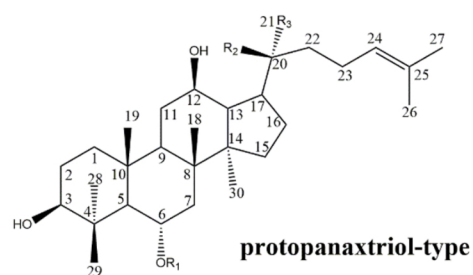
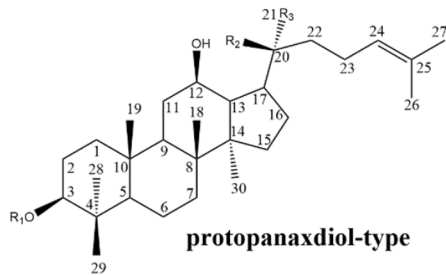


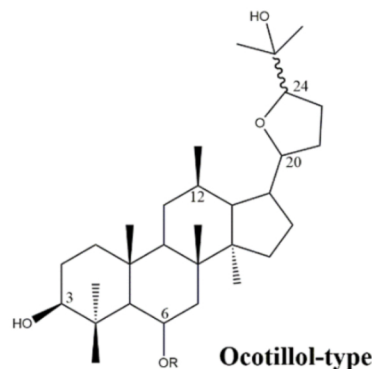
Table S1 Lists of identified genes involved in ginsenoside biosynthesis in American ginseng

NO.	Genes	Abbreviation	Accession no.(protein or gene)
1	3-Hydroxy-3-methylglutaryl coenzyme A reductase	PqHMGR	FJ755158(ACV65036)
2	Farnesyl diphosphate synthase	PqFPS	GQ401664(ADJ68004)
3	Squalene synthase	PqSS1	GU997681(AED99863)
4	Squalene synthase	PqSS2	AM182456(CAJ58418)
5	Squalene synthase	PqSS3	AM182457(CAJ58419)
6	Squalene epoxidase	PqSE	KC524469(AGK62446)
7	$\beta$ -amyrin synthase	Pq $\beta$ -AS1	JX185490(AGG09938)
8	$\beta$ -amyrin synthase	Pq $\beta$ -AS1	JX262290(AGG09939)
9	Dammarendiol synthase	PqDDS	KC316048(AGI15962)
10	Cytochrome P450	PqPPDS (PqD12H)	JX569336(AFU93031)
11	Cytochrome P450	PqPPTS (PqCYP6H)	KC190491 (AGC31652)
12	UDP-glycosyltransferase	Pq3-OUGT1	No. KR028477
13	UDP-glycosyltransferase	Pq3-OUGT2	No. KR106207

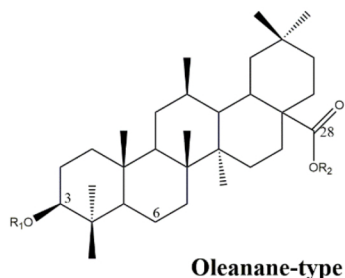


No.	Name	R1	R2	R3
1	Ginsenoside Rb1	Glc <sup>2</sup> -Glc	O-Glc <sup>6</sup> -Glc	CH <sub>3</sub>
2	Ginsenoside Rb2	Glc <sup>2</sup> -Glc	O-Glc <sup>6</sup> -Ara(p)	CH <sub>3</sub>
3	Ginsenoside Rb3	Glc <sup>2</sup> -Glc	O-Glc <sup>6</sup> -xyl	CH <sub>3</sub>
4	Ginsenoside Rc	Glc <sup>2</sup> -Glc	O-Glc <sup>6</sup> -Ara(f)	CH <sub>3</sub>
5	Ginsenoside Rd	Glc <sup>2</sup> -Glc	O-Glc	CH <sub>3</sub>
6	20(S)-Ginsenoside Rh2	Glc	OH	CH <sub>3</sub>
7	20(R)-Ginsenoside Rh2	Glc	CH <sub>3</sub>	OH
8	20(S)-Ginsenoside Rg3	Glc <sup>2</sup> -Glc	OH	CH <sub>3</sub>
9	20(R)-Ginsenoside Rg3	Glc <sup>2</sup> -Glc	CH <sub>3</sub>	OH
10	Ginsenoside F2	Glc	O-Glc	CH <sub>3</sub>
11	Ginsenoside Rs1	Glc <sup>2</sup> -Glc <sup>6</sup> -Ac	O-Glc <sup>6</sup> -Arap	CH <sub>3</sub>
12	Ginsenoside Ra1	Glc <sup>2</sup> -Glc <sup>6</sup>	O-Glc <sup>6</sup> -Arap <sup>+</sup> xyl	CH <sub>3</sub>
13	Ginsenoside Ra2	Glc <sup>2</sup> -Glc	O-Glc <sup>6</sup> -Araf <sup>+</sup> xyl	CH <sub>3</sub>
14	Ginsenoside Rao	(Glc <sup>2</sup> -Glc) <sup>2</sup> -Glc	Glc <sup>6</sup> -Glc	CH <sub>3</sub>
15	20(S)-Ginsenoside Rs3	Glc <sup>2</sup> -Glc <sup>6</sup> -Ac	OH	H
16	20(R)-Ginsenoside Rs3	Glc <sup>2</sup> -Glc <sup>6</sup> -Ac	H	OH
17	Malonyl-ginsenoside Rb1	Glc <sup>2</sup> -Glc <sup>6</sup> -M	O-Glc <sup>6</sup> -Glc	CH <sub>3</sub>
18	Malonyl-ginsenoside Rb2	Glc <sup>2</sup> -Glc <sup>6</sup> -M	O-Glc <sup>6</sup> -arap	CH <sub>3</sub>
19	Malonyl-ginsenoside Rc	Glc <sup>2</sup> -Glc <sup>6</sup> -M	O-Glc <sup>6</sup> -araf	CH <sub>3</sub>
20	Malonyl-ginsenoside Rd	Glc <sup>2</sup> -Glc <sup>6</sup> -M	O-Glc	CH <sub>3</sub>
21	Pseudo-ginsenoside RC1	Glc <sup>2</sup> -Glc <sup>6</sup> -Ac	O-Glc	CH <sub>3</sub>
22	Pseudo-ginsenoside F8	Glc <sup>2</sup> -Glc <sup>6</sup> - <sup>1</sup> Glc Ac	O-Glc-arap	CH <sub>3</sub>
23	Gypenoside X VII	Glc	O-Glc <sup>6</sup> -Glc	CH <sub>3</sub>
24	Gypenoside IX	Glc	O-Glc <sup>6</sup> -xyl	CH <sub>3</sub>
25	Notoginsenoside Fe	Glc	O-Glc <sup>6</sup> -araf	CH <sub>3</sub>
26	Quinquenoside L5	Glc <sup>2</sup> -Glc	-Xyl	OH
27	Quinquenoside L6	Glc <sup>2</sup> -Glc	Glc	=O
28	Quinquenoside L10	Glc	Glc <sup>6</sup> -Ara(p)	OH
29	Quinquenoside L14	Glc <sup>2</sup> -Glc	Ara(p)	OH
30	Quinquenoside R1	Glc <sup>2</sup> -Glc <sup>6</sup> -Ac	Glc <sup>6</sup> -Glc	OH
31	Quinquenoside I	Butenoyl-6Glc <sup>2</sup> -Glc	O-Glc	CH <sub>3</sub>
32	Quinquenoside II	Octenoyl-Glc <sup>2</sup> -Glc	O-Glc <sup>6</sup> -Glc	CH <sub>3</sub>
33	Quinquenoside III	Glc <sup>2</sup> -Glc	O-Glc	CH <sub>3</sub>
34	Quinquenoside V	Glc <sup>2</sup> -Glc	O-Glc <sup>6</sup> -Glc <sup>4</sup> -Glc	CH <sub>3</sub>
35	20(S)-protopanadiol	H	CH <sub>3</sub>	OH
36	20(R)-protopanadiol	H	OH	CH <sub>3</sub>

No.	Name	R1	R2	R3
37	Ginsenoside Re	Glc <sup>2</sup> -Rha	O-Glc	CH <sub>3</sub>
38	Ginsenoside Rg1	Glc	O-Glc	CH <sub>3</sub>
39	20(S)-Ginsenoside Rh1	Glc <sup>2</sup> -Rha	OH	CH <sub>3</sub>
40	20(R)-Ginsenoside Rh1	Glc <sup>2</sup> -Rha	CH <sub>3</sub>	OH
41	20(S)-Ginsenoside Rg2	Glc <sup>2</sup> -Glc	OH	CH <sub>3</sub>
42	20(R)-Ginsenoside Rg2	Glc <sup>2</sup> -Glc	CH <sub>3</sub>	OH
43	Ginsenoside F1	Glc	O-Glc	CH <sub>3</sub>
44	Ginsenoside F3	H	O-Glc	CH <sub>3</sub>
45	Ginsenoside Rf	H	O-Glc <sup>6</sup> -arap	CH <sub>3</sub>
46	Notoginsenoside R1	Glc <sup>2</sup> -xyl	O-Glc	CH <sub>3</sub>
47	Notoginsenoside R2	Glc <sup>2</sup> -xyl	OH	CH <sub>3</sub>
48	Quinquenoside L17	Glc	O-Glc <sup>6</sup> -xyl	CH <sub>3</sub>
49	Quinquenoside F6	Glc	O-Glc <sup>6</sup> -araf	CH <sub>3</sub>
50	6'-O-acetyl-Ginsenoside Rg1	Glc <sup>6</sup> -AC	O-Glc	CH <sub>3</sub>
51	20(S)-acetyl-Ginsenoside Rg2	Glc-Rha	OH	CH <sub>3</sub>
52	20(R)-acetyl-Ginsenoside Rg2	Glc-Rha	CH <sub>3</sub>	OH
53	20(S)-protopanaxtriol	H	OH	CH <sub>3</sub>
54	20(R)-protopanaxtriol	H	CH <sub>3</sub>	OH

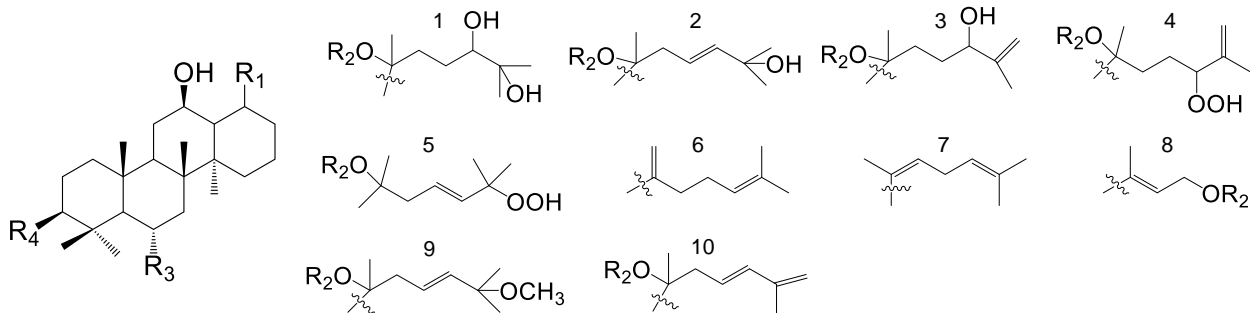


No.	Name	R
58	24(S)-Pseudoginsenoside F11	Glc <sup>2</sup> -Rha
59	24(R)-Pseudoginsenoside F11	Glc <sup>2</sup> -Rha
60	Ocotillol	H
61	Pseudoginsenoside RT4	Glc
62	24(R)-pseudoginsenoside RT5	Glc
63	Vinaginsenoside R1	Glc <sup>2</sup> -Rha   6 Ac



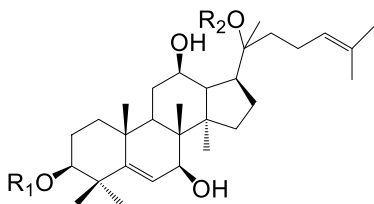
No.	Name	R1	R2
55	Ginsenoside Ro	GlcA <sup>2</sup> -Glc	Glc
56	Quinquenoside R3	Glc <sup>3</sup> -Glc	Glc
57	Quinquenoside R4	Glc <sup>2</sup> -Glc	Glc

**Fig. S1:** The chemical compounds in american ginseng

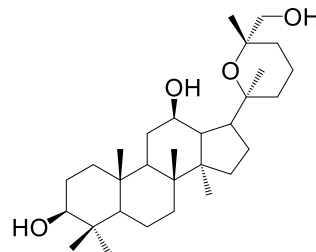


C17 side-chain varied PPD/PPT-type

N O.	Name	R 1	R2	R3	R4	NO.	Name	R 1	R2	R3	R4
64	Quinquenoside F1	1	H	H	OGlc-Glc	82	Ginsenoside II	4	Glc	H	OGlc-Glc
65	Quinquenoside F2	1	H	H	OGlc-Glc	83	Notoginsenoside C	4	Glc-Glc	H	OGlc-Glc
66	Quinquenoside F3	1	Glc-Xyl	H	OGlc-Glc	84	Floraquinquenoside A	5	H	OGlc	OH
67	Quinquenoside F4	1	H	<sup>-OGlc<sup>2-1</sup>Glc</sup> <sub>Rha</sub>	OH	85	Floraquinquenoside C	5	H	OGlc-Rha	OH
68	Quinquenoside L9	1	H	OGlc-Rha	OH	86	Notoginsenoside E	5	Glc	H	OGlc-Glc
69	Quinquenoside L16	1	OGlc-Glc	H	OGlc-Glc	87	Notoginsenoside K	5	Glc-Glc	H	OGlc-Glc
70	Gypenoside LXIX	2	Glc-Xyl	H	OGlc-Glc	88	Ginsenoside Rg6	6	/	OGlc-Rha	OH
71	Notoginsenoside A	2	Glc-Glc	H	OGlc-Glc	89	Ginsenoside Rh4	6	/	OGlc	OH
72	Quinquenoside L3	2	Glc-Xyl	H	OGlc	90	Ginsenoside Rk1	6	/	H	OGlc-Glc
73	Quinquenoside L7	2	Glc-Xyl	H	OGlc-Glc	91	Ginsenoside Rk2	6	/	H	OGlc
74	Vinaginsenoside R8	2	Glc	H	OGlc-Glc	92	Ginsenoside Rk3	6	/	OGlc	OH
75	Gypenoside LXXI	3	Glc-Glc	H	OGlc-Glc	93	Ginsenoside F4	7	/	OGlc-Rha	OH
76	Majoroside F1	3	Glc	H	OGlc-Glc	94	Ginsenoside Rh3	7	/	H	OGlc
77	Majoroside F2	3	Glc	H	OGlc	95	Quinquenoside L13	7	/	H	OGlc-Glc
78	Quinquenoside B	3	H	H	OGlc	96	Quinquenoside L12	8	Glc	H	OGlc-Glc
79	Floraquinquenoside B	4	H	OGlc-Rha	OH	97	Quinquenoside L15	8	H	H	OGlc-Glc
80	Floraquinquenoside D	4	Glc	H	OGlc	98	Quinquenoside Lc	9	Glc-Xyl	H	OGlc-Glc
81	Ginsenoside I	4	Glc	H	Glc-Glc	99	Quinquenoside L1	10	Glc	H	OGlc-Glc



NO.	Name	R1	R2
100	Notoginsenoside G	Glc-Glc	Glc
101	Quinquenoside IV	Glc-Glc	Glc-Glc



102 Dammar-20S,25S-epoxy-3β,12β,26-triol

Others

Fig. S2: The chemical compounds in american ginseng