-3'-methoxyisoflavan	C ₁₆ H ₁₆ O ₄	5.1	271.0	135.0	20	149.1	20	y=0.004073x+0.03625	0.9996	2.5-5000	1	2.5	7.92	8.81	9.23	6.77
	59	abyssinone II	C ₂₀ H ₂₀ O ₄	7.7	323.0	187.1	25	135.0	20	y=0.02728x-0.08232	0.9995	1-1000	0.1	0.5	10.34	8.02	11.02	6.43
	107	glabrene	C ₂₀ H ₁₈ O ₄	8.5	321.0	306.1	25	175.1	25	y=0.0003793x+0.002524	0.9954	10--250	3	10	5.83	10.95	12.64	9.66
	85	kanzonol W	C ₂₀ H ₁₆ O ₅	8.5	335.0	291.0	25	307.0	30	y=0.002307x-0.002199	0.9996	2.5-500	1	2.5	1.38	6.34	8.20	5.97
	147	isoglabrone	C ₂₀ H ₁₆ O ₅	8.7	335.0	201.1	25	157.1	35	y=0.0003013x-0.005585	0.9953	1-250	0.2	1	6.23	7.77	3.93	7.23
	89	2'-O-demethylbidwillol B	C ₁₉ H ₁₈ O ₄	9.1	309.0	254.1	25	265.1	30	y=0.001649x-0.01568	0.9965	5-250	2	5	4.29	8.32	11.53	9.28
	90	kanzonol U	C ₁₉ H ₁₆ O ₄	9.6	307.0	291.1	30	277.0	35	y=0.001514x-0.0007478	0.9985	2.5-250	1	2.5	9.34	11.34	6.09	5.34
	151	erybacin B	C ₁₉ H ₁₈ O ₅	9.7	325.0	215.1	15	109.1	20	y=0.04228x+0.2967	0.9989	5-1000	0.1	0.5	3.24	2.45	5.93	11.02
	60	(2S)-abyssinone I	C ₂₀ H ₁₈ O ₄	10.3	321.0	135.0	20	185.1	30	y=0.01855x-0.03138	0.9996	1-500	0.3	1	6.34	7.53	5.86	3.40

	148	parvisoflavones-A	C ₂₀ H ₁₆ O ₆	10.6	351.0	217.1	25	173.1	30	y=0.004572x+0.008962	0.9982	1-1000	0.3	1	10.38	10.32	8.33	3.10
	145	glabrone	C ₂₀ H ₁₆ O ₅	11.3	335.0	291.1	25	135.0	35	y=0.03277x+0.1465	0.9972	5-500	0.05	0.5	4.98	11.37	5.56	4.32
	56	3-OH glabrol	C ₂₅ H ₂₈ O ₅	11.6	407.1	379.2	20	177.1	30	y=0.07248x-0.05363	0.9994	1-250	0.05	0.1	6.23	11.40	8.45	12.08
	91	glyinflanin	C ₁₉ H ₁₆ O ₄	11.8	307.0	291.0	30	277.1	35	y=0.0009681x-0.03054	0.9961	25-1000	3	10	7.23	5.24	8.32	9.21
	105	3,4-didehydroglabridin	C ₂₀ H ₁₈ O ₄	11.8	321.0	306.0	25	277.0	25	y=0.0002399x-0.0003692	0.9993	25-500	2	10	-	-	-	-
	78	isobavachalcone	C ₂₀ H ₂₀ O ₄	13.2	323.0	203.1	15	119.1	30	y=0.07227x+0.003251	0.9997	0.1-100	0.02	0.1	12.31	11.23	13.40	9.86
	62	glabrol	C ₂₅ H ₂₈ O ₄	13.9	391.0	187.1	30	203.1	20	y=0.04108x-0.3913	0.9972	10-1000	0.2	1	8.39	3.29	5.97	9.87
		3,3'-bis(γ,γ-dimethylallyl)-4,2',4'-																
	150	trihydroxyl-α-tridroxy	C ₂₅ H ₃₀ O ₅	14.4	409.1	235.2	20	177.1	30	y=0.8282x+0.1071	0.999	1-1000	0.02	0.1	7.73	8.29	5.57	8.11
		dihydrochalcone																
	94	licoagrocarpin	C ₂₁ H ₂₂ O ₄	15	337.0	322.1	20	279.1	30	y=0.001152x-0.001596	0.9969	2.5-500	1	2.5	2.43	8.02	7.77	13.65
	55	kanzonol Z	C ₂₅ H ₂₆ O ₅	15.4	405.2	377.2	20	175.1	30	y=0.002646x-0.0002388	0.9993	1-500	0.2	0.5	3.41	2.77	4.06	11.24
	109	4'-O-methylglabridin	C ₂₁ H ₂₂ O ₄	15.7	337.0	201.1	20	149.1	20	y=0.003108x+0.01675	0.9974	5-1000	2	5	3.78	5.05	7.21	10.80
	106	8-prenyl-phaseollinisoflavan	C ₂₅ H ₂₈ O ₄	15.7	391.0	203.1	20	201.1	30	y=0.004711x-0.004864	0.9973	0.5-100	0.2	0.5	11.95	9.55	15.23	11.23
	144	gancaonin H	C ₂₅ H ₂₄ O ₆	15.7	419.0	364.2	35	389.1	40	y=0.001527x-0.002185	0.9996	5-500	0.5	2	9.24	9.23	9.81	6.40
	57	euchrenone a ₅	C ₂₅ H ₂₆ O ₄	16.4	389.0	203.1	25	185.1	35	y=0.004165x+0.005180	0.9987	0.5-500	0.2	1	1.92	3.16	9.02	5.50
	46	5,3',4'-trihydroxy-8,6'-di-(3-meth	C ₂₅ H ₂₆ O ₅	16.7	405.1	295.0	35	350.1	30	y=0.01300x+0.007815	0.9998	1-1000	0.05	0.2	6.37	10.52	16.78	13.00
		yl-2-butenyl)-flavone																
	111	hispaglabridin A	C ₂₅ H ₂₈ O ₄	16.8	391.0	203.0	20	201.0	30	y=0.0004715x-0.003068	0.9979	50-1000	2.5	10	2.48	2.45	3.03	4.64
	58	shinflavanone	C ₂₅ H ₂₆ O ₄	16.9	389.0	187.1	30	132.1	40	y=0.004997x-0.01355	0.9997	5-500	0.2	1	5.30	4.47	1.43	11.65
	77	Kanzonol C	C ₂₅ H ₂₈ O ₄	17.7	391.0	187.0	30	203.1	20	y=0.05774x+0.01154	0.9982	1-500	0.05	0.2	7.83	9.27	12.53	13.81
	108	hispaglabridin B	C ₂₅ H ₂₆ O ₄	18.6	389.0	201.1	25	175.1	25	y=0.004603x+0.001721	0.9981	0.5-250	0.1	0.3	5.87	3.75	6.26	10.23
	IS	chrysophanol	C ₁₅ H ₁₀ O ₄	14.7	253.0	225.0	30	182.0	50									
2-d	146	7,3',4'-Trihydroxyisoflavone	C ₁₅ H ₁₀ O ₅	2.0	269.0	225.0	22	135.0	25	y=12.76x+4.854	0.9970	5-250	2	5	16.39	10.44	13.03	12.88
	76	3,4,3',4'-Tetrahydroxychalcone	C ₁₅ H ₁₂ O ₅	3.0	271.0	135.0	20	253.0	18	y=66.13x-84.23	0.9996	5-1000	1	2.5	11.65	9.02	6.39	17.67
	72	licoagrochalcone C	C ₂₁ H ₂₂ O ₅	6.7	353.1	150.0	30	338.0	20	y=93.19x-37.82	0.9990	5-1250	1	2.5	6.60	5.79	5.90	4.39
	70	5-(1,1-dimethylallyl)-3,4,4'-trihy	C ₂₁ H ₂₂ O ₅	8.0	353.1	218.1	28	338.0	20	y=48.38x+17.62	0.9992	10-1250	1.5	5	13.79	5.77	12.42	8.54

		droxy-2-methoxychalcone																
	137	eurycarpin A	C ₂₀ H ₁₈ O ₅	7.9	337.1	268.0	24	135.0	38	y=85.36x-51.14	0.9973	2.5-250	1	2.5	4.45	9.52	9.97	18.65
	143	glycyrrhisoflavone	C ₂₀ H ₁₈ O ₆	8.4	353.1	297.2	30	283.9	30	y=3.33x+11.25	0.9956	50-2500	10	25	-	-	-	-
	71	licochalcone E	C ₂₁ H ₂₂ O ₄	8.8	337.2	187.0	40	305.1	22	y=29.60x-114.8	0.9979	10-1000	1.5	5	13.64	8.79	7.16	3.90
	69	licochalcone C	C ₂₁ H ₂₂ O ₄	9.3	337.1	279.0	28	267.0	28	y=85.36x-51.14	0.9977	5-1250	1	2.5	4.78	13.46	14.42	14.31
	141	7,8-dihydroxy-4'-methoxy-6-pre nylisoflavanone	C ₂₁ H ₂₀ O ₅	9.4	351.0	336.0	22	281.0	30	y=40.96x-64.78	0.9983	5-1250	1	2.5	10.40	9.37	3.43	13.93
	97	glyasperin F	C ₂₀ H ₁₈ O ₆	9.3	353.1	125.0	20	227.7	46	y=147.5x-19.86	0.9993	10-2000	1	5	9.53	3.99	14.56	16.89
	75	corylifol B	C ₂₀ H ₂₀ O ₅	10.3	339.0	135.0	30	203.1	18	y=105.5x+49.54	0.9971	5-500	2	5	12.56	9.65	9.88	10.12
		1-(2,4-dihydroxy-phenyl)-3-[4-hydr																
	73	oxy-3-(3-methyl-but-2-enyl)-phenyl]- propenone	C ₂₀ H ₂₀ O ₄	11.6	323.2	187.1	26	135.0	22	y=85.27x-69.02	0.9966	5-500	1	2.5	9.73	5.27	11.53	16.88
	95	shinpterocarpin	C ₂₀ H ₁₈ O ₄	12.6	321.1	199.0	22	121.0	20	y=0.3353x+2.067	0.9921	25-500	10	25	-	-	-	-
	45	licoflavone B	C ₂₅ H ₂₆ O ₄	13.6	389.2	334.0	28	278.2	44	y=33.86x+420.3	0.9972	25-2500	2.5	10				
	110	3'-hydroxy-4'-O-methylglabridin	C ₂₁ H ₂₂ O ₅	14.4	353.1	201.1	25	165.1	20	y=55.83x-65.74	0.9981	5-500	1	2.5	-	-	-	-
	139	glyurallin B	C ₂₀ H ₁₈ O ₆	15.7	421.2	365.5	32	309.1	38	y=10.92x+18.15	0.9955	25-2500	2.5	10	-	-	-	-
	96	dehydroglyceollin I	C ₂₀ H ₁₆ O ₄	15.8	319.1	291.0	22	275.2	30	y=1.599x+0.8210	0.9909	25-500	10	25	-	-	-	-
	63	paratocarpin L	C ₂₅ H ₂₈ O ₅	16.8	407.2	187.1	32	219.0	26	y=58.79x+35.32	0.9980	5-500	1	2.5	2.64	6.80	4.18	13.03
	140	6,8-diprenylgenistein	C ₂₅ H ₂₆ O ₅	17.2	405.2	307.1	34	350.0	26	y=22.66x+81.00	0.9951	5-1000	1.5	5	15.49	10.46	14.54	7.93
	138	angustone B	C ₂₅ H ₂₄ O ₆	18.7	419.1	199.1	40	219.1	33	y=21.71x+309.8	0.9988	25-1000	2.5	10	4.90	3.59	2.92	8.07
	IS	chrysophanol	C ₁₅ H ₁₀ O ₄	14.7	253.0	225.0	30	182.0	50									
3	11	schaftoside	C ₂₆ H ₂₈ O ₁₄	4.3	563.0	353.0	40	383.0	40	y=1.964x+0.03226	0.9991	3-3000	1	3	12.07	11.34	9.31	9.37
	17	7,4'-dihydroxyflavone 7-O-glucoside	C ₂₁ H ₂₀ O ₄	4.5	415.0	253.0	35	135.0	45	y=0.0001466x+0.001163	0.9994	3-500	1	3	5.54	6.62	12.56	7.32
	12	isoschaftoside	C ₂₆ H ₂₈ O ₁₄	4.5	563.0	353.0	40	383.0	40	y=0.001854x-0.007867	0.9991	5-2000	1.5	5	10.78	12.65	13.56	12.16
	16	sophoraflavone B	C ₂₁ H ₂₀ O ₄	4.6	415.0	253.0	15	135.0	50	y=0.2150x+0.004884	0.9965	3-1000	1	3	4.34	8.32	11.05	9.91

13	isoviolanthin apigenin	C ₂₇ H ₃₀ O ₁₄	4.8	577.0	353.0	40	383.0	50	y=1.706x+0.02311	0.9990	30-3000	10	30	11.42	9.22	11.40	6.35
14	6-C- α -L-rha-8-C-[6''-(3-hydroxy-3-methylglutaryl)- β -D-glucopyranoside]	C ₃₃ H ₃₈ O ₁₈	5.3	721.0	457.0	35	383.0	45	y=1.297x+0.003259	0.9996	5-2000	2	5	6.35	13.95	8.21	8.21
15	neoisoliquiritin	C ₂₁ H ₂₂ O ₄	7.4	417.0	255.0	20	119.0	55	y=1.330x+0.1098	0.9949	30-3000	10	30	12.70	11.39	10.34	14.58
112	7-methoxy-2',4'-dihydroxy isoflavone	C ₁₆ H ₁₂ O ₅	11.9	283.0	133.0	35	268.0	20	y=0.00003844x-0.004634	0.9975	200-3000	20	50	2.74	5.34	9.23	5.80
131	pratensein	C ₁₆ H ₁₂ O ₆	13.0	299.0	284.0	25	227.0	35	y=46.83x+0.2491	0.9983	5-300	2	5	9.63	6.93	8.61	7.54
34	uralsaponin M	C ₄₄ H ₆₄ O ₁₈	14.9	879.3	351.0	45	193.0	50	y=1.3784x-0.0006304	0.9981	3-3000	1	3	5.40	8.34	5.01	12.11
67	homobutein	C ₁₆ H ₁₄ O ₅	15.5	285.0	272.0	15	134.0	30	y=0.01515x+0.0005995	0.9978	5-2000	2	5	-	-	-	-
35	uralsaponin O	C ₄₂ H ₆₀ O ₁₆	16.8	819.0	351.0	45	193.0	50	y=0.7958x-0.002275	0.9968	5-3000	1.5	5	4.76	12.34	4.23	3.43
86	glycyuralin E	C ₂₁ H ₂₂ O ₆	17.2	369.0	339.0	30	268.0	40	y=0.3610x-0.001643	0.9990	3-300	1	3	5.65	6.35	2.58	2.53
113	glycyrrhiza-isoflavone C	C ₂₁ H ₂₀ O ₆	17.8	367.0	296.0	30	135.0	40	y=1.146x+0.006887	0.9907	3-500	1	3	6.02	9.75	10.34	14.32
40	uralsaponin N	C ₄₂ H ₆₂ O ₁₇	18.0	837.0	351.0	45	193.0	50	y=0.8163x+0.004473	0.9989	3-3000	1	3	3.04	6.32	12.34	5.65
44	genkwanin	C ₁₆ H ₁₂ O ₅	19.5	283.0	268.2	20	117.0	55	y=42.40x-0.09775	0.9994	5-1000	1.5	5	6.61	10.44	5.02	9.40
134	abiochanin A	C ₁₆ H ₁₂ O ₅	20.0	283.0	268.2	20	239.0	35	y=66.78x+0.4760	0.9974	3-1000	1	3	6.69	6.92	7.23	11.52
149	glicophenone	C ₂₀ H ₂₂ O ₆	20.9	357.0	247.0	10	109.0	20	y=2.696x+0.05014	0.9951	3-1000	1	3	10.95	6.05	9.23	12.62
114	luteone	C ₂₀ H ₁₈ O ₆	21.8	353.0	133.0	40	219.0	30	y=0.6022x+0.02416	0.9960	5-2000	1	5	-	-	-	-
128	6-C-prenylorobol 3 β -O-[β -D-glucuronopyranosyl]-	C ₂₀ H ₁₈ O ₆	21.9	353.0	298.0	35	309.0	40	y=0.4361x+0.005498	0.9954	3-1000	1	3	9.48	5.34	11.60	13.32
37	1 $\rightarrow$ 2)- β -D-glucuronopyranosyl]- olean-9,12-diene-30-oic-acid	C ₄₂ H ₆₂ O ₁₅	22.5	805.0	351.0	45	193.0	50	y=0.6643x+0.002293	0.9986	30-3000	10	30	9.83	10.34	6.28	7.26
38	uralsaponin V	C ₄₂ H ₆₂ O ₁₅	22.8	805.0	351.0	45	193.0	50	y=0.0002391x-0.006403	0.9982	50-3000	15	50	9.83	7.73	9.34	9.22
39	uralsaponin W	C ₄₂ H ₆₂ O ₁₅	23.1	805.0	351.0	45	193.0	50	y=0.0004526x+0.003675	0.9995	50-3000	15	50	12.21	11.02	10.07	15.70
127	lupiwighteone	C ₂₀ H ₁₈ O ₅	24.6	337.0	282.0	25	253.0	40	y=5.301x+0.03136	0.9997	3-1000	1	3	7.68	4.02	8.76	10.29
100	dehydroglyasperin C	C ₂₁ H ₂₂ O ₅	25.8	353.0	283.0	25	295.0	20	y=0.1659x+0.001159	0.9958	30-1000	10	30	16.84	10.23	9.73	11.43

36	3- <i>O</i> -β-D-glucuronopyranosyl-glycyrrhetic acid	C ₃₆ H ₅₄ O ₁₀	25.9	645.0	351.0	45	193.0	50	y=0.0004382x+0.005777	0.9998	5-1000	1	5	5.09	8.23	5.92	10.27
118	licoisoflavone B	C ₂₀ H ₁₆ O ₆	26.7	351.0	283.0	25	199.0	40	y=0.003283x+0.09443	0.9966	30-1000	10	30	11.76	9.30	15.92	9.72
130	2'-hydroxyisolupalbigenin	C ₂₅ H ₂₆ O ₆	30.2	421.0	309.0	30	351.0	35	y=0.0001947x-0.0006155	0.9971	3-1000	1	3	6.43	5.05	9.35	6.32
115	isolupalbigenin	C ₂₅ H ₂₆ O ₅	31.4	405.0	350.2	30	295.0	30	y=0.0003500x+0.006447	0.9984	3-1000	1	3	7.45	9.98	10.97	10.89
IS	chrysophanol	C ₁₅ H ₁₀ O ₄	28.4	253.0	225.0	30	182.0	50									

Note:

1. CE, collision energy. IS, internal standard. 2. For analytes determined using Method 2-d, the cone voltage (CV) values of the 20 compounds and the internal standard (IS) were 40, 32, 46, 44, 50, 60, 50, 50, 45, 36, 40, 40, 47, 60, 46, 62, 50, 48, 64, 60, and 43 V, respectively. 3. In the regression equation, *x* is the peak area, *y* the concentration of each analyte (μg/mL), and *r* the correlation coefficient. LOD, limit of detection (S/N=3), LOQ, limit of quantification (S/N=10). Intra-, inter-day precision, repeatability, and stability are shown in RSD (%).

Table S9. Recoveries of the standard addition test of the 107 analytes in Methods 2-a, 2-b, 2-c, and 2-d.

Method	Analytes	50% spiking			100% spiking			150% spiking			Mean	RSD (%)
		Found (n=3, ng)	Spiked (ng)	Recovery (%)	Found (n=3, ng)	Spiked, ng)	Recovery (%)	Found (n=3, ng)	Spiked, ng)	Recovery (%)	Recovery (%)	
2-a	23	210.00	200.00	105.00	419.50	400.00	104.87	624.60	600.00	104.09	104.65	0.47
	24	332.60	300.00	110.87	675.90	600.00	112.65	1002.60	900.00	111.40	111.64	0.82
	25	56.70	50.00	113.41	118.00	100.00	118.01	174.20	150.00	116.13	115.85	2.00
	26	101.20	100.00	101.15	222.00	200.00	111.02	346.10	300.00	115.36	109.18	6.67
	27	50.90	50.00	101.79	97.20	100.00	97.20	154.20	150.00	102.80	100.60	2.97
	28	54.50	50.00	108.96	110.20	100.00	110.20	149.90	150.00	99.95	106.37	5.26
	29	578.00	500.00	115.61	1150.70	1000.00	115.07	1612.60	1500.00	107.51	112.73	4.02
	30	118.70	100.00	118.69	233.10	200.00	116.55	340.30	300.00	113.44	116.23	2.27
	31	205.00	200.00	102.49	433.10	400.00	108.27	634.40	600.00	105.73	105.50	2.75
	32	60.20	50.00	120.40	116.00	100.00	116.04	171.90	150.00	114.61	117.02	2.58
	33	51.70	50.00	103.49	110.70	100.00	110.75	165.80	150.00	110.56	108.27	3.82
2-b	41	20.51	20	102.56	46.47	40	116.18	68.67	60	114.45	111.06	6.68
	42	19.7	20	98.5	39.31	40	98.28	53.07	60	88.45	95.08	6.04
	43	20.16	20	100.81	38.86	40	97.14	54.64	60	91.06	96.34	5.11
	47	18.25	20	91.23	41.51	40	103.76	65.82	60	109.7	101.56	9.28
	48	16	20	80	31.51	40	78.78	47.06	60	78.43	79.07	10.41
	49	18.33	20	91.67	34.45	40	86.11	52.82	60	88.04	88.61	3.19
	50	29.49	30	98.3	58.8	60	97.47	84.66	90	94.06	96.61	2.33
	51	19.46	20	97.28	38.18	40	100.56	56.1	60	93.5	97.11	3.64
	52	18.85	20	96.25	37.79	40	94.48	57.27	60	95.45	95.39	0.93
	53	44.77	50	89.54	100.75	100	100.75	141.88	150	94.59	94.96	5.91
	54	19.35	20	98.77	41.12	40	102.79	57.89	60	96.48	99.35	3.22

64	23.09	30	115.96	57.81	60	96.35	91.03	90	101.14	104.48	9.78
65	23.86	30	79.55	57.22	60	95.36	85.97	90	95.53	90.15	10.18
66	24.99	30	95.63	51.07	60	84.66	92.2	90	102.44	94.24	9.52
68	19.12	20	95.6	37.3	40	93.25	56	60	93.33	94.06	1.42
79	20.33	20	95.2	39.3	40	98.26	57.92	60	96.53	96.66	1.59
80	20.68	20	103.38	41.3	40	103.24	65.49	60	109.15	105.26	3.2
81	27.1	30	90.34	61.02	60	101.7	93.52	90	103.91	98.65	7.38
82	45.34	50	90.69	107.79	100	115.26	159.34	150	98.09	101.35	12.44
83	19.85	20	99.24	39.66	40	99.14	54.49	60	90.82	96.4	5.01
84	50.28	50	100.56	97.97	100	97.97	142.97	150	95.32	97.95	2.67
87	15.55	20	77.74	27.35	40	68.38	50.34	60	83.9	76.67	10.2
88	18.47	20	98.33	38.03	40	95.07	64.32	60	107.2	100.2	6.26
92	33.25	30	100.9	60.31	60	106.34	102.23	90	113.59	106.94	5.95
93	19.98	20	99.9	38.58	40	96.45	54.48	60	90.8	95.72	4.8
98	20.22	20	101.1	41.82	40	104.55	65.36	60	108.94	104.86	3.75
99	33.4	30	111.33	64.32	60	107.21	92.68	90	102.98	107.17	3.9
101	48.14	50	96.28	96.15	100	96.15	149.95	150	99.97	97.47	2.23
102	49.44	50	98.88	104.96	100	104.96	144.86	150	96.58	100.14	4.32
103	18.19	20	90.93	36.54	40	91.34	55.17	60	91.96	91.41	0.57
116	17.33	20	86.66	33.75	40	84.36	53.03	60	88.38	86.47	2.33
117	42.59	50	85.18	98.11	100	98.11	131.43	150	87.62	90.3	7.61
119	18.31	20	91.57	35.62	40	89.05	56.82	60	94.71	91.78	3.09
120	31.02	30	103.41	64.05	60	106.76	96.01	90	106.68	105.62	1.81
121	18.79	20	93.94	35.68	40	89.21	51.83	60	86.39	89.85	4.25
122	21.28	20	106.4	41.35	40	103.39	62.85	60	104.75	104.85	1.44
123	19.96	20	99.78	36.57	40	91.43	58.32	60	97.21	96.14	4.45

2-c	124	20.28	20	101.38	38.48	40	96.21	58.06	60	96.77	98.12	2.89
	125	19.43	20	113.19	44.24	40	110.6	63.29	60	105.48	109.76	3.57
	126	17.95	20	89.73	36.87	40	92.17	52.1	60	86.84	89.58	2.98
	129	23.76	20	110.04	42.9	40	107.26	68.3	60	113.83	110.38	2.99
	132	19.03	20	95.13	37.45	40	93.62	62.31	60	103.85	97.53	5.66
	133	20.13	20	100.64	39.3	40	98.26	57.92	60	96.53	98.48	2.1
	135	28.34	30	94.46	55.77	60	92.95	81.63	90	90.7	92.7	2.04
	136	18.52	20	92.6	39.82	40	99.56	57.75	60	96.26	96.14	3.62
	46	130.32	150	86.88	268.19	300	89.4	376.98	450	83.77	86.68	3.25
	55	141.74	150	94.49	279.76	300	93.25	489.85	450	108.86	98.87	8.77
	56	145.82	150	97.21	283.01	300	94.34	449.25	450	99.83	97.13	2.83
	57	30.33	30	101.11	66.3	60	110.49	85.59	90	95.1	102.24	7.59
	58	35.21	30	117.36	52.85	60	88.08	82.21	90	91.34	98.93	16.22
	59	15.75	15	105.01	30.71	30	102.38	47.49	45	105.54	104.31	1.62
	60	18.06	15	120.37	31.21	30	104.02	44.6	45	99.1	107.83	10.33
	61	17.55	15	116.97	35.59	30	118.63	52.32	45	116.27	117.29	1.03
	62	33.68	30	112.26	62.96	60	104.94	106.13	90	117.92	111.71	5.83
	74	14.7	15	97.99	33.84	30	112.8	49.23	45	109.41	106.73	7.27
	77	31.59	30	107.66	58.67	60	97.78	87.78	90	97.53	100.99	5.72
	78	15.13	15	100.86	29.65	30	98.83	42.36	45	94.13	97.94	3.53
	85	15.9	15	105.99	32.56	30	108.52	46.37	45	103.04	105.85	2.59
	89	16.73	15	111.52	31.38	30	104.62	45.41	45	100.9	105.68	5.1
	90	14.59	15	97.29	27.35	30	91.15	40.62	45	90.27	92.9	4.12
	91	14.93	15	99.54	29.38	30	97.92	48.66	45	108.12	101.86	5.38
	94	30.41	30	95.29	56.81	60	94.69	79.66	90	88.51	92.83	4.04
	104	131.79	150	87.86	311.02	300	103.67	509.97	450	113.33	101.62	12.65

	105	17.3	15	115.3	32.08	30	106.93	48.16	45	107.02	109.75	4.38
	106	29.3	30	97.66	58.25	60	97.09	87.55	90	97.28	97.34	0.3
	107	14.61	15	97.37	30.09	30	100.31	48.63	45	108.07	101.92	5.42
	108	30.77	30	102.55	56.38	60	93.97	85.04	90	94.49	97.01	4.96
	109	33.98	30	113.28	65.17	60	108.62	94.22	90	117.37	113.09	3.87
	111	32.21	30	112.36	67.25	60	112.09	102.02	90	113.35	112.6	0.59
	142	15.98	15	106.55	32.33	30	107.78	50.71	45	112.68	109	2.98
	144	163.68	150	110.11	265.27	300	87.41	400.49	450	89	95.5	13.27
	145	16.84	15	112.28	35.22	30	117.41	51.58	45	114.62	114.77	2.24
	147	16.07	15	107.14	31.17	30	105.73	42.86	45	97.21	103.36	5.2
	148	31.11	30	106.85	57.06	60	95.1	78.15	90	86.83	96.26	10.45
	150	176.03	150	117.35	272.47	300	90.82	423.52	450	94.12	100.76	14.35
	151	14.18	15	94.51	33.39	30	111.31	39.39	45	87.53	97.78	12.5
2-d	45	-	-	-	190.23	180	105.68	305.71	270	113.23	109.45	4.87
	63	77.2	90	85.78	147.91	180	82.17	199.79	270	74	80.65	7.49
	69	75.34	90	83.71	155.95	180	86.64	310.32	270	114.93	95.09	18.13
	70	79.38	90	88.2	150.69	180	83.72	220.95	270	81.83	84.58	3.87
	71	77.03	90	85.59	170.23	180	94.57	228.15	270	84.5	88.22	6.27
	72	25.34	30	84.47	55.1	60	91.83	99.07	90	110.08	95.46	13.81
	73	19.44	30	64.8	49.21	60	82.02	83	90	92.22	79.68	17.39
	75	25.83	30	86.1	47.51	60	79.18	69.32	90	77.02	80.77	5.87
	76	10.97	15	73.13	21.86	30	72.87	29.5	45	65.56	70.52	6.1
	95	76.88	90	85.42	160.86	180	89.37	198.27	270	73.43	82.74	10.03
	96	80.62	90	89.58	192.79	180	107.11	218.45	270	80.91	92.53	14.42
	97	72.01	90	80.01	167.39	180	92.99	247.93	270	91.83	88.28	8.14
	110	11.72	15	78.13	20.83	30	69.43	30.18	45	67.07	71.54	8.15

137	12.23	15	81.53	22.47	30	74.9	29.99	45	66.64	74.36	10.03
138	76.91	90	85.46	130.93	180	72.74	230.4	270	85.33	88.58	8.25
139	22.74	30	75.8	51.04	60	85.07	75.2	90	83.56	81.47	6.1
140	20.23	30	67.43	42.66	60	71.1	79.52	90	88.36	75.63	14.77
141	27.56	30	91.87	45.91	60	76.52	65.76	90	73.07	80.48	12.43
143	12.05	15	80.33	19.98	30	66.6	35.23	45	78.29	75.07	9.87
146	-	-	-	19.43	30	64.77	33.96	45	75.47	70.12	10.79

Supplementary information-part III										Contents of 151 secondary metabolites in 95 licorice samples (µg/g).												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
US-1	1655.77	1172.62	1180.16	5432.52	15846.59	627.41	579.81	429.59	8034.78	2592.88	607.93	38.31	725.46	230.45	274.13	234.88	40.93	2122.50	3163.10	841.53	2779.26	15454.32
US-2	1155.40	284.18	291.92	5496.73	13830.44	57.42	333.25	185.92	1375.97	1568.29	272.03	17.12	372.39	250.37	164.47	106.16	19.84	4479.55	5776.81	1678.84	4199.57	28529.10
US-3	642.43	224.49	43.09	4031.30	6894.19	48.12	314.49	83.83	784.80	533.76	151.96	10.08	228.39	164.81	263.99	30.17	4.31	5519.53	6037.92	1659.40	4268.98	33487.30
US-4	1015.52	159.05	136.93	2895.77	10388.89	29.24	147.55	108.40	1494.59	1153.33	116.60	130.72	148.15	90.90	311.75	44.50	3.26	2464.91	3359.82	657.37	2544.92	13529.47
US-5	787.05	177.13	121.33	3756.51	8854.06	8.80	203.87	122.72	1042.34	991.42	160.43	177.31	218.77	168.49	254.95	52.76	6.56	2345.56	3509.25	824.73	2962.68	15511.12
US-6	647.25	157.88	153.22	3845.25	10266.65	0.00	225.10	110.84	1088.78	1345.28	171.92	189.37	190.98	121.21	298.35	54.00	7.14	2661.18	3929.76	878.97	2937.11	16454.70
US-7	1630.00	1160.00	1160.00	5420.00	15470.00	620.00	560.00	420.00	7470.00	2310.00	243.40	17.94	297.91	223.74	273.98	105.39	20.05	4033.57	3822.64	1038.97	3298.48	22983.39
US-8	460.22	125.30	189.58	4392.30	7314.17	13.06	181.82	100.82	1328.50	1493.38	185.53	13.19	204.97	122.52	635.36	115.33	14.77	3900.27	5004.45	1566.74	3720.63	23188.83
US-9	1098.40	231.38	128.68	4921.43	10509.60	146.64	298.91	239.35	1087.53	1374.99	147.26	10.22	229.45	147.12	271.58	44.06	7.89	2737.50	3124.16	1845.61	3764.65	21051.73
US-10	1187.93	208.20	190.81	4646.17	15078.60	57.91	314.40	205.29	1124.99	1981.32	177.92	195.71	217.05	114.09	443.65	81.75	11.44	2631.50	3019.08	1660.37	3413.50	19613.15
US-11	2028.84	896.39	609.36	15660.95	24084.22	330.55	789.34	575.52	4805.32	3242.29	270.82	32.97	377.14	354.24	453.98	249.61	40.22	2956.20	3558.24	0.00	4984.23	37408.28
US-12	1481.18	754.60	238.42	12686.45	14764.15	215.84	676.24	366.58	3501.89	2014.78	438.76	45.24	504.97	393.44	532.33	119.29	26.42	2368.19	4065.41	1045.95	3261.49	16571.08
US-13	2123.02	775.16	289.64	11828.58	21523.16	213.02	820.18	589.39	3274.50	3274.77	314.53	34.31	593.06	280.20	770.56	150.04	33.50	2798.95	3812.98	1191.38	3624.73	23451.13
US-14	1673.45	593.36	136.81	6951.93	7400.39	119.81	615.19	456.05	1856.75	1235.77	180.50	16.79	363.96	168.72	381.71	81.05	23.98	5493.90	4710.44	2207.35	5444.93	44536.13
US-15	1851.63	457.51	268.09	6426.12	14122.08	110.86	762.13	483.49	1799.96	2384.25	294.52	24.90	243.05	81.47	379.81	103.56	22.99	4392.99	3307.37	1150.60	4364.78	34403.31
US-16	2143.45	432.38	325.84	8257.30	22008.44	132.37	756.10	553.79	2340.34	3732.11	226.79	17.73	237.09	197.69	450.74	118.78	25.83	5205.53	3936.60	2082.57	5387.62	44137.94
US-17	2336.31	459.60	312.49	8592.29	25024.06	121.60	707.33	595.63	2485.63	4182.64	233.68	19.88	318.49	209.98	498.17	119.09	35.70	4065.80	3342.23	1173.38	3737.45	23478.58
US-18	566.79	269.37	219.20	7304.05	7400.03	131.07	589.38	132.79	2376.03	1207.76	137.59	13.51	329.81	246.33	180.73	98.40	16.63	4441.80	4493.06	1640.63	4522.35	27952.35
US-19	5430.50	721.79	14.43	6309.37	28062.71	147.94	1662.03	1723.14	2136.81	4693.61	713.17	57.82	492.73	323.18	2009.34	41.38	19.69	4483.56	6830.73	1925.67	5207.18	34598.65
US-20	888.38	246.56	232.64	12820.06	21836.70	86.26	557.30	193.91	3876.58	2937.24	597.07	49.82	425.02	260.61	1802.56	30.81	16.08	5236.79	6411.68	2101.49	6387.25	41347.82
US-21	538.67	441.22	54.73	13530.55	10255.18	943.35	1619.27	121.80	5109.27	1462.55	885.16	95.69	1039.52	310.38	1230.87	50.05	22.74	5229.69	614.95	0.00	17040.71	81586.02
US-22	415.18	393.47	21.43	12119.71	8547.13	1043.20	1586.07	72.53	4499.32	1429.07	787.67	74.10	981.57	256.96	1048.05	36.28	15.07	4585.71	3881.53	1914.77	7433.52	52154.64
US-23	534.89	458.53	34.25	13261.74	7669.84	1117.30	1293.34	121.26	4339.51	997.52	913.59	99.45	1053.78	309.46	800.13	41.08	15.79	4004.70	4122.04	935.34	2971.27	21511.75
US-25	471.05	400.31	165.63	8939.77	4867.37	181.21	329.93	122.34	3016.67	857.04	232.43	26.96	317.55	194.09	201.29	68.82	12.86	2150.15	3733.30	1155.01	4187.81	20625.38
US-26	1340.59	660.94	253.19	10886.67	14394.88	0.00	153.11	178.09	693.05	1373.70	436.53	51.00	401.76	242.82	587.74	242.38	51.99	2799.91	1529.46	1727.82	3360.18	21839.29
US-27	1363.59	189.76	215.38	3410.07	13968.65	13.82	71.20	170.30	776.46	1487.18	196.66	215.58	165.49	92.97	246.85	92.09	8.11	2366.67	4039.12	838.86	3613.10	20056.79
US-28	506.85	167.93	137.30	5091.30	7401.12	29.24	147.55	108.40	1494.59	1153.33	136.43	10.38	185.04	126.76	246.85	79.58	9.50	5349.13	4981.76	3752.11	6016.25	57113.81
US-29	815.60	182.32	150.01	3982.39	11607.99	0.00	122.29	87.65	856.51	1202.10	216.99	237.13	222.77	120.78	332.88	89.42	10.93	3383.86	4858.73	1350.09	4549.61	30652.26
US-30	743.87	105.61	211.35	2729.92	15601.84	4.07	126.92	75.67	541.07	1672.66	172.02	189.48	156.36	87.55	309.32	89.11	12.41	3504.22	5663.27	0.00	9366.96	74059.48
US-31	1492.87	278.05	220.06	4623.92	16749.79	63.16	81.30	190.29	997.46	1530.83	171.12	188.43	193.71	174.97	237.28	91.45	11.81	3339.97	1108.59	0.00	8323.56	64563.64
US-32	613.14	171.31	209.46	3169.51	12014.11	52.58	1779.45	37.18	375.97	766.17	153.58	169.93	155.08	97.34	125.23	65.24	8.29	2515.86	2532.98	921.67	3050.78	18478.21
US-33	664.82	159.27	159.05	5117.18	9732.24	9.08	283.85	187.38	1512.91	1846.64	196.14	15.65	139.56	118.15	436.12	118.76	24.81	4295.36	4648.84	1782.93	3819.51	27315.15
US-34	626.17	173.61	179.54	5239.16	10242.32	5.63	240.28	171.69	1502.61	1816.05	148.74	12.73	149.61	97.21	285.61	102.64	18.50	2548.18	4156.90	621.32	3521.46	17818.28
US-35	1321.09	231.01	197.23	5438.70	19792.90	63.89	204.25	185.74	1104.60	2200.33	183.48	201.62	253.52	172.66	403.57	80.76	10.52	3383.86	4858.73	1350.09	4549.61	30652.26
US-36	1173.20	380.93	207.80	7722.66	16857.39	110.44	305.93	270.53	2057.08	1950.89	183.75	14.10	233.66	147.96	281.15	132.27	19.84	4295.36	4648.84	1782.93	3819.51	27315.15
US-37	948.68	458.61	168.57	5858.23	11103.56	216.50	1193.54	218.90	1496.91	1573.17	366.81	41.52	807.85	112.40	801.91	64.83	18.91	4985.36	1808.60	641.68	5068.55	36548.76
US-39	377.19	689.06	1758.10	30187.87	5417.80	797.34	2527.39	241.20	11963.04	883.85	775.42	62.78	372.07	51.56	895.72	35.24	14.51	2402.60	3107.36	0.00	3079.91	53746.04
UC-1	603.61	223.97	142.48	2092.77	2471.13	76.06	966.72	147.22	433.23	604.55	83.45	8.27	125.22	149.88	95.15	49.21	9.64	1673.22	5439.98	862.40	1886.09	9600.40
UC-2	1196.47	1089.23	404.02	9399.25	3885.17	341.52	823.39	287.66	2683.72	684.08	244.03	25.21	14.39	4.92	50.15	83.73	8.46	2142.95	8523.71	1582.28	3127.31	18007.81
UC-3	943.13	405.32	373.77	12648.15	11043.90	183.37	853.48	347.40	4032.03	2077.16	149.90	15.67	124.74	71.42	202.61	127.84	17.94	4476.97	7646.91	2968.86	6579.67	45079.96
UC-4	1656.36	134.31	532.33	3024.23	12066.10	102.24	2166.30	673.46	872.86	2486.47	268.43	22.23	9.40	2.32	244.61	147.80	34.63	8818.07	14398.81	2852.22	3771.95	46721.28
UC-5	1190.06	256.71	400.87	4152.46	7757.52	175.17	1344.91	453.39	1108.74	1338.43	162.68	18.70	5.87	0.00	97.25	84.26	18.67	6453.86	11383.04	1306.78	2539.54	27328.13
UC-6	966.80	894.30	264.67	12925.89	7557.81	642.62	1274.89	242.85	4489.18	1214.18	433.46	42.86	370.58	308.15	157.59	102.43	16.91	4339.66	9168.51	2070.98	8935.91	30114.56
UC-7	1443.89	361.44	464.85	12238.68	25458.84	378.72	1357.86	501.50	4358.70	5474.52	673.84	52.42	896.29	172.67	542.69	145.09	31.12	13184.04	15392.50	5263.24	7884.98	100837.97
UC-8	2005.31	451.77	476.29	13391.02	31764.63	732.50	1697.76	637.41	4586.81	6080.18	639.77	52.11	1054.00	327.54	518.10	168.96	39.53	16413.87	16845.72	4887.41	8513.14	108254.29
UC-9	985.26	20.63	2357.89	14480.24	16601.70	635.23	852.55	332.98	6014.99	3945.20	1873.78	136.04	71.16	11.62	362.11	188.47						

	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
US-1	837.05	597.14	361.03	776.08	1.98	999.44	1611.57	675.74	3450.73	169.46	852.23	321.17	337.36	36.26	129.18	1475.45	100.87	406.17	82.51	1.53	37.39	8.10
US-2	1244.18	1221.07	330.13	517.43	1.98	177.47	2996.41	705.35	1224.18	175.09	440.50	226.61	134.29	47.56	55.03	348.60	180.84	367.01	83.10	0.86	28.53	20.01
US-3	451.79	313.91	155.71	179.79	37.78	64.88	627.20	4090.36	2252.57	150.10	263.13	60.33	27.63	12.97	49.31	255.06	37.48	362.02	13.98	0.41	10.25	14.31
US-4	1040.72	968.59	233.31	182.27	5.42	30.25	2361.14	752.26	854.05	100.54	89.15	146.54	50.50	16.23	19.36	75.86	171.71	244.01	9.24	0.24	6.59	2.09
US-5	753.95	976.09	241.75	250.78	6.84	42.01	2196.18	151.80	910.99	49.97	212.79	158.26	48.00	13.44	19.92	142.73	114.32	263.33	10.12	0.52	13.09	2.37
US-6	959.69	1292.98	314.55	255.70	6.17	36.15	2549.15	574.80	1123.92	74.38	326.28	132.30	41.19	11.52	22.43	122.67	174.02	254.78	10.44	0.43	17.73	2.45
US-7	1101.73	1126.94	246.98	415.03	21.77	165.80	2241.80	1563.65	1658.57	179.40	295.51	214.66	115.21	54.29	54.03	418.82	63.58	377.55	162.51	0.88	45.15	1.27
US-8	1191.26	228.40	334.91	285.92	2.49	58.76	578.59	650.54	1277.75	100.77	122.89	123.39	56.00	28.68	50.17	263.87	133.41	445.28	16.06	0.89	29.68	1.36
US-9	848.80	708.61	189.31	200.50	34.61	60.19	1629.25	2001.90	1354.24	168.78	174.73	124.72	50.95	13.97	25.53	115.86	172.80	248.50	14.10	0.18	12.35	1.74
US-10	1335.96	1086.80	268.38	277.64	21.20	60.05	2741.04	1631.76	1651.79	244.13	263.59	130.39	55.97	11.38	35.33	175.44	266.46	338.26	15.77	0.30	12.27	9.07
US-11	1124.92	917.12	638.28	462.02	0.00	275.18	2199.69	1612.69	3223.95	353.23	639.46	207.61	199.00	29.43	145.67	1379.38	159.62	362.14	16.09	0.35	20.60	1.61
US-12	652.61	629.57	241.10	373.79	44.65	133.82	1467.37	10706.74	3754.74	158.84	275.54	122.70	71.92	31.02	99.88	938.70	110.30	360.63	23.25	0.43	28.68	2.17
US-13	1219.78	761.52	433.53	448.61	41.14	200.55	1985.52	14574.33	3057.95	256.65	590.17	188.46	166.30	14.30	107.94	1015.73	136.56	372.58	14.81	1.54	28.41	2.80
US-14	875.66	968.04	167.03	362.40	61.86	233.56	1581.91	2801.50	1382.64	169.13	199.81	146.11	81.13	7.97	29.15	295.09	6.91	314.77	16.21	0.47	17.93	2.09
US-15	1296.22	1230.58	265.86	300.62	12.31	120.01	2568.55	1792.81	2392.40	190.21	350.32	175.55	95.70	13.74	51.22	391.11	82.94	341.08	15.90	0.40	24.45	10.90
US-16	1693.20	1705.65	442.93	418.99	3.60	95.67	4040.01	1367.60	2276.79	309.77	649.11	270.74	127.37	21.84	77.73	531.67	249.62	372.62	48.38	0.14	26.09	1.24
US-17	2103.08	1738.06	639.72	348.64	3.96	94.84	4108.49	1799.41	2532.29	421.52	450.83	213.64	127.78	24.44	87.25	607.45	334.27	391.13	19.51	0.00	20.04	1.38
US-18	550.15	778.96	221.53	408.46	5.63	195.74	1446.34	1076.60	1855.96	88.15	12.72	187.48	86.38	52.70	66.85	613.22	53.56	289.65	113.08	0.00	38.63	2.42
US-19	1144.99	406.10	160.43	189.11	156.06	229.78	500.96	56598.09	4287.98	388.25	728.71	36.18	47.22	49.50	186.64	1528.18	67.66	1940.50	24.33	0.47	30.43	8.01
US-20	1567.70	1125.85	154.60	535.37	29.92	127.90	2637.88	24565.33	4203.04	343.56	842.27	26.49	38.66	39.82	130.19	1107.34	77.76	1355.51	19.66	0.00	26.13	7.37
US-21	623.58	209.46	71.59	236.75	170.10	59.67	489.94	46831.62	11058.43	132.28	201.77	24.27	6.64	38.82	239.98	1936.79	1016.99	803.39	75.74	0.74	17.64	2.01
US-22	566.77	239.54	34.09	245.95	151.11	64.94	508.21	45918.51	10810.73	150.77	1291.94	28.42	6.23	314.38	208.17	1584.24	823.40	858.06	474.76	0.80	41.51	2.29
US-23	475.24	153.04	26.98	195.33	160.44	44.78	406.90	41157.42	8962.89	109.73	1256.64	24.98	5.29	53.67	218.86	1640.45	857.89	860.61	112.86	0.88	18.92	1.02
US-25	527.70	571.94	228.87	408.19	32.49	182.53	1214.49	2295.53	2293.94	97.48	85.29	134.26	63.17	21.41	48.71	546.11	276.95	270.62	110.43	3.85	31.24	1.71
US-26	1249.68	1351.77	332.03	313.46	3.59	52.63	3201.60	731.71	1329.77	116.52	107.09	229.54	271.74	21.68	107.13	1071.10	163.10	381.81	32.93	0.59	46.22	2.41
US-27	119.22	1483.21	350.93	282.24	6.50	35.82	3610.13	717.12	942.08	121.84	485.60	149.82	32.30	29.56	20.01	107.99	164.52	273.14	15.65	0.86	11.69	1.44
US-28	1416.42	921.42	421.44	435.50	16.50	153.32	2267.62	809.31	1395.82	265.36	236.99	151.66	53.61	21.37	31.44	200.09	98.82	271.40	22.68	0.89	31.09	2.31
US-29	1358.55	1704.80	331.43	255.93	8.46	45.98	3311.43	817.09	1382.44	139.12	535.13	130.11	60.94	20.29	29.13	150.52	291.53	319.84	27.15	1.66	41.46	2.20
US-30	1092.82	1252.34	210.27	251.62	1.84	51.03	2473.92	603.84	1105.62	104.03	394.78	116.75	52.44	36.58	21.10	119.31	212.42	291.71	52.13	0.63	36.84	1.55
US-31	1569.28	1936.47	246.32	347.97	2.72	59.65	3740.26	626.16	1200.12	176.71	516.41	193.18	89.18	15.49	27.74	150.66	204.39	354.18	9.08	0.46	5.83	1.24
US-32	1229.00	1404.75	296.45	221.98	2.62	41.73	2756.03	590.57	1055.95	120.79	466.14	114.67	50.47	21.41	24.26	110.11	298.11	297.15	21.21	1.99	25.94	2.41
US-33	946.13	729.80	244.50	308.76	0.75	124.16	1506.69	95.61	1416.68	200.95	315.06	111.03	143.79	34.05	56.33	385.14	99.75	368.79	84.04	0.60	39.73	1.98
US-34	919.47	691.68	245.68	252.59	0.00	102.32	1436.14	443.84	1334.27	171.86	163.73	100.90	107.88	16.25	31.08	314.58	76.21	235.61	80.14	0.36	36.17	1.81
US-35	1465.34	1216.81	337.85	344.12	14.44	72.82	3362.20	1500.72	2031.10	247.83	724.16	173.75	65.50	14.09	52.37	198.23	194.06	293.91	11.22	0.18	7.40	1.64
US-36	1346.68	1136.55	340.85	450.73	8.84	156.93	2670.91	1341.27	2065.64	207.43	455.52	207.47	118.23	29.57	82.88	498.88	111.33	310.16	11.94	0.32	7.16	1.61
US-37	627.88	308.84	134.66	337.75	79.38	246.49	624.45	18700.77	2385.29	268.15	522.23	88.03	36.13	17.43	146.65	1377.21	714.09	636.74	131.51	2.57	19.58	12.72
US-39	292.54	57.59	37.87	237.46	55.85	73.19	287.20	23682.64	3387.13	72.36	740.94	12.51	3.18	10.41	106.54	698.40	107.72	160.33	20.71	7.95	50.66	139.34
UC-1	459.50	502.23	247.35	66.91	0.00	39.46	1152.89	157.21	1170.10	26.14	110.38	79.22	76.76	8.24	48.72	255.94	123.52	153.31	65.67	0.80	88.21	43.66
UC-2	525.30	789.72	162.48	136.56	0.00	191.26	1570.56	211.14	1359.05	17.78	115.03	135.20	113.54	15.63	48.23	306.59	33.54	195.50	40.98	3.36	60.39	75.78
UC-3	613.34	945.43	435.87	239.04	0.00	95.99	1291.77	567.48	1284.78	106.30	205.69	337.87	336.00	55.49	65.73	558.30	150.37	584.51	72.87	0.23	92.14	6.61
UC-4	1652.54	1060.19	342.18	244.17	0.00	72.57	5912.81	492.78	1682.59	276.74	408.65	494.60	244.82	54.17	131.36	970.90	294.11	269.65	46.97	0.20	147.12	105.96
UC-5	634.88	673.98	371.85	148.54	0.00	61.61	2385.26	334.30	1313.32	95.20	232.66	196.80	98.08	7.11	51.85	504.02	31.06	134.11	14.14	0.33	150.50	116.38
UC-6	385.08	1959.29	194.45	218.38	0.00	79.05	1520.63	389.67	778.88	131.71	53.11	201.62	145.44	12.72	13.79	123.36	88.90	473.84	59.72	0.83	123.64	79.63
UC-7	1205.45	942.41	433.56	1595.02	0.00	20.96	3351.96	801.78	1942.39	496.29	485.57	470.82	356.81	94.62	225.02	1743.56	380.88	419.09	64.98	1.10	80.30	2.01
UC-8	1099.30	1039.35	272.51	1793.27	0.00	985.63	3208.75	795.70	2081.22	503.69	538.49	377.99	261.15	86.77	313.39	1961.60	390.83	380.16	56.92	0.79	75.37	2.19
UC-9	2388.53	1594.02	1118.40	1948.30	0.00	1276.27	8472.34	1304.06	4393.74	535.54	1605.57	815.63	567.62	104.49	655.11	4642.47	637.14	540.51	221.78	0.73	261.09	3.53
UC-10	404.99	938.11	201.72	175.75	0.00	61.51	1663.47	475.17	1677.03	94.04	265.25	120.55	46.08	29.38	46.33	370.98	52.92	188.82	341.50	0.00	43.65	1.43
UC-11	547.51	1052.46	132.32	264.97	0.00	96.45	2095.53	485.14	2061.98	107.43	300.49	245.98	81.07	46.53	80.79	540.05	301.09	322.05	162.00	0.00	61.16	2.79
UC-12	258.93	124.16	172.24	259.36	58.28	108.68	384.67	39184.86	1785.73	92.95	619.42	40.92	11.11	22.44	141.21	1215.53	629.53	267.07	28.57	0.05	216.68	432.16
UC-13	281.55	13.74	17.33	99.35	164.21	60																

	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
US-1	0.00	7.89	45.85	14.80	0.00	289.18	39.97	102.27	153.81	57.46	0.00	0.00	0.00	0.00	3.65	1.53	9.40	12.00	9.88	295.94	131.21	75.54	4.08	7.49
US-2	0.00	13.60	33.54	16.54	16.57	359.55	5.94	16.98	15.10	24.60	0.00	0.00	0.00	0.00	3.87	1.14	24.78	7.17	0.00	900.78	60.92	144.36	0.00	15.99
US-3	0.00	12.02	28.66	2.99	7.29	56.67	1.18	7.30	6.48	8.88	0.00	0.00	0.00	0.00	2.10	0.84	14.41	6.36	0.00	222.15	22.36	65.78	0.00	2.08
US-4	0.00	9.01	27.70	15.11	6.88	186.39	8.80	18.74	21.20	36.23	0.00	0.00	0.00	0.00	2.77	0.91	10.97	6.44	1.83	364.85	16.33	40.80	0.00	10.70
US-5	0.00	9.82	54.07	31.34	18.00	359.77	12.34	31.54	23.18	74.98	0.00	0.00	0.00	0.00	3.68	0.81	32.28	10.09	3.63	271.46	55.33	87.29	0.00	11.66
US-6	0.00	12.48	78.98	37.78	18.37	507.77	13.36	35.49	28.14	78.23	0.00	0.78	0.00	0.00	3.92	1.29	35.65	5.15	3.48	272.03	44.20	68.98	0.00	11.80
US-7	0.00	8.19	28.06	3.51	0.00	120.91	3.54	10.42	10.14	13.83	0.00	0.40	0.00	0.00	3.59	1.36	11.89	6.97	0.00	663.25	133.20	153.36	0.00	14.12
US-8	0.00	10.99	46.83	12.97	9.69	271.73	9.71	21.07	18.52	48.08	0.00	0.57	0.00	0.00	3.06	1.04	42.91	4.80	1.50	3255.79	65.22	484.74	0.00	12.65
US-9	0.00	12.53	31.00	1.32	5.08	46.26	4.54	13.24	14.40	19.86	0.00	0.66	0.00	0.00	2.39	0.89	12.85	7.56	0.00	629.95	25.03	87.49	0.00	4.51
US-10	0.00	8.05	36.74	0.00	7.15	187.39	5.54	12.69	14.64	23.89	0.00	0.00	0.00	0.00	3.73	0.70	15.01	8.53	0.00	444.95	16.21	101.87	0.00	5.28
US-11	0.00	7.65	26.86	0.00	0.00	51.01	6.02	39.31	32.83	17.16	0.00	0.00	0.00	0.00	2.19	0.92	6.58	6.00	0.00	293.75	34.37	108.28	0.00	2.76
US-12	0.00	9.96	23.56	1.41	0.00	154.92	8.01	41.75	34.83	25.87	0.00	0.00	0.00	0.00	2.78	0.85	13.21	10.30	0.00	370.13	38.80	101.88	0.00	2.45
US-13	0.00	7.90	121.61	9.46	0.00	221.73	18.09	104.17	72.40	60.92	0.00	0.00	0.00	0.00	2.68	1.07	13.21	11.29	5.67	291.93	68.23	136.80	0.00	2.51
US-14	0.00	8.14	84.09	22.51	0.00	189.93	11.81	33.82	32.90	27.81	0.00	0.00	0.00	0.00	2.22	0.68	8.03	10.14	1.95	285.30	18.40	69.37	0.00	1.82
US-15	0.00	8.00	54.50	8.95	3.62	179.71	4.65	24.62	17.01	15.71	0.00	0.00	0.00	0.00	3.25	1.42	13.72	9.28	0.00	446.59	86.56	123.68	0.00	3.90
US-16	0.00	7.55	5.87	2.35	4.99	189.61	3.90	18.27	15.52	29.06	0.00	0.00	0.00	0.00	3.88	0.69	14.55	7.98	0.00	770.26	67.10	166.15	0.00	5.67
US-17	0.00	7.89	11.67	4.44	0.00	103.44	7.35	24.21	29.89	29.50	0.00	0.00	0.00	0.00	2.29	0.96	14.43	7.63	0.00	495.80	65.25	149.32	0.00	2.78
US-18	0.00	8.05	56.46	3.01	4.82	293.00	11.44	40.61	34.63	35.70	0.00	0.00	0.00	0.00	1.96	0.68	18.04	8.84	1.39	949.99	12.88	201.53	0.00	2.70
US-19	0.00	8.06	37.83	2.61	0.00	34.29	0.00	1.66	0.42	1.51	0.00	0.00	0.00	0.00	1.66	0.68	32.00	8.92	0.00	299.95	77.43	209.78	0.00	0.00
US-20	0.00	9.80	33.45	0.00	0.00	16.37	0.00	1.22	0.12	0.95	0.00	0.61	0.00	0.00	1.63	0.69	18.01	10.58	0.00	248.79	68.95	198.63	0.00	0.00
US-21	0.00	8.05	19.35	0.00	0.00	30.22	0.13	0.45	0.30	0.79	0.00	0.00	0.00	0.00	1.66	0.94	7.47	9.00	0.00	73.73	37.73	48.35	0.00	0.00
US-22	0.00	8.51	28.53	11.54	0.00	99.07	0.09	0.31	0.24	1.40	0.00	0.00	0.00	0.00	1.47	1.10	8.66	11.94	0.00	128.40	83.78	66.41	0.00	0.00
US-23	0.00	14.28	22.92	22.34	0.00	81.71	0.08	0.35	0.39	0.98	0.00	0.89	0.00	0.00	1.93	0.92	4.45	11.98	0.00	46.66	43.56	27.04	0.00	0.00
US-25	0.00	60.42	64.90	19.94	10.83	244.49	9.48	29.81	27.01	47.03	0.00	1.63	0.00	0.00	6.84	2.44	26.69	4.98	6.27	856.80	38.80	161.29	0.00	84.95
US-26	0.00	8.53	54.05	0.00	0.00	87.49	12.68	59.43	56.65	42.64	0.00	0.00	0.00	0.00	7.01	1.97	14.94	8.60	3.77	316.18	173.51	129.74	0.00	2.71
US-27	0.00	8.55	39.32	7.62	10.00	235.46	7.58	17.34	18.88	36.34	0.00	0.00	0.00	0.00	2.64	1.16	20.99	8.42	2.99	429.23	20.29	127.83	0.00	13.71
US-28	0.00	8.53	42.65	22.67	17.08	392.55	16.19	33.41	35.32	71.48	0.00	0.00	0.00	0.00	3.71	1.40	44.39	10.60	2.32	1304.23	79.34	234.93	0.00	14.65
US-29	0.00	24.73	62.29	15.39	11.20	424.71	14.36	29.61	29.12	62.96	0.00	1.17	0.00	0.00	5.28	1.05	25.21	9.67	6.22	433.82	190.78	143.99	0.00	15.89
US-30	0.00	8.28	15.99	0.00	0.00	117.16	6.39	11.81	17.40	33.21	0.00	0.00	0.00	0.00	3.20	1.13	25.53	6.78	3.18	1024.13	59.69	237.18	0.00	6.74
US-31	0.00	10.13	5.35	0.00	5.12	72.73	5.14	11.11	11.38	22.28	0.00	0.00	0.00	0.00	2.90	0.76	10.66	6.16	0.00	187.73	6.58	43.33	0.00	4.30
US-32	0.00	9.37	54.84	0.52	8.65	432.20	13.19	23.55	28.76	54.27	0.00	0.00	0.00	0.00	3.58	1.36	26.28	12.41	2.54	762.25	50.85	77.18	0.00	9.18
US-33	0.00	7.71	49.22	3.34	0.00	243.34	10.31	22.06	26.92	22.38	0.00	0.00	0.00	0.00	2.50	1.26	30.55	8.65	2.97	3203.41	11.76	391.69	0.00	4.76
US-34	0.00	7.77	25.02	1.19	0.00	205.67	16.92	26.22	30.97	35.41	0.00	0.00	0.00	0.00	2.17	0.91	28.23	7.52	0.00	1948.26	11.83	307.84	0.00	3.63
US-35	0.00	9.27	40.66	2.09	8.83	262.56	6.88	18.97	26.09	34.18	0.00	0.00	0.00	0.00	2.63	0.81	13.37	7.72	0.00	205.11	29.44	53.66	0.00	5.67
US-36	0.00	8.14	11.93	0.00	4.16	155.08	6.78	15.21	20.47	22.38	0.00	0.00	0.00	0.00	2.38	0.68	10.09	6.78	0.00	316.67	15.86	68.79	0.00	5.47
US-37	0.00	1.32	37.33	0.00	0.00	20.26	0.00	1.18	0.00	1.65	0.00	0.00	0.00	0.00	2.58	0.90	24.76	10.32	1.99	295.63	36.14	84.42	1.46	16.29
US-39	0.00	37.77	16.94	3.25	0.00	235.94	0.11	0.89	0.94	5.87	0.00	0.00	0.00	0.00	1.99	0.80	18.42	11.26	2.74	619.55	12.39	295.83	118.03	58.31
UC-1	0.00	26.61	19.04	1.15	0.00	102.50	45.31	92.37	85.70	46.32	0.00	0.00	0.00	0.00	3.10	0.86	30.98	8.25	8.04	1007.58	100.36	310.16	0.00	1.58
UC-2	0.00	7.77	5.52	25.27	0.00	255.36	36.49	0.13	27.28	132.35	0.00	0.00	0.00	0.00	6.76	1.78	24.18	7.61	0.00	556.47	37.10	183.91	0.00	0.00
UC-3	0.00	14.70	18.28	0.00	0.00	33.25	14.62	40.85	147.34	17.55	0.00	0.00	0.00	0.00	2.24	0.99	19.21	7.74	0.00	1315.29	80.85	373.48	0.00	0.00
UC-4	0.00	9.58	14.00	0.00	0.00	59.08	9.40	67.87	24.94	26.94	0.00	0.00	0.00	0.00	2.40	0.68	39.00	7.71	0.00	1034.47	47.00	465.93	34.11	0.00
UC-5	0.00	11.97	15.61	0.00	31.02	82.34	18.19	101.45	24.42	22.79	0.00	0.00	0.00	0.00	5.75	1.23	25.27	8.21	1.75	633.98	101.66	427.32	108.63	0.00
UC-6	0.00	17.70	175.60	3.88	7.76	238.60	0.52	4.13	1.04	3.98	0.00	0.00	0.00	0.00	7.47	1.53	16.98	8.22	12.70	668.48	165.31	414.29	549.51	0.00
UC-7	0.00	15.36	82.19	0.00	9.16	406.93	0.26	0.20	0.48	1.08	0.00	0.00	0.00	0.00	5.77	1.55	219.59	8.03	3.59	4121.84	80.22	1076.91	0.00	43.15
UC-8	0.00	10.38	97.84	0.00	0.00	400.96	0.00	0.65	0.09	0.88	0.00	0.00	0.00	0.00	3.54	1.07	179.81	7.93	0.00	6064.83	65.34	1112.61	27.46	34.14
UC-9	0.00	55.08	55.92	0.00	62.72	267.24	0.00	0.00	0.00	1.68	0.00	0.74	0.00	0.00	12.33	1.18	145.80	9.58	6.79	8190.29	184.54	1076.50	56.25	14.15
UC-10	0.00	3.64	7.79	0.00	0.00	29.99	0.12	15.67	3.71	1.95	0.00	0.00	0.00	0.00	2.17	0.81	11.53	7.80	0.00	581.18	22.06	169.91	0.00	1.89
UC-11	0.00	14.49	9.69	0.00	5.92	128.35	18.54	94.18	22.72	26.85	0.00	0.00	0.00	0.00	17.13	2.04	35.63	8.79	10.85	978.94	192.99	297.71	13.91	0.00
UC-12	0.00	4.81	50.71	0.00	1.97	26.76	0.00	2.06	0.61	11.81	0.00	0.00	0.00	0.00	1.73	0.78	57.28	7.77	0.00	717.40	100.21	830.40	409.13	0.00
UC-13	0.00	4.07	7.36	0.00	0.00	12.12	0.00	0.64	0.11	0.40	0.00	0.00	0.00	0.00	1.45	0.69	32.72	7.59	0.00	442.62	42.05	151.25	0.00	0.00
UC-14	0.00	0.23	2.22	0.00	0.00	3.07	0.00	0.16	0.00	0.62	0.0													

	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116
US-1	31.27	0.00	0.00	0.00	81.27	44.65	222.27	17.33	779.56	274.79	0.00	3.69	0.00	1.56	56.40	0.65	2.34	0.00	0.00	0.00	91.09	0.00	24.44	8.36
US-2	20.31	0.00	0.00	0.00	85.76	70.71	3.63	43.28	552.76	186.93	0.00	1.06	0.00	0.87	274.98	0.39	0.00	0.00	0.00	42.77	1.25	5.36	26.31	7.76
US-3	11.99	0.00	0.00	0.00	165.41	163.26	0.45	4.90	68.24	143.52	4.86	11.94	0.00	0.41	28.20	0.27	0.00	0.00	0.00	0.00	0.00	1.15	37.62	23.33
US-4	19.21	0.00	0.00	0.00	101.99	73.62	0.30	133.09	465.26	195.93	0.00	14.74	0.00	1.22	99.83	0.00	0.00	0.00	0.00	0.00	0.00	0.95	44.18	8.69
US-5	33.65	0.00	0.00	0.00	358.65	187.30	0.28	180.16	685.76	276.70	0.28	29.53	0.00	0.46	277.25	0.00	2.13	0.00	0.00	0.00	0.00	36.73	67.42	15.12
US-6	53.08	0.00	0.00	0.00	360.39	275.39	0.25	195.53	864.93	341.75	1.62	2.78	0.00	2.09	298.19	0.54	0.00	0.00	0.00	0.00	0.00	44.21	80.44	14.40
US-7	14.78	0.00	0.00	0.00	116.93	78.63	0.00	33.71	247.30	106.55	0.32	0.40	0.00	1.94	73.52	0.33	7.51	0.00	0.00	0.00	0.00	0.70	24.28	7.09
US-8	30.67	0.00	0.00	0.00	163.68	142.09	0.28	48.75	611.26	190.19	4.79	0.97	0.00	2.58	108.12	0.70	0.00	0.00	0.00	0.00	0.00	0.50	17.40	9.59
US-9	15.73	0.00	0.00	0.00	106.58	107.14	0.00	64.03	192.79	121.40	4.73	0.57	0.00	1.06	65.52	0.59	0.00	0.00	0.00	0.00	0.00	13.23	39.92	7.31
US-10	14.60	0.00	0.00	0.00	124.23	85.00	0.00	69.82	304.42	120.68	0.00	20.75	0.00	2.18	117.88	0.00	0.00	0.00	0.00	0.00	0.00	0.33	40.43	8.19
US-11	4.02	0.00	0.00	0.00	26.15	15.00	31.72	0.00	195.25	87.42	0.00	0.58	0.00	1.39	33.66	0.00	0.00	0.00	0.00	0.00	11.98	0.00	5.97	2.87
US-12	21.28	0.00	0.00	0.00	330.32	197.28	6.21	0.00	263.80	191.29	0.00	0.80	0.00	0.71	59.57	0.32	0.00	0.00	0.00	67.83	1.64	12.55	24.43	18.57
US-13	32.21	0.00	0.00	0.00	478.38	257.72	8.77	22.96	397.21	416.44	0.00	2.28	0.00	1.60	65.91	0.00	0.00	0.00	0.00	0.00	4.56	31.29	47.96	24.14
US-14	41.83	0.00	0.00	1.62	508.38	318.19	0.00	18.70	349.76	300.15	0.00	0.81	0.00	0.96	49.51	0.00	0.00	0.00	0.00	0.00	0.00	15.90	35.09	19.16
US-15	16.55	0.00	0.00	0.00	91.26	120.27	0.00	17.46	242.43	215.82	0.00	0.70	0.00	1.09	109.04	0.00	2.77	0.00	0.00	0.00	0.00	5.18	19.52	9.22
US-16	13.19	0.00	0.00	0.00	80.24	63.85	0.00	25.19	290.18	164.24	0.47	0.61	0.00	0.87	98.66	0.00	2.33	0.00	0.00	0.00	0.00	0.00	23.38	5.64
US-17	12.52	0.00	0.00	0.00	59.35	48.13	0.00	14.38	300.34	143.24	0.00	0.74	0.00	0.82	59.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.46	4.78
US-18	30.11	0.00	0.00	0.00	110.78	96.80	0.00	15.69	557.07	162.36	0.56	1.33	0.00	0.75	54.38	0.00	0.00	0.00	0.00	43.08	0.00	1.85	23.47	5.26
US-19	16.54	0.00	0.00	0.00	176.50	222.77	0.00	0.00	11.10	92.48	0.00	1.05	0.00	0.38	7.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.43	8.02
US-20	13.44	0.00	0.00	0.00	205.10	168.66	0.00	0.00	5.91	74.29	0.00	18.72	0.00	0.40	37.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.84	5.26
US-21	33.20	0.00	0.00	0.00	222.09	154.86	0.00	0.00	8.34	217.58	0.00	5.68	0.00	1.15	35.79	0.74	0.00	0.00	0.00	0.00	13.54	0.00	3.49	2.95
US-22	37.02	0.00	2.99	0.00	326.01	249.77	0.33	0.00	11.65	228.42	0.74	7.54	0.00	0.54	43.77	0.82	0.00	0.00	0.00	0.00	5.36	0.00	9.50	4.25
US-23	44.42	0.00	0.00	0.00	192.63	218.11	0.31	0.00	8.59	307.37	5.39	6.84	0.00	0.40	41.72	1.48	0.00	0.00	0.00	0.00	5.77	0.00	6.67	4.09
US-25	31.74	0.00	0.00	0.00	162.81	221.09	1.59	9.05	373.52	275.73	8.31	2.38	0.00	1.83	104.17	1.16	0.00	0.00	0.00	41.84	0.00	16.34	20.03	11.30
US-26	9.19	0.00	0.00	0.00	45.68	37.10	13.21	13.85	299.71	220.83	0.00	2.20	0.00	1.63	50.92	0.00	5.14	0.00	0.00	43.02	6.76	0.00	17.36	5.30
US-27	28.25	0.00	0.00	0.00	89.85	93.24	0.00	98.31	532.09	197.35	0.48	18.96	0.00	1.63	199.75	0.00	0.00	0.00	0.00	0.00	0.00	5.33	30.63	5.26
US-28	34.87	0.00	0.00	0.00	188.11	172.75	0.44	70.74	727.09	268.93	0.00	2.44	0.00	1.49	131.40	0.51	1.39	0.00	0.00	0.00	0.00	21.74	59.52	15.31
US-29	41.08	0.00	0.00	0.00	179.87	166.15	0.00	141.01	781.78	240.08	13.19	1.83	0.00	2.45	230.58	2.88	1.95	0.00	0.00	0.00	0.00	15.26	75.40	12.88
US-30	15.97	0.00	0.00	0.00	165.45	75.69	0.00	47.55	319.88	89.20	0.00	0.48	0.00	0.42	49.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.05	4.70
US-31	10.78	0.00	0.00	0.00	44.23	40.23	0.00	74.98	320.19	96.36	0.00	10.66	0.00	0.46	93.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.68	3.62
US-32	36.07	0.00	0.00	0.00	162.30	136.73	0.53	94.45	663.75	187.13	0.00	44.44	0.00	1.80	206.76	0.00	0.00	0.00	0.00	0.00	0.00	11.26	67.88	13.17
US-33	22.79	0.00	0.00	0.00	70.17	60.43	0.00	23.67	471.39	98.33	0.00	1.53	0.00	0.38	70.94	0.00	0.49	0.00	0.00	0.00	0.00	2.08	24.12	3.97
US-34	21.71	0.00	0.00	0.00	55.69	55.04	0.00	13.83	455.77	67.33	0.00	1.21	0.00	1.06	59.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.01	3.78
US-35	27.92	0.00	0.00	0.00	120.31	112.80	0.89	84.32	542.83	172.77	0.14	0.70	0.00	1.13	120.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.96	5.81
US-36	18.56	0.00	0.00	0.00	53.92	75.56	0.27	33.25	281.21	99.27	0.47	7.29	0.00	1.38	65.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.14	4.00
US-37	13.82	0.00	0.00	0.00	209.48	170.42	1.54	0.00	13.87	102.68	0.00	109.19	0.00	0.53	7.12	0.00	0.00	0.00	0.00	0.00	0.00	7.27	33.28	7.97
US-39	36.70	0.00	0.00	0.00	259.93	324.86	1.07	10.33	14.28	157.73	0.00	618.08	0.00	0.40	6.59	0.00	0.00	0.00	0.00	0.00	0.00	6.11	99.87	76.07
UC-1	2.86	0.00	0.00	0.00	7.76	6.70	0.52	15.06	60.35	444.92	0.00	520.80	0.00	0.97	7.33	0.00	0.00	0.00	0.00	45.55	47.85	3.27	59.88	8.45
UC-2	31.81	0.00	0.00	0.00	75.95	75.74	25.46	12.92	760.94	93.15	0.00	660.81	0.00	4.16	7.19	3.33	17.58	0.00	0.00	45.01	9.34	0.00	11.31	2.61
UC-3	1.25	0.00	2.53	0.00	2.07	2.30	3.88	0.00	285.08	130.23	0.00	875.14	0.00	0.36	6.52	0.00	0.00	0.00	0.00	44.95	1.01	0.00	32.34	5.14
UC-4	1.48	0.00	0.00	0.00	0.00	1.19	1.06	0.00	234.06	90.00	0.00	1169.24	0.00	0.57	6.72	0.00	0.00	0.00	0.00	71.12	4.42	0.00	13.13	4.58
UC-5	1.84	0.00	0.00	0.00	6.33	1.08	0.00	0.00	370.08	148.92	0.74	1869.40	0.00	0.87	27.64	0.00	2.11	0.00	0.00	60.57	0.00	0.00	21.91	6.49
UC-6	3.62	0.00	0.00	0.00	3.44	5.04	105.90	0.00	639.68	400.48	0.00	2384.26	0.00	1.79	7.48	0.00	6.89	0.00	0.00	148.65	50.34	2.97	24.43	6.61
UC-7	64.06	0.00	2.68	0.00	76.87	82.03	1.29	0.00	891.03	87.27	0.91	1996.06	0.00	1.76	30.46	0.88	7.80	0.00	0.00	45.03	0.00	0.00	20.71	3.68
UC-8	52.22	0.00	0.00	0.00	74.17	67.25	0.62	0.00	918.47	79.57	0.00	2169.95	0.00	0.86	19.95	0.00	1.63	0.00	0.00	55.38	0.00	0.00	14.81	2.58
UC-9	35.15	0.00	0.00	0.00	82.69	97.44	0.00	0.00	779.14	80.56	0.65	2663.02	0.00	0.94	12.14	0.00	8.92	0.00	0.00	66.94	0.00	0.00	4.00	0.13
UC-10	12.68	0.00	0.00	0.00	37.27	30.97	62.41	0.00	231.24	22.40	0.00	229.86	0.00	0.38	7.41	0.00	0.00	0.00	0.00	0.00	13.36	0.00	4.52	0.00
UC-11	54.25	0.00	2.55	0.00	82.26	79.72	56.20	11.55	583.89	236.32	0.00	1323.81	0.00	0.39	12.17	0.47	6.36	0.00	0.00	53.54	25.23	0.00	23.40	5.42
UC-12	19.66	0.00	0.00	0.00	169.55	237.92	1.20	0.00	18.77	142.60	0.00	1678.73	0.00	0.36	6.39	0.00	0.00	0.00	0.00	137.90	0.00	5.29	10.90	6.44
UC-13	6.46	0.00	0.00	0.00	37.65	21.13	0.00	0.00	3.68	85.81	0.00	1307.31	0.00	0.73	6.70	0.29	6.45	0.00	0.00	48.23	0.00	0.00	2.76	3.71
UC-14	4.15	0.00	0.00	0.00	6.95	6.07	0.36	0.00	2.17	41.97	0.00	166.71	0.00	0.37	6.43	0								

	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
US-1	165.25	45.46	50.33	56.62	22.87	67.10	7.89	21.60	298.36	35.52	56.21	11.82	16.50	14.87	23.48	5.20	41.68	4.41	14.32	1.54	0.00	0.00	810.24	140.16
US-2	89.21	112.74	54.95	68.53	31.62	68.51	3.09	20.12	94.86	21.29	44.30	16.35	21.98	26.46	2.49	14.95	72.78	9.84	18.31	9.09	0.00	0.00	226.48	55.84
US-3	17.96	356.30	16.31	153.24	32.85	49.67	1.42	31.69	82.24	20.16	27.29	0.84	16.42	57.96	3.20	0.44	49.26	6.13	30.86	1.56	0.00	28.34	113.33	22.47
US-4	64.48	102.01	42.71	93.77	27.20	55.50	2.40	17.74	113.88	19.53	34.86	216.15	19.28	45.35	19.06	12.07	13.50	2.36	23.49	0.00	0.00	1.41	202.97	36.20
US-5	75.03	246.05	82.04	156.18	40.62	94.29	4.11	36.27	196.31	50.20	68.96	25.55	51.88	53.16	34.83	25.54	23.72	13.15	42.71	0.94	0.00	12.53	446.37	108.29
US-6	98.44	313.36	97.56	187.77	41.86	134.52	5.34	46.75	232.93	53.31	92.01	28.64	47.42	47.37	33.76	26.73	29.73	16.12	49.94	1.47	0.00	0.00	479.18	118.42
US-7	31.46	194.19	22.68	46.21	18.36	47.73	1.49	20.85	69.51	13.65	29.31	5.28	12.33	27.38	2.48	4.89	92.44	3.31	15.26	5.74	0.00	7.16	127.54	29.43
US-8	63.93	172.26	68.26	123.38	38.19	82.37	3.73	30.88	150.76	34.57	36.68	1.74	35.26	35.82	10.50	19.41	87.69	1.40	34.39	2.91	0.95	0.00	274.73	58.86
US-9	36.93	126.32	24.03	50.44	12.67	48.43	1.40	21.15	70.57	13.09	39.96	12.52	13.71	37.57	17.95	6.55	31.87	7.06	20.79	1.24	0.00	6.32	95.52	25.21
US-10	62.79	127.78	43.75	74.16	28.59	49.85	2.18	22.88	82.89	16.85	34.86	132.92	16.07	36.78	12.42	9.59	40.78	2.89	21.50	2.67	0.00	6.39	149.41	40.33
US-11	61.62	5.39	24.48	21.57	22.03	10.87	2.75	3.83	60.31	9.26	15.83	2.63	8.43	9.73	2.10	4.07	30.47	0.23	5.18	3.13	0.00	0.00	118.08	24.10
US-12	64.24	432.86	41.59	115.95	21.23	69.13	3.08	36.27	167.68	34.06	45.15	8.22	27.39	56.76	3.02	15.09	53.47	5.45	41.58	7.13	0.00	53.68	374.81	103.32
US-13	113.92	254.88	80.33	185.76	34.95	82.56	6.11	36.91	305.81	45.02	71.89	6.76	47.62	48.88	21.44	17.04	44.47	4.77	12.36	11.24	0.00	6.32	921.14	183.60
US-14	78.56	327.92	58.58	70.23	11.32	194.85	5.17	49.11	217.47	47.51	35.48	7.95	32.91	51.51	2.57	11.77	31.46	2.43	35.73	2.44	0.00	33.70	436.41	97.51
US-15	58.68	169.70	38.80	67.74	15.34	65.24	2.33	23.83	131.28	21.50	28.05	5.48	17.81	27.48	2.91	9.11	59.51	4.06	18.03	5.83	0.00	0.00	176.86	34.44
US-16	58.19	61.91	42.63	44.21	18.17	40.99	0.23	17.44	114.39	14.83	30.88	7.64	14.90	18.17	12.97	7.34	42.79	2.39	21.74	31.98	0.00	0.00	241.52	48.45
US-17	54.67	50.09	31.22	52.64	14.44	36.62	1.84	14.77	92.78	14.38	22.48	3.05	13.60	16.37	12.40	9.93	34.35	0.92	11.26	6.35	0.00	0.00	167.53	38.37
US-18	119.27	100.54	51.38	41.93	20.67	95.49	3.90	24.52	154.64	26.72	49.11	10.65	21.02	21.22	3.99	12.81	124.71	11.70	5.63	3.06	0.00	255.12	93.71	
US-19	5.79	282.24	10.91	31.40	5.01	44.99	1.16	32.55	54.57	9.42	13.90	0.00	8.20	17.55	2.93	5.15	46.36	2.24	9.18	2.16	0.00	16.76	59.23	21.32
US-20	5.11	211.49	8.53	22.53	3.29	44.78	0.00	27.05	41.38	7.48	10.55	0.00	6.77	15.34	2.73	5.78	33.28	1.82	8.54	1.73	0.00	10.41	126.04	40.93
US-21	16.12	217.39	5.94	22.96	22.69	63.79	2.83	27.94	34.38	6.47	4.64	0.00	4.46	10.73	2.48	4.18	39.19	2.63	3.57	0.41	0.00	18.07	20.93	11.05
US-22	17.20	277.21	10.42	34.96	20.14	89.42	2.73	44.16	60.71	9.51	8.97	0.30	7.80	12.22	3.03	3.40	65.15	4.72	5.73	4.94	0.00	26.27	131.17	19.36
US-23	16.54	292.40	9.13	30.39	16.63	90.08	2.81	38.83	52.85	9.40	7.40	0.00	6.00	13.72	2.18	3.49	23.89	13.67	5.61	1.05	0.66	9.34	79.16	9.68
US-25	82.79	279.43	54.40	111.79	28.10	117.24	5.46	41.52	165.85	41.43	49.48	6.74	33.12	25.37	20.43	14.13	113.69	8.20	25.09	4.20	0.00	1.58	210.63	50.20
US-26	64.86	51.94	37.01	71.10	21.70	22.70	3.38	8.73	127.18	17.56	35.36	7.87	17.86	23.40	15.54	4.88	50.63	1.95	11.04	4.01	0.00	0.00	282.39	48.34
US-27	47.52	95.81	45.78	63.32	23.63	70.65	2.03	22.33	112.13	17.88	31.89	10.81	21.02	35.76	17.72	0.93	18.52	1.71	34.01	0.26	0.00	0.00	157.71	34.33
US-28	92.76	178.49	74.62	135.89	40.34	110.46	3.71	39.71	222.46	41.12	60.47	17.84	46.86	45.12	26.23	18.66	62.98	8.21	48.27	1.52	0.00	0.00	400.08	92.59
US-29	85.93	191.71	59.08	128.57	48.46	103.25	2.63	37.32	212.39	32.59	54.24	15.61	41.41	65.27	22.88	15.69	50.24	4.56	54.79	3.76	0.00	5.78	309.68	78.16
US-30	47.96	71.75	34.08	43.35	17.35	52.36	3.21	18.12	82.04	15.09	21.52	3.20	14.62	16.35	11.45	7.58	63.52	2.98	15.97	5.05	0.00	0.00	236.56	54.36
US-31	34.49	38.62	24.11	41.12	23.52	35.09	0.00	9.86	59.20	11.80	20.18	3.70	13.85	17.95	10.04	5.97	11.25	0.54	13.70	0.20	0.00	0.00	92.09	20.58
US-32	67.42	173.42	55.63	96.65	35.21	92.87	2.21	32.16	201.74	35.51	47.69	14.26	29.15	56.22	20.12	13.65	39.86	3.27	42.50	1.69	0.00	5.15	332.75	76.06
US-33	59.91	76.00	37.74	40.65	42.78	59.64	2.54	18.19	131.54	20.16	37.93	8.32	17.64	24.82	10.97	6.85	63.24	2.08	14.22	5.03	0.00	0.00	230.08	61.39
US-34	62.77	35.76	37.26	37.29	17.45	65.19	0.25	20.06	101.53	15.72	25.86	2.17	16.85	17.23	13.26	5.45	57.04	0.42	10.14	7.05	0.00	0.00	182.41	54.96
US-35	59.77	110.42	38.48	60.70	28.20	78.32	2.02	27.51	109.49	19.77	32.03	8.09	17.84	19.53	12.25	9.47	19.47	1.34	22.19	0.00	0.00	0.00	160.31	55.05
US-36	48.19	66.63	27.36	30.29	18.07	50.87	0.17	15.37	79.45	13.71	23.43	0.42	13.94	19.14	10.04	5.75	17.68	0.45	11.96	0.96	0.00	0.00	87.46	29.18
US-37	9.39	372.64	14.44	48.66	2.83	53.23	2.71	35.57	52.00	11.11	29.91	0.00	0.81	26.28	4.13	7.20	64.38	5.21	18.75	5.62	0.00	17.01	103.39	31.92
US-39	11.08	1015.05	12.92	327.73	40.26	78.91	0.31	108.07	264.51	42.60	70.33	2.51	22.99	104.72	6.33	23.01	1085.19	86.13	92.44	8.42	0.00	184.54	273.33	67.62
UC-1	84.08	4.23	45.41	80.67	20.09	11.06	4.06	3.56	227.11	24.40	53.02	6.73	22.57	40.43	6.36	16.28	372.25	25.60	23.58	10.68	0.00	0.00	126.37	88.47
UC-2	73.00	64.79	45.30	17.29	19.54	76.77	3.48	25.19	114.77	11.89	27.29	20.95	16.70	10.24	4.93	13.64	382.72	45.55	14.46	4.95	0.00	0.00	188.92	30.75
UC-3	78.88	0.00	28.10	23.68	50.62	12.45	1.81	1.84	126.56	16.07	34.51	0.00	15.20	19.89	3.15	8.10	190.61	16.64	16.02	8.60	0.00	0.00	331.59	77.77
UC-4	60.45	0.00	25.45	35.62	17.13	4.54	2.62	0.00	123.60	13.64	31.86	0.80	13.59	21.90	9.69	13.09	420.01	65.01	3.60	14.69	0.00	0.00	262.38	58.33
UC-5	75.20	0.00	33.53	72.76	15.08	4.93	2.48	2.01	186.39	21.98	32.28	2.72	19.38	21.35	6.56	15.37	682.87	70.94	8.10	10.20	0.00	0.00	250.06	65.18
UC-6	138.23	8.43	43.76	153.33	114.48	29.16	0.28	2.63	114.33	34.29	57.89	14.69	12.17	19.36	6.18	13.52	349.76	47.83	6.67	5.94	0.00	0.00	199.21	61.74
UC-7	134.03	80.11	60.41	21.90	29.95	101.63	7.58	22.39	27.86	16.33	25.56	13.79	13.19	17.64	2.47	13.99	315.87	8.88	8.27	15.91	0.00	0.00	41.65	40.17
UC-8	130.18	51.86	57.25	14.17	22.11	93.51	7.57	17.80	25.53	13.28	24.13	12.01	11.01	10.66	2.72	16.91	341.50	10.55	6.67	19.02	0.00	0.00	39.99	46.90
UC-9	108.57	54.30	72.64	21.89	11.53	119.24	6.67	20.21	39.22	20.11	38.45	12.86	22.95	36.48	2.94	30.71	419.70	29.94	7.14	80.02	0.00	0.00	38.31	78.62
UC-10	20.54	17.30	8.94	4.47	1.19	19.82	0.92	8.39	38.42	5.30	5.59	0.00	3.34	44.14	2.37	1.26	63.40	0.81	2.32	8.17	0.00	0.00	45.38	23.17
UC-11	107.69	107.14	45.56	39.04	5.34	75.41	3.01	44.45	208.42	22.07	38.43	4.60	1.61	14.90	3.77	9.92	436.61	20.43	26.03	13.61	0.00	0.00	386.52	63.66
UC-12	13.56	318.58	17.87	44.81	1.10	101.96	0.15	36.73	28.01	15.96	16.44	3.12	15.76	33.20	17.82	37.74	1882.22	271.54	0.58	29.38	0.00	0.00	18.89	11.30

	141	142	143	144	145	146	147	148	149	150	151
US-1	0.00	81.81	100.56	0.00	0.00	0.00	0.00	0.00	71.56	0.00	0.00
US-2	0.00	21.47	328.06	0.00	0.00	0.00	0.00	0.00	94.94	0.00	0.00
US-3	0.00	7.40	1131.69	0.00	0.00	0.00	0.00	0.00	20.83	0.00	0.00
US-4	0.00	18.46	1149.06	0.00	0.00	0.00	0.00	0.00	59.78	0.00	0.00
US-5	6.68	30.99	205.60	0.00	0.00	0.00	0.00	0.00	154.50	0.00	0.00
US-6	6.07	46.12	535.98	0.00	0.00	0.00	0.00	0.00	183.42	0.00	0.00
US-7	1.88	69.87	97.71	0.00	0.00	0.00	0.00	0.00	32.88	0.00	0.00
US-8	2.87	38.29	254.47	0.00	0.00	0.00	0.00	0.00	54.91	0.00	0.00
US-9	0.00	22.09	119.73	0.00	0.00	0.00	0.00	0.00	107.25	0.00	0.00
US-10	0.00	12.42	282.09	0.00	0.00	0.00	0.00	0.00	62.57	0.00	0.00
US-11	0.00	12.17	426.72	0.00	0.00	0.00	0.00	0.00	29.17	0.00	0.00
US-12	0.00	44.97	206.07	1.00	0.00	0.00	0.00	0.00	50.66	0.00	0.00
US-13	3.17	20.14	226.51	0.00	0.00	0.00	0.00	0.00	90.13	0.00	0.00
US-14	0.00	11.58	253.93	0.00	0.00	0.00	0.00	0.00	74.49	0.00	0.00
US-15	0.00	48.06	261.81	0.00	0.00	0.00	0.00	0.00	47.39	0.00	0.00
US-16	0.00	59.54	338.15	0.00	0.00	0.00	0.00	0.00	63.92	0.00	0.00
US-17	0.00	65.92	1.90	0.00	0.00	0.00	0.00	0.00	43.05	0.00	0.00
US-18	0.00	8.11	89.20	0.00	0.00	0.00	0.00	0.00	81.93	0.00	0.00
US-19	0.00	6.87	0.00	0.68	0.00	0.00	0.00	0.00	11.48	0.00	0.00
US-20	0.00	4.92	36.62	0.00	0.00	0.00	0.00	0.00	6.51	0.00	0.00
US-21	0.00	82.82	53.98	0.00	0.00	0.00	0.00	0.00	1.43	0.00	0.00
US-22	0.00	289.67	277.63	0.00	0.00	0.00	0.00	0.00	6.64	0.00	0.00
US-23	0.00	96.21	307.78	0.00	0.00	0.00	0.00	0.00	6.17	0.00	0.00
US-25	0.00	68.30	333.98	0.00	11.04	0.00	0.00	0.00	80.72	0.00	0.00
US-26	0.00	102.44	716.55	0.00	0.00	0.00	0.00	0.00	56.28	0.00	0.00
US-27	0.00	32.91	491.20	0.00	0.00	0.00	0.00	0.00	97.29	0.00	0.00
US-28	0.00	26.62	158.80	0.00	0.00	0.00	0.00	0.00	128.25	0.00	0.00
US-29	2.28	63.25	172.42	0.00	0.00	0.00	0.00	0.00	113.99	0.00	0.00
US-30	3.01	16.51	366.44	0.00	0.00	0.00	0.00	0.00	54.18	0.00	0.00
US-31	0.00	15.02	214.95	0.00	0.00	0.00	0.00	0.00	48.76	0.00	0.00
US-32	2.52	24.95	220.08	0.00	0.00	0.00	0.00	0.00	108.33	0.00	0.00
US-33	0.00	12.94	271.78	0.00	0.00	0.00	0.00	0.00	74.84	0.00	0.00
US-34	0.00	12.65	1.32	0.00	0.00	0.00	0.00	0.00	56.18	0.00	0.00
US-35	2.31	19.73	0.00	0.00	0.00	0.00	0.00	0.00	66.46	0.00	0.00
US-36	0.00	12.45	0.00	0.00	0.00	0.00	0.00	0.00	46.39	0.00	0.00
US-37	0.00	15.42	154.63	17.82	0.00	0.00	0.00	4.53	21.82	0.00	0.00
US-39	1.97	1.48	0.00	12.39	2.33	0.00	0.00	3.60	6.36	0.00	0.00
UC-1	0.00	15.63	93.13	8.51	0.00	0.00	0.00	0.00	45.09	0.00	0.00
UC-2	0.00	26.95	142.36	12.41	0.00	0.00	0.00	0.00	66.09	0.00	0.00
UC-3	0.00	17.70	158.65	6.70	0.00	0.00	0.00	0.00	40.31	0.00	0.00
UC-4	0.00	12.98	444.66	6.68	0.00	0.00	0.00	0.00	45.57	0.00	0.00
UC-5	4.00	8.78	187.96	9.11	0.00	0.00	0.00	0.00	33.45	0.00	0.00
UC-6	4.57	18.42	155.01	49.40	0.00	0.00	0.00	0.00	58.21	0.00	0.00
UC-7	0.00	20.51	297.31	33.86	0.00	0.00	0.00	0.00	87.64	0.00	0.00
UC-8	0.00	13.55	0.56	5.66	0.00	0.00	0.00	0.00	112.80	0.00	0.00
UC-9	0.00	1.71	204.12	7.60	0.00	3.39	0.00	0.00	103.95	0.00	0.00
UC-10	0.00	2.03	51.35	7.75	0.00	0.00	0.00	0.00	5.56	0.00	0.00
UC-11	0.00	22.29	24.40	16.91	0.00	0.00	0.00	0.00	64.47	0.00	0.00
UC-12	0.00	8.57	0.53	7.17	0.00	0.00	0.00	0.00	18.33	0.00	0.00
UC-13	0.00	7.09	2.96	8.73	0.00	3.91	0.00	0.00	0.58	0.00	0.00
UC-14	0.00	0.03	101.92	6.11	0.00	0.00	0.00	0.00	0.20	0.00	0.00
UC-15	0.00	1.13	156.07	12.02	0.00	0.00	0.00	0.00	5.11	0.00	0.00
UC-16	0.00	8.56	106.63	15.80	0.00	0.00	0.00	0.00	9.63	0.00	0.00
UC-17	0.00	15.83	301.82	11.75	0.00	0.00	0.00	0.00	13.50	0.00	0.00
UC-18	0.00	14.68	313.55	29.27	0.00	0.00	0.00	4.66	22.59	0.00	0.00
UC-19	0.00	10.33	117.59	8.90	0.00	6.51	0.00	0.00	32.01	0.00	0.00
UC-20	0.00	0.00	299.03	18.25	0.00	0.00	0.00	2.72	43.83	0.00	0.00
UC-21	2.53	582.64	756.32	0.66	0.00	5.45	0.00	0.00	1.48	0.00	0.00
UC-22	3.97	313.21	482.77	0.20	0.00	0.00	0.00	0.00	19.58	0.00	0.00
UC-23	9.23	40.91	157.49	0.21	0.00	10.41	0.00	0.00	178.78	0.00	0.00
UC-24	0.00	76.23	487.81	0.85	0.00	5.14	0.00	0.00	109.95	0.00	0.00
UC-25	0.00	7.83	105.14	4.85	0.00	0.00	0.00	0.00	31.62	0.00	0.00
UC-26	0.00	87.53	4.56	5.34	0.00	0.00	0.00	0.00	180.30	0.00	0.00
UC-27	0.00	21.96	392.62	0.00	0.00	0.00	0.00	0.00	32.47	0.00	0.00
UC-28	0.00	63.16	791.76	4.94	0.00	0.00	0.00	0.00	13.64	0.00	0.00
In-1	8.86	35.20	0.00	7.17	244.94	5.73	6.44	2.15	0.00	3.25	0.00
In-5	0.00	43.52	0.00	4.79	383.40	8.30	99.51	0.19	0.00	0.00	0.00
In-6	3.18	32.16	0.00	4.89	265.62	5.14	94.05	1.97	0.00	0.00	0.00
In-7	0.00	1.59	0.00	4.88	109.45	0.00	23.98	0.21	0.00	0.00	0.00
In-8	0.00	1.86	0.00	4.64	177.99	0.00	42.14	0.00	0.00	0.00	0.00
In-9	1.80	1.10	2.81	4.69	75.96	0.00	21.65	0.13	0.00	0.00	0.00
In-10	3.17	18.38	2.53	4.67	109.80	0.00	27.08	0.13	0.00	0.00	0.00
In-11	14.03	12.84	12.38	5.51	45.37	3.39	12.46	0.43	0.00	0.00	0.00
In-12	110.86	2.58	4.25	5.61	56.33	0.00	17.91	0.19	0.00	2.28	0.00
In-13	352.48	16.86	0.00	9.71	43.95	0.00	43.29	0.14	0.00	8.82	0.00
In-14	168.16	3.30	0.00	5.61	17.78	0.00	21.30	0.13	0.00	3.63	0.00
In-15	0.00	12.18	0.00	5.28	127.77	0.00	37.67	0.22	0.00	0.00	0.00
In-18	13.82	25.74	0.00	6.77	14.04	0.00	2.94	0.00	0.00	0.00	0.00
In-16	0.00	160.96	4.71	4.78	274.81	8.27	90.45	0.00	0.00	0.00	0.00
In-17	5.89	77.64	0.00	5.04	818.77	7.63	193.90	2.08	0.00	0.00	0.00
G-1	4.06	1.52	31.27	5.07	34.11	0.00	174.95	7.76	0.00	17.39	43.64
G-2	6.03	24.03	0.00	5.53	140.56	4.58	33.31	24.47	0.00	20.74	178.40
G-3	2.96	4.89	0.00	11.05	2.60	0.00	1.25	80.00	0.00	1.55	0.47
G-4	1.96	3.33	21.84	10.20	4.80	0.00	0.39	70.59	0.00	3.48	2.45
G-6	21.36	4.46	0.00	20.74	7.86	0.00	3.95	93.04	0.00	10.71	7.19
G-7	10.93	7.93	0.00	27.91	5.62	0.00	6.47	159.03	0.00	8.37	5.05
G-8	45.15	5.33	0.00	24.17	29.12	0.00	10.44	100.73	0.00	37.90	26.34
G-9	76.73	7.88	0.00	8.34	211.02	0.00	42.33	78.71	0.00	64.58	109.46
G-10	30.01	21.64	0.00	5.88	76.78	0.00	13.73	30.30	0.00	64.07	49.81
G-11	24.72	18.82	0.00	7.00	91.26	0.00	11.36	34.05	0.00	71.11	51.97
G-12	0.00	7.10	0.00	5.42	37.60	0.00	11.91	18.87	0.00	26.69	9.86
G-13	7.16	3.35	371.29	5.85	77.59	5.16	191.72	14.62	0.00	51.66	26.56
G-14	11.82	8.27	99.77	5.66	82.95	3.20	16.48	15.30	0.00	59.82	64.27
G-15	38.29	16.49	48.46	87.46	24.07	0.00	106.69	464.55	3.63	48.90	16.16
G-17	11.41	40.98	71.05	29.69	10.25	8.15	1.63	91.88	0.00	11.17	5.95