Supplementary material

Contents

1. Supplementary Figure

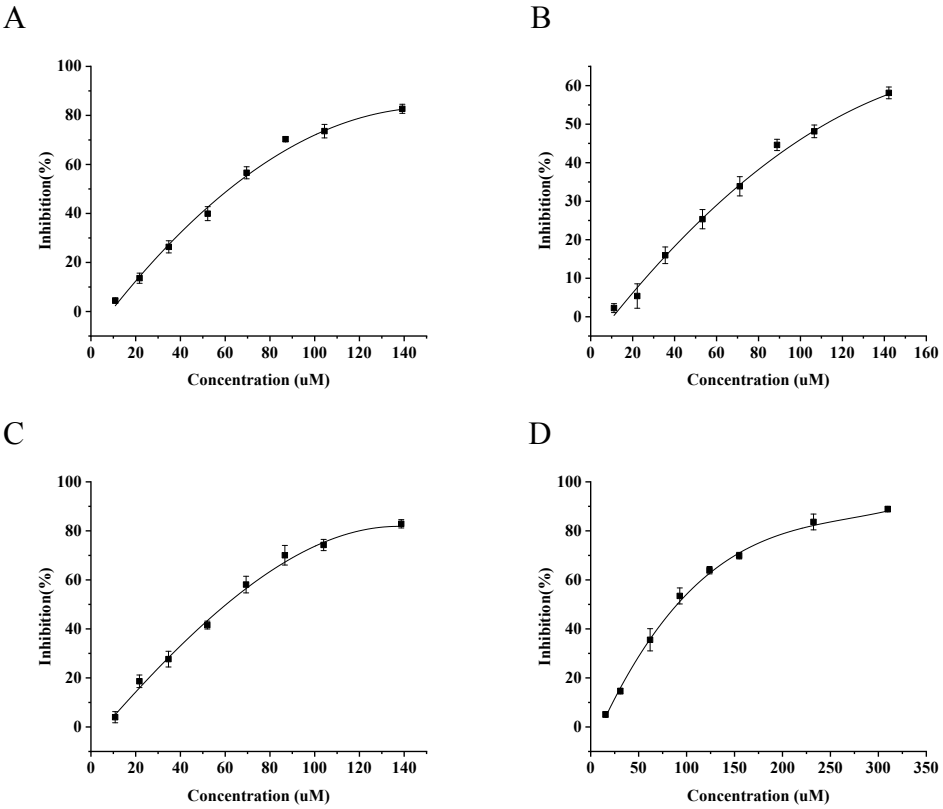

Fig S1. Inhibitory effect of stigmasterol glucoside (A), campesterol glucoside (B), daucosterol (C) and acarbose (D) on alpha-amylase.

Score	Expect	Method	Identities	Positives	Gaps
1023 bits (2646)	0.0	Compositional matrix adjust.	494/495 (99%)	494/495 (99%)	0/495 (0%)

```
NP_999360.1   MKLFLLLSAFGFCWAQYAPQTQSGRTSIVHLFEWRWVDIALECERYLGPKGFGGVQVSPPNENIVVTNPSRPWWERYQPV   80
pdb|3L2M|A    ..............XYAPQTQSGRTSIVHLFEWRWVDIALECERYLGPKGFGGVQVSPPNENIVVTNPSRPWWERYQPV   65
Consensus                    yapqtqsgrtsivhlfewrwvdialecerylgpkgfggvqvsppnenivvtnpsrpwweryqpv

NP_999360.1   SYKLCTRSGNENEFRDMVTRCNNVGVRIYVDAVINHMCGSGAAAGTGTTCGSYCNPGNREFPAVPYSAWDFNDGKCKTAS   160
pdb|3L2M|A    SYKLCTRSGNENEFRDMVTRCNNVGVRIYVDAVINHMCGSGAAAGTGTTCGSYCNPGNREFPAVPYSAWDFNDGKCKTAS   145
Consensus     syklctrsgnenefrdmvtrcnnvgvriyvdavinhmcgsgaaagtgttcgsycnpgnrefpavpysawdfndgkcktas

NP_999360.1   GGIESYNDPYQVRDCQLVGLLDLALEKDYVRSMIADYLNKLIDIGVAGFRIDASKHMWPGDIKAVLDKLHNLNTNWFPAG   240
pdb|3L2M|A    GGIESYNDPYQVRDCQLVGLLDLALEKDYVRSMIADYLNKLIDIGVAGFRIDASKHMWPGDIKAVLDKLHNLNTNWFPAG   225
Consensus     ggiesyndpyqvrdcqlvglldlalekdyvrsmiadylnklidigvagfridaskhmwpgdikavldklhnlntnwfpag

NP_999360.1   SRPFIFQEVIDLGGEAIQSSEYFGNGRVTEFKYGAKLGTVVRKWSGEKMSYLKNWGEGWGFMPSDRALVFVDNHDNQRGH   320
pdb|3L2M|A    SRPFIFQEVIDLGGEAIQSSEYFGNGRVTEFKYGAKLGTVVRKWSGEKMSYLKNWGEGWGFMPSDRALVFVDNHDNQRGH   305
Consensus     srpfifqevidlggeaiqsseyfgngrvtefkygaklgtvvrkwsgekmsylknwgegwgfmpsdralvfvdnhdnqrgh

NP_999360.1   GAGGASILTFWDARLYKVAVGFMLAHPYGFTRVMSSYRWARNFVNGQDVNDWIGPPNNNGVIKEVTINADTTCGNDWVCE   400
pdb|3L2M|A    GAGGASILTFWDARLYKVAVGFMLAHPYGFTRVMSSYRWARNFVNGQDVNDWIGPPNNNGVIKEVTINADTTCGNDWVCE   385
Consensus     gaggasiltfwdarlykvavgfmlahpygftrvmssyrwarnfvngqdvndwigppnnngvikevtinadttcgndwvce

NP_999360.1   HRWRQIRNMVWFRNVVDGQPFANWWANGSNQVAFGRGNRGFIVFNNDDWQLSSTLQTGLPGGTYCDVISGDKVGNSCTGI   480
pdb|3L2M|A    HRWRQIRNMVWFRNVVDGQPFANWWDNGSNQVAFGRGNRGFIVFNNDDWQLSSTLQTGLPGGTYCDVISGDKVGNSCTGI   465
Consensus     hrwrqirnmvwfrnvvdgqpfanww ngsnqvafgrgnrgfivfnnddwqlsstlqtglpggtycdvisgdkvgnsctgi

NP_999360.1   KVYVSSDGTAQFSISNSAEDPFIAIHAESK   510
pdb|3L2M|A    KVYVSSDGTAQFSISNSAEDPFIAIHAESK   495
Consensus     kvyvssdgtaqfsisnsaedpfiaihaesk
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Fig S2. Sequence alignment of the amino acid residue between alpha-amylase (GenBank: NP_999360.1) and 3L2M_A from pig pancreatic. ■: Identical sequence (homology=100%); ■: similar sequence (homology≥50%); □: different sequence (homology=0%).

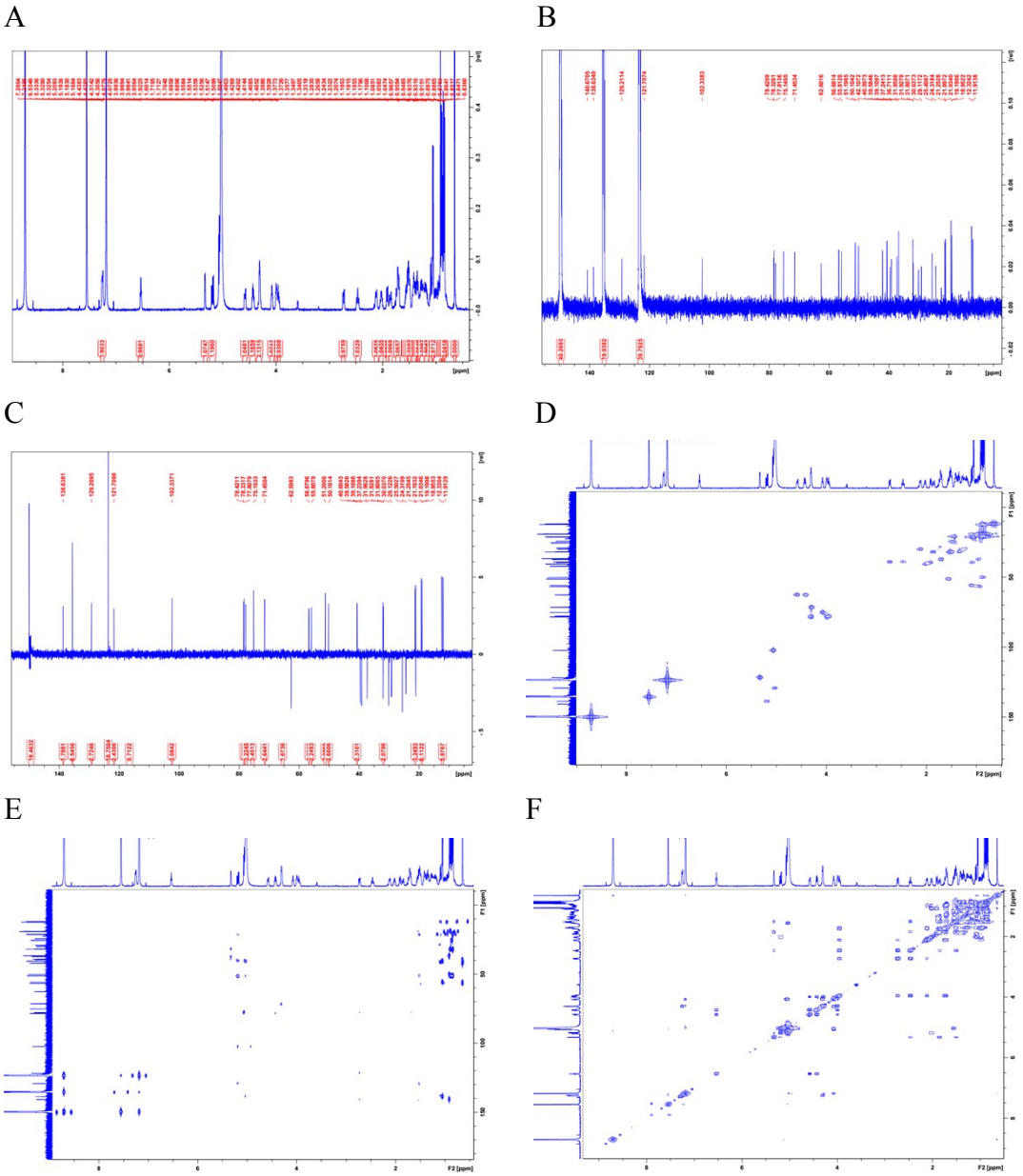

Fig S3. ^{1}H NMR (A), ^{13}C NMR (B), DEPT 135 (C), HMQC (D), HMBC (E) and COSY (F) spectra of Compounds 1 (600 MHz, Pyridine-d_5)

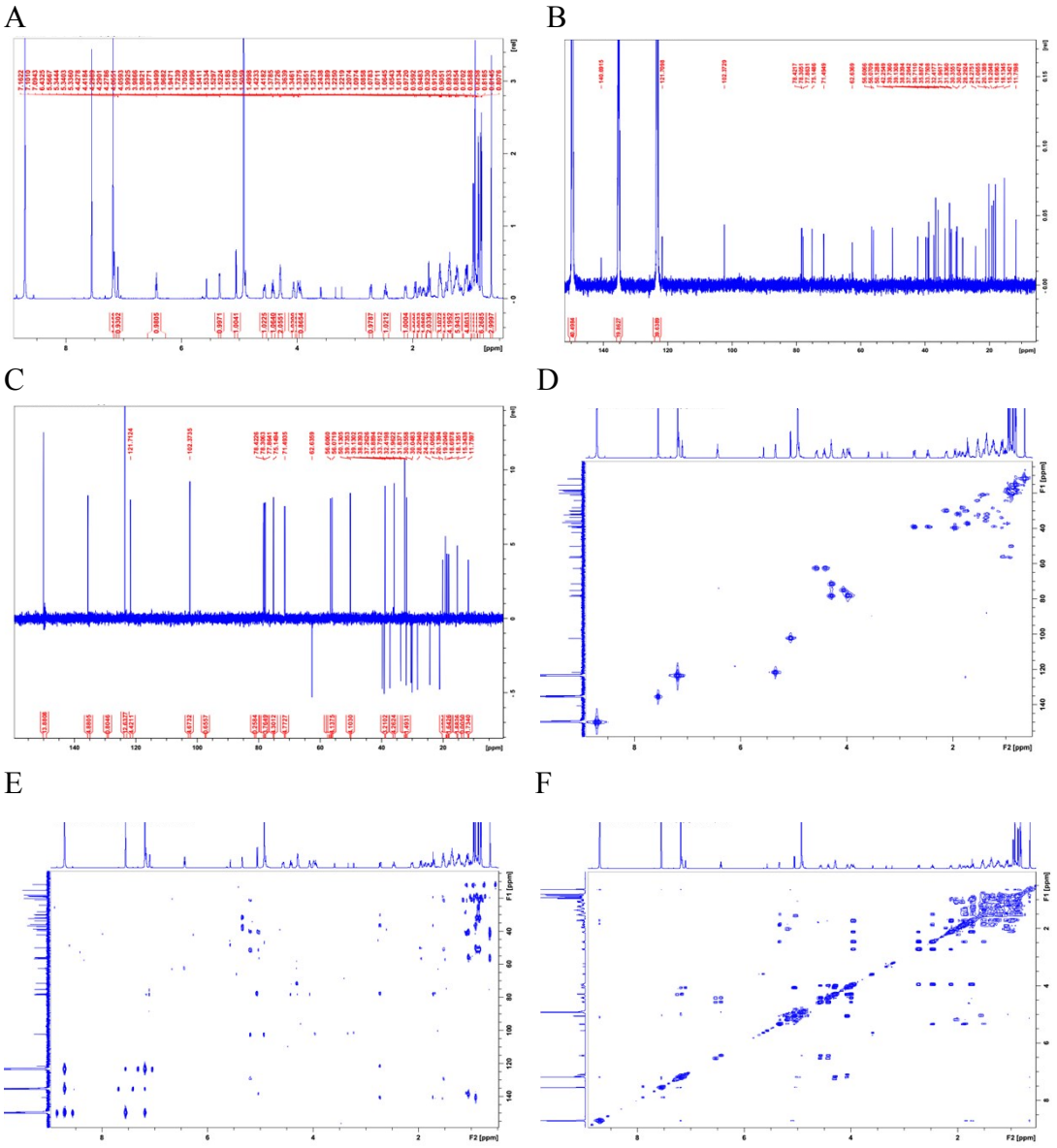

Fig S4. ^{1}H NMR (A), ^{13}C NMR (B), DEPT 135 (C), HMQC (D), HMBC (E) and COSY (F) spectra of Compounds 2 (600 MHz, Pyridine-d_5)

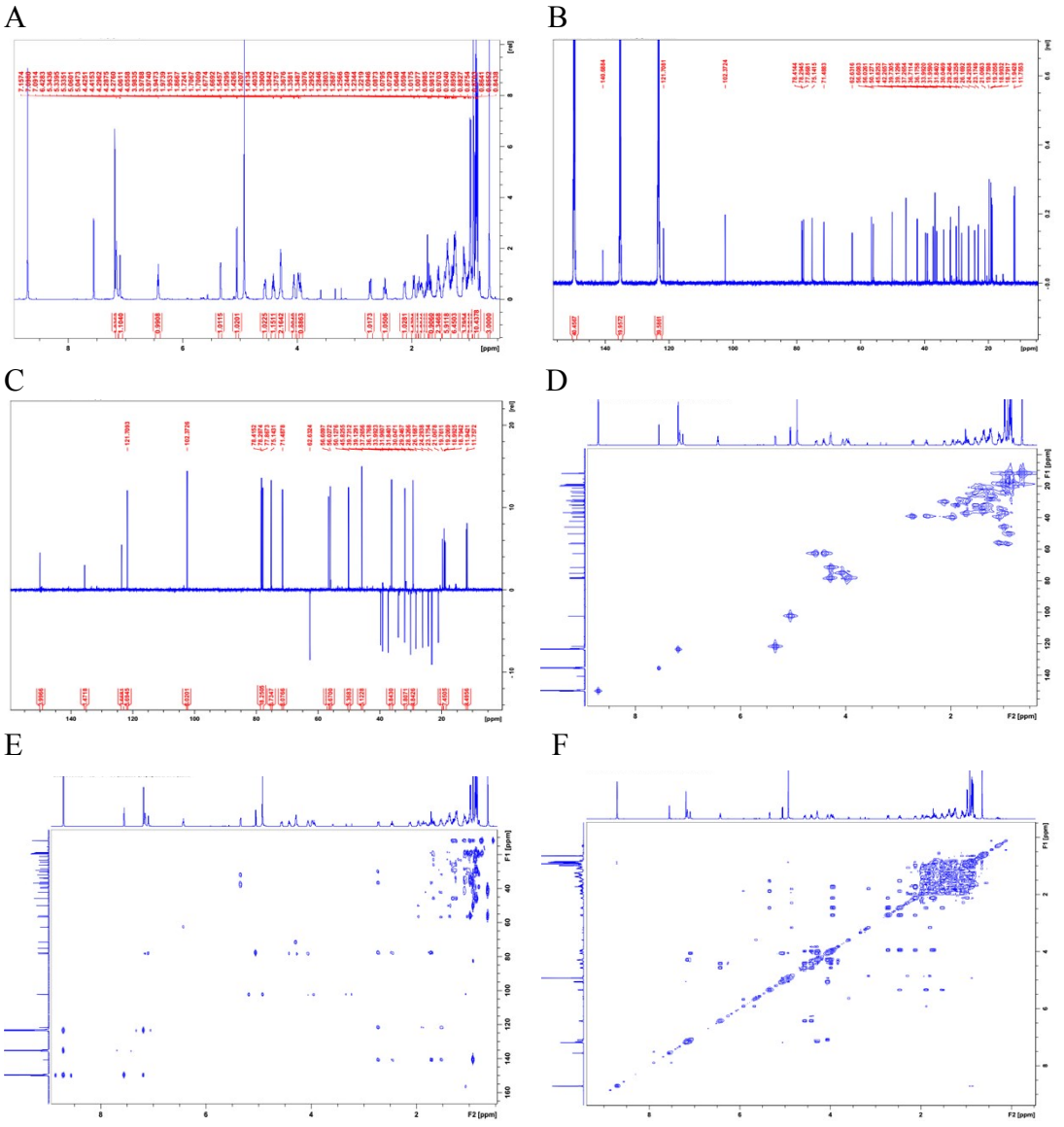

Fig S5. ^{1}H NMR (A), ^{13}C NMR (B), DEPT 135 (C), HMQC (D), HMBC (E) and COSY (F) spectra of Compounds 3 (600 MHz, Pyridine-d_5)

2. Supplementary Tables

Table S1. ^{1}H NMR Chemical Shifts for Compounds 1-3 (600 MHz, Pyridine-d_5)

Proton	Compounds (δ in ppm)		
	1 (J in Hz)	**2** (J in Hz)	**3** (J in Hz)
1a	1.70 (m)	1.71 (m)	1.70 (m)
1b	0.95 (m)	0.97 (m)	0.95 (m)
2a	2.12 (m)	2.12 (m)	2.11 (m)
2b	1.73 (overlapped)	1.73 (overlapped)	1.73 (overlapped)
3	3.96 (m)	3.98 (m)	3.98 (m)
4a	2.72 (ddd, 13.4, 4.8, 2.3)	2.73 (ddd, 13.4, 4.8, 2.3)	2.72 (ddd, 13.4, 4.8, 2.3)
4b	2.47 (m)	2.47 (m)	2.47 (m)
6	5.34 (dd, 4.8, 2.1)	5.34 (dd, 4.8, 2.1)	5.34 (dd, 4.8, 2.1)
7a	1.86 (m)	1.87 (m)	1.86 (m)
7b	1.36 (overlapped)	1.36 (overlapped)	1.36 (overlapped)
8	1.52 (m)	1.51 (m)	1.52 (m)
9	0.89 (overlapped)	0.89 (m)	0.89 (overlapped)
11a	1.47 (m)	1.44 (m)	1.46 (m)
11b	1.42 (m)	1.42 (m)	1.42 (m)
12a	1.91 (dd, 12.5, 3.5)	1.96 (dd, 12.7, 3.3)	1.96 (dd, 12.5, 3.5)
12b	1.08 (overlapped)	1.09 (overlapped)	1.09 (overlapped)
14	1.09 (overlapped)	1.07 (overlapped)	1.08 (overlapped)
15a	1.48 (m)	1.54 (m)	1.54 (m)
15b	0.92 (overlapped)	1.00 (overlapped)	1.00 (overlapped)
16a	1.73 (overlapped)	1.84 (m)	1.83 (m)
16b	1.24 (m)	1.25 (m)	1.26 (overlapped)
17	0.94 (overlapped)	0.93 (overlapped)	0.93 (overlapped)
18	0.65 (s)	0.65 (s)	0.65 (s)
19	0.92 (s)	0.92 (s)	0.92 (s)
20	2.02 (m)	1.38 (overlapped)	1.37 (overlapped)
21	0.84 (d, 6.6)	0.95 (d, 6.5)	0.97 (d, 6.5)
22a	5.19 (dd, 15.2, 8.8)	1.38 (overlapped)	1.38 (overlapped)
22b	-	1.08 (overlapped)	1.04 (overlapped)
23a	5.06 (overlapped)	1.16 (overlapped)	1.25 (overlapped)
23b	-	1.15 (overlapped)	1.24 (overlapped)
24	1.56 (m)	1.22 (m)	0.99 (overlapped)
25	1.53 (m)	1.90 (m)	1.68 (m)
26	0.89 (d, 6.6)	0.82 (d, 6.8)	0.85 (d, 6.8)
27	1.05 (d, 6.6)	0.87 (d, 6.8)	0.87 (d, 6.8)
28a	1.42 (m)	0.81 (d, 6.5)	1.31 (m)
28b	1.20 (m)	-	1.27 (m)
29	0.86 (t, 7.4)	-	0.88 (t, 7.4)
Glc			
1′	5.07 (overlapped)	5.06 (d, 7.7)	5.05 (d, 7.7)
2′	4.07 (dd, 8.1, 3.5)	4.06 (dd, 8.5, 3.8)	4.06 (dd, 8.0, 3.6)
3′	4.30 (overlapped)	4.29 (overlapped)	4.29 (overlapped)
4′	4.29 (overlapped)	4.28 (overlapped)	4.28 (overlapped)
5′	3.95 (m)	3.95 (m)	3.94 (m)
6′a	4.58 (ddd, 11.8, 5.7, 2.5)	4.56 (ddd, 11.8, 5.6, 2.5)	4.56 (ddd, 11.8, 5.6, 2.5)
6′b	4.43 (m)	4.42 (m)	4.42 (m)

Not: J values are given in parentheses. Overlapped signals are detected on HMQC experiment. Multiplicities: s = singlet, d = doublet, t = triplet, m = multiplet.

Table S2. ^{13}C NMR Chemical Shifts for Compounds 1-3 (600 MHz, Pyridine-d_5)

Carbon	Compounds (δ in ppm)		
	1	**2**	**3**
1	37.3 (CH_2)	37.3 (CH2)	37.3 (CH_2)
2	30.0 (CH_2)	30.0 (CH_2)	30.0 (CH_2)
3	78.3 (CH)	78.3 (CH)	78.3 (CH)
4	39.1 (CH_2)	39.1 (CH_2)	39.1 (CH_2)
5	140.7 (C)	140.7 (C)	140.7 (C)
6	121.7 (CH)	121.7 (CH)	121.7 (CH)
7	31.9 (CH_2)	32.0 (CH_2)	31.9 (CH_2)
8	31.8 (CH)	31.8 (CH)	31.8 (CH)
9	50.1 (CH)	50.1 (CH)	50.1 (CH)
10	36.7 (C)	36.7 (C)	36.7 (C)
11	21.0 (CH_2)	21.1 (CH_2)	21.0 (CH_2)
12	39.6 (CH_2)	39.7 (CH_2)	39.7 (CH_2)
13	42.1 (C)	42.3 (C)	42.3 (C)
14	56.7 (CH)	56.6 (CH)	56.6 (CH)
15	24.3 (CH_2)	24.2 (CH_2)	24.2 (CH_2)
16	29.1 (CH_2)	28.3 (CH_2)	28.3 (CH_2)
17	55.8 (CH)	56.1 (CH)	56.0 (CH)
18	11.9 (CH_3)	11.8 (CH_3)	11.7 (CH_3)
19	19.2 (CH_3)	19.2 (CH_3)	19.2 (CH_3)
20	40.6 (CH)	35.9 (CH)	36.1 (CH)
21	19.0 (CH_3)	18.7 (CH_3)	18.9 (CH_3)
22	138.6 (CH)	33.8 (CH_2)	33.9 (CH_2)
23	129.2 (CH)	30.4 (CH_2)	26.1 (CH_2)
24	51.2 (CH)	38.8 (CH)	45.3 (CH)
25	32.0 (CH)	32.4 (CH)	29.2 (CH)
26	21.1 (CH_3)	18.1 (CH_3)	18.7 (CH_3)
27	21.3 (CH_3)	20.1 (CH_3)	19.7 (CH_3)
28	25.5 (CH_2)	15.3 (CH_3)	23.1 (CH_2)
29	12.3 (CH_3)	-	11.9 (CH_3)
Glc			
1′	102.3 (CH)	102.4 (CH)	102.4 (CH)
2′	75.1 (CH)	75.1 (CH)	75.1 (CH)
3′	78.4 (CH)	78.4 (CH)	78.4 (CH)
4′	71.5 (CH)	71.5 (CH)	71.5 (CH)
5′	77.8 (CH)	77.9 (CH)	77.9 (CH)
6′	62.6 (CH_2)	62.6 (CH_2)	62.6 (CH_2)

Not: Multiplicities are decided on DEPT experiments