Supplementary Information for

Switching glycosyltransferase $UGT_{BL}1$ regioselectivity toward polydatin synthesis using semi-rational design

Bo Fan[a], Wenxin Dong[a], Tianyi Chen[a], Jianlin Chu*[b,c] and Bingfang He*[a,b,c]

[a] College of Biotechnology and Pharmaceutical Engineering, Nanjing Tech University, 30 Puzhunan Road, Nanjing 211816, China.
[b] School of pharmaceutical sciences, Nanjing Tech University, 30 Puzhunan Road, Nanjing 211816, China.
[c] Jiangsu National Synergetic Innovation Center for Advanced Materials, 30 Puzhunan road, Nanjing 211816, China.
*Correspondence and requests for materials should be addressed to Bingfang He (email: bingfanghe@njtech.edu.cn) and Jianlin Chu (email: cjl2fl@126.com).

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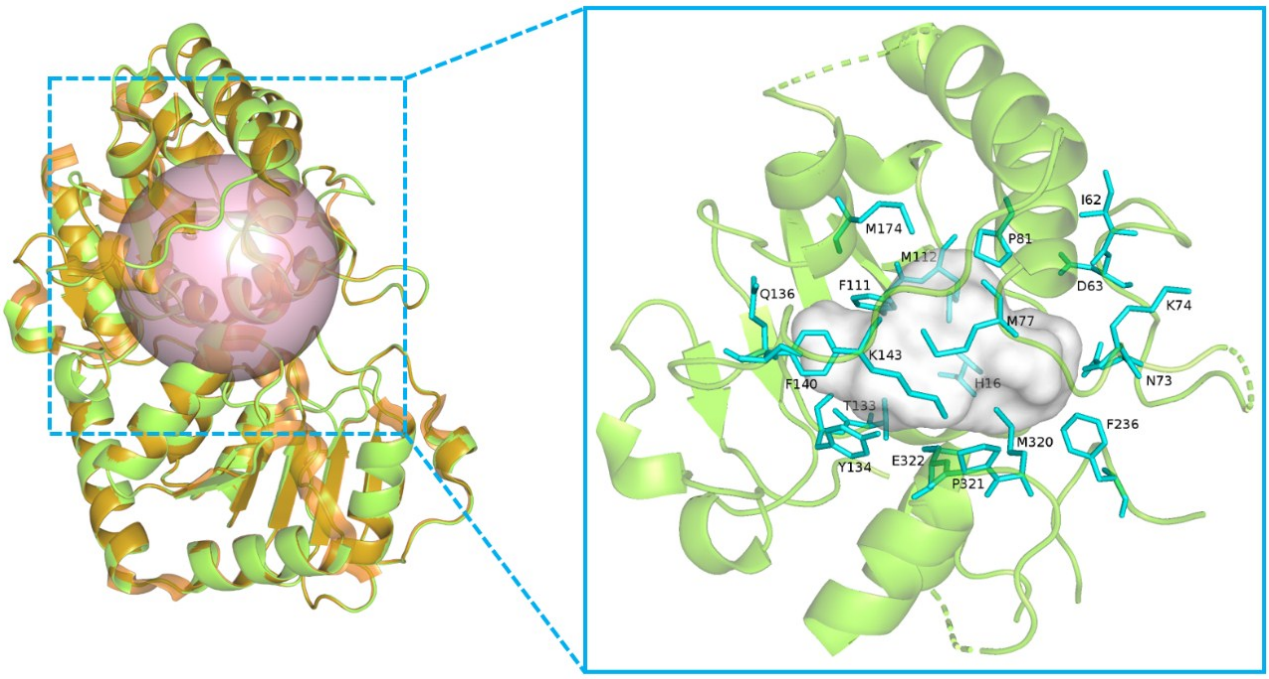

Fig. S1 The superimposition of homology model $UGT_{BL}1$ with template OleI (2IYA), and the residues targeted for mutagenesis.

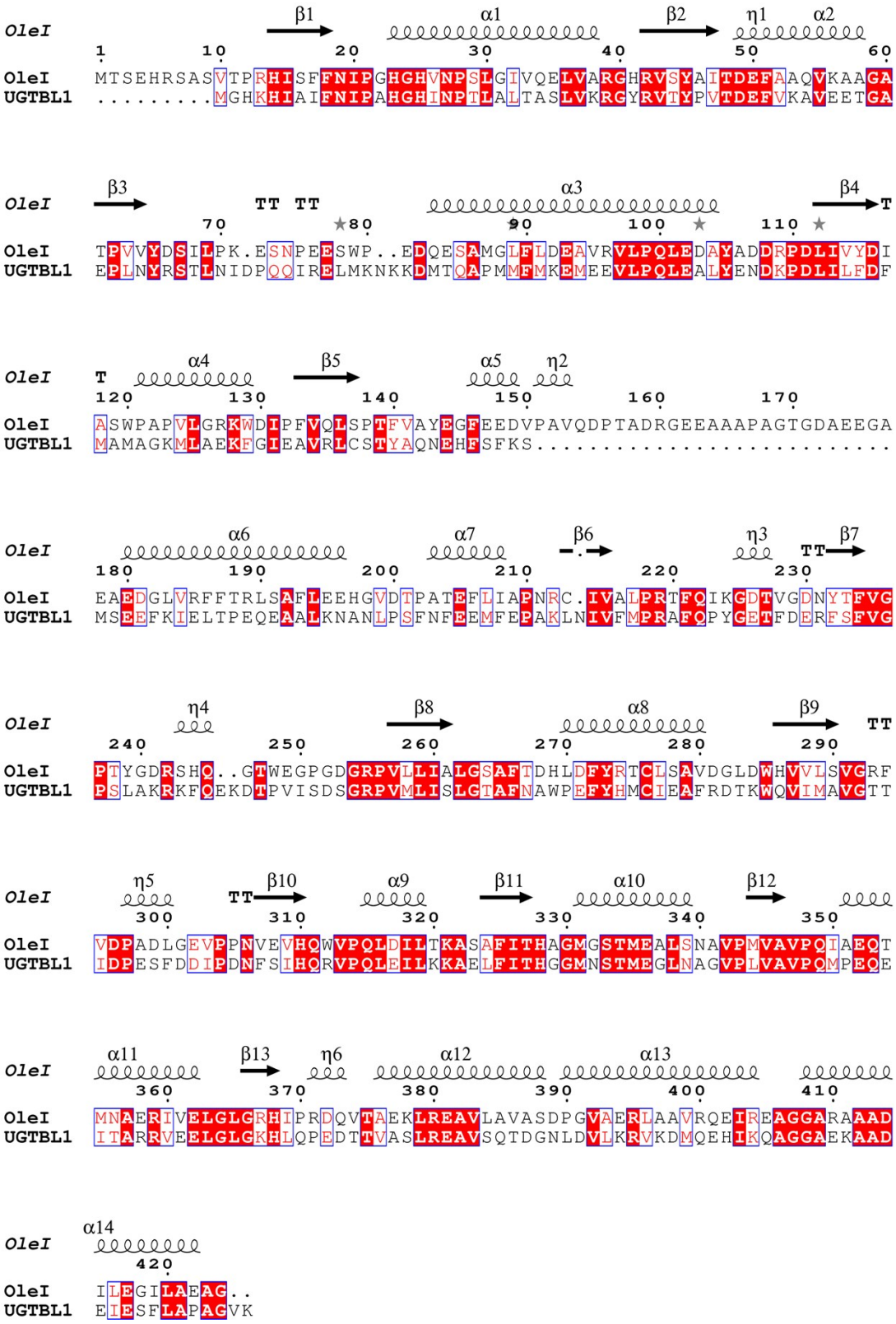

Fig. S2 The alignment of OleI and $UGT_{BL}1$. Secondary structure of OleI is shown above the OleI sequence.

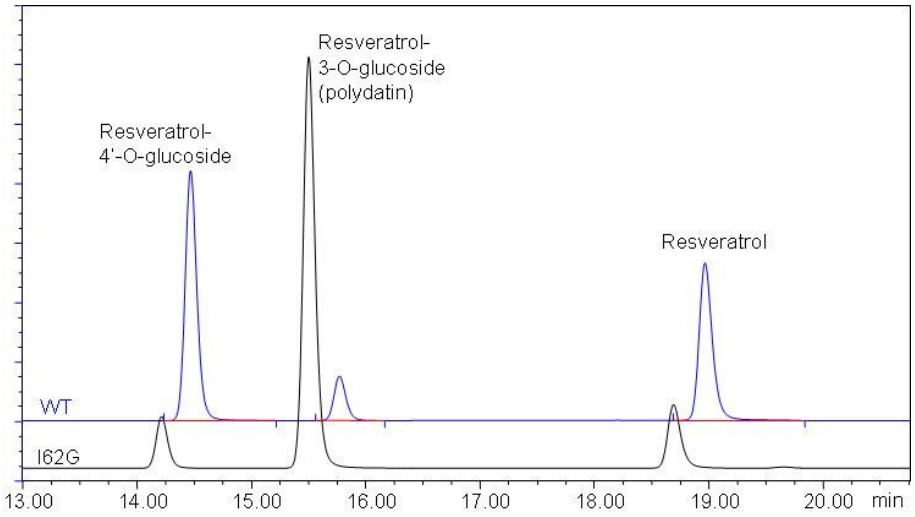

Fig. S3 The HPLC chromatogram of glycosylation of resveratrol catalyzed by $UGT_{BL}1$ WT (blue, up) and $UGT_{BL}1$ I62G (black, down).

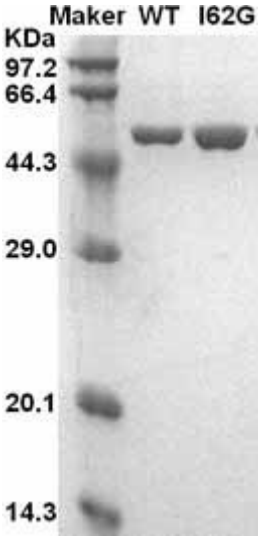

Fig. S4 SDS-PAGE gel of purified $UGT_{BL}1$ WT and I62G.

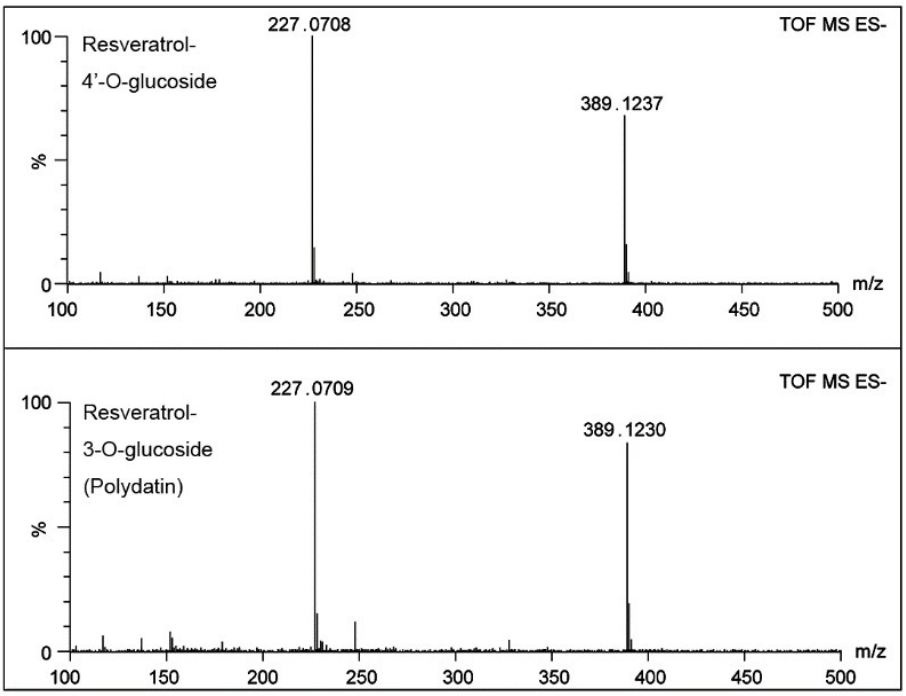

Fig. S5 The HRMS spectrums of resveratrol glucosides. A: product with shorter retention time (speculated to be 4′-O-β-glucoside of resveratrol); B: product with longer retention time (speculated to be 3-O-β-glucoside of resveratrol, polydatin)

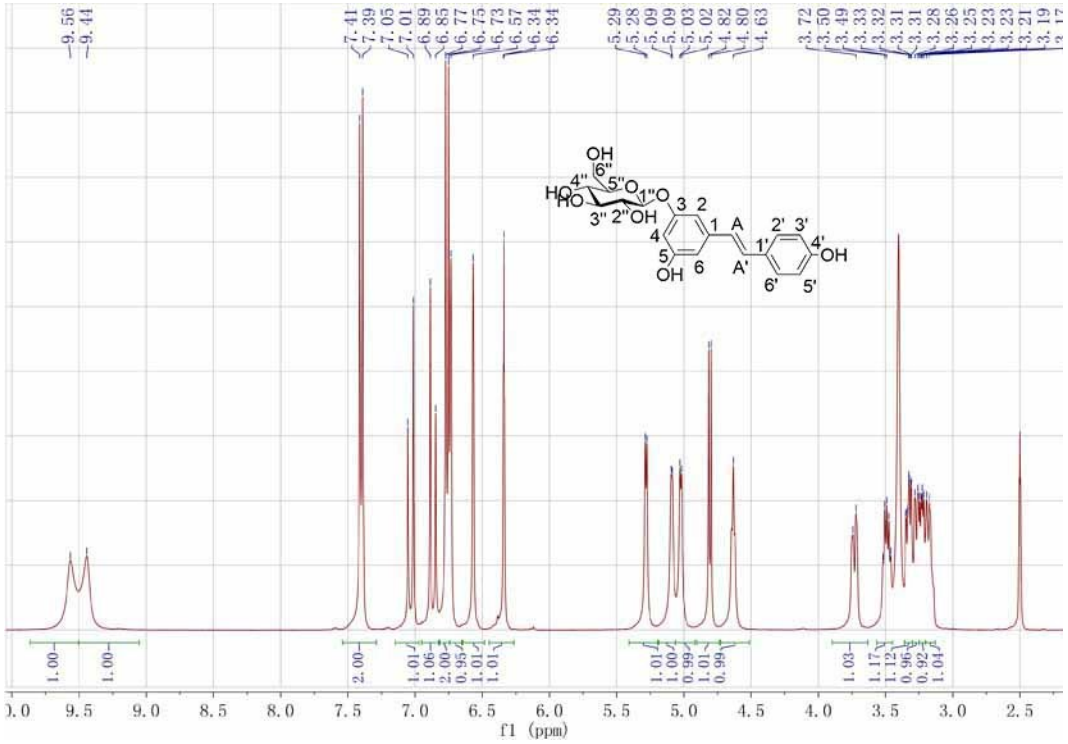

Fig. S6 ^{1}H NMR of resveratrol 3-O-glucoside (polydatin)

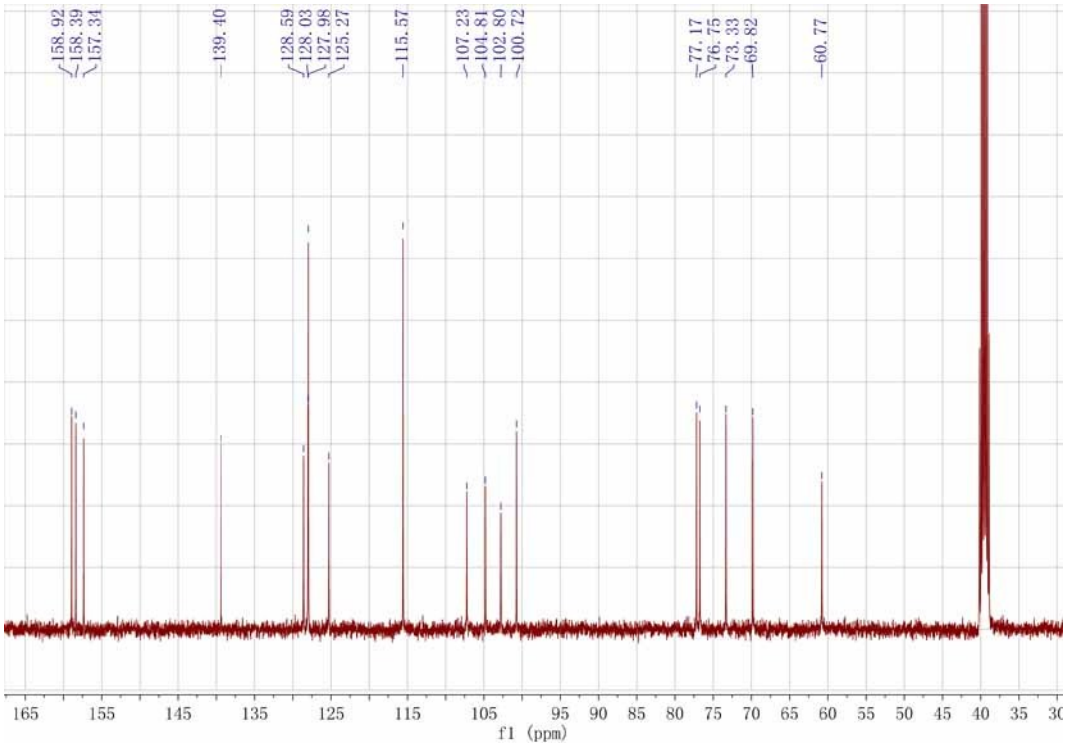

Fig. S7 ^{13}C NMR of resveratrol 3-O-glucoside (polydatin)

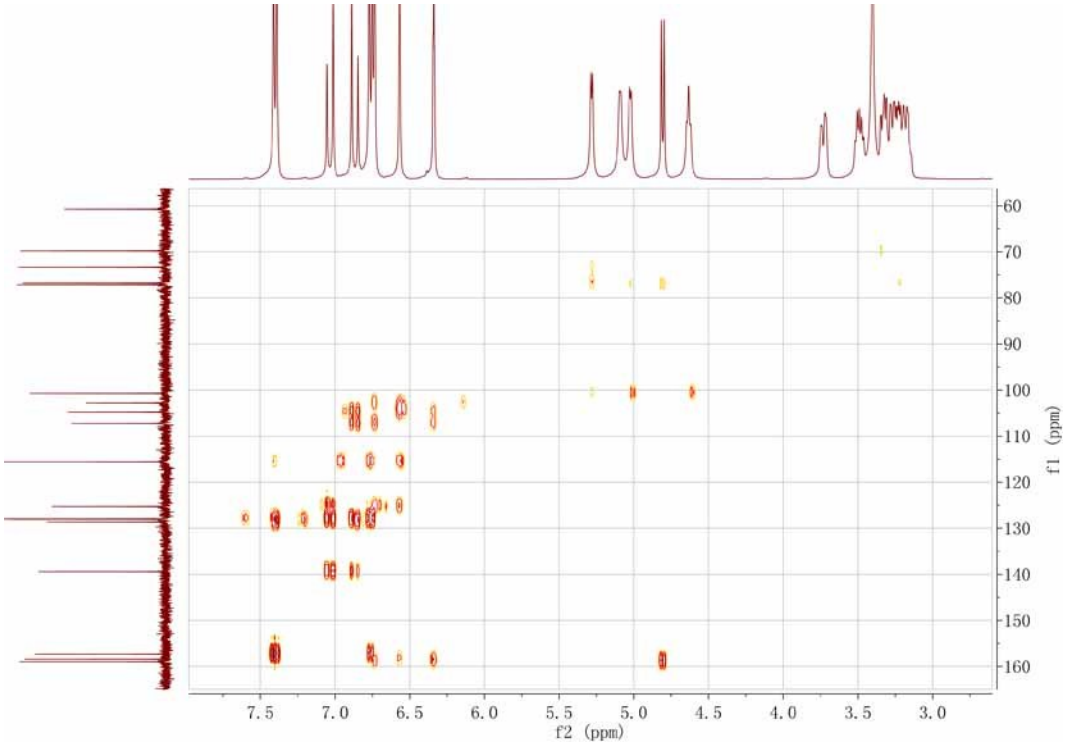

Fig. S8 HMBC NMR of resveratrol 3-O-glucoside (polydatin)

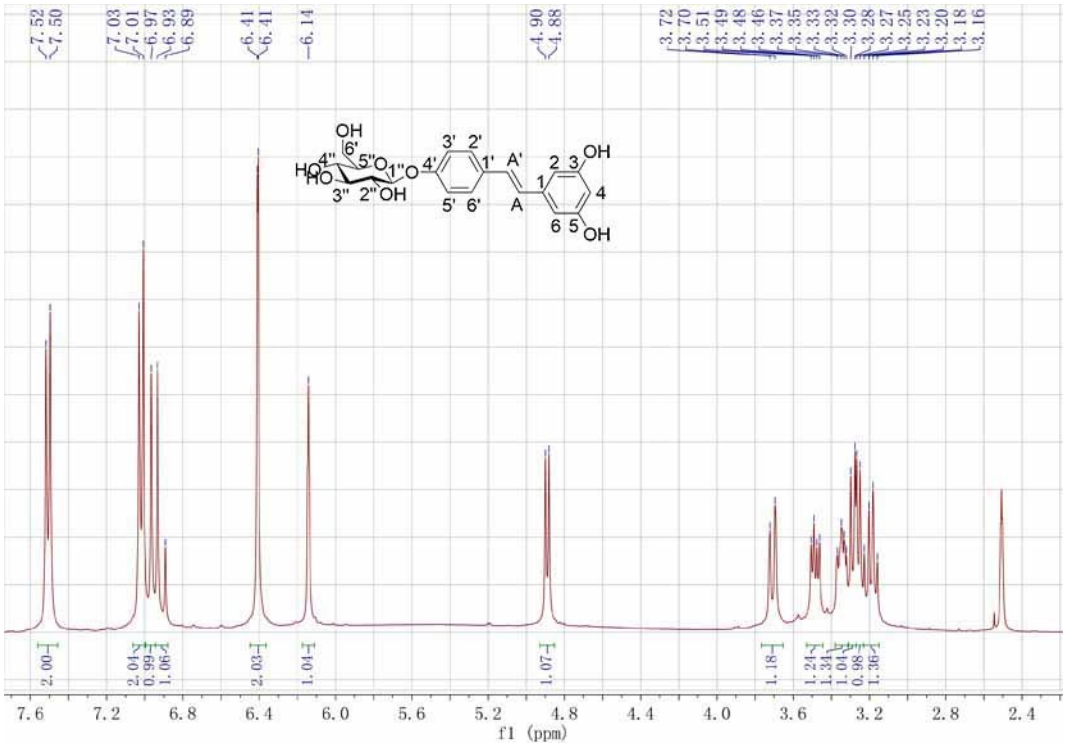

Fig. S9 ^{1}H NMR of resveratrol 4′-O-glucoside

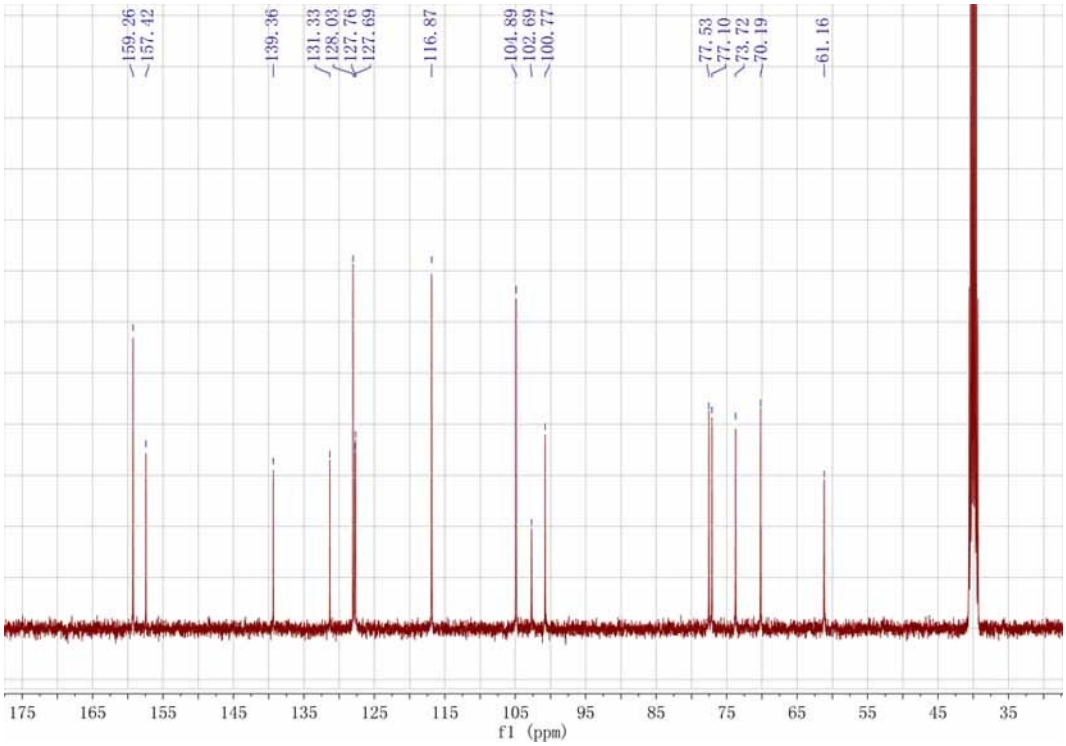

Fig. S10 ^{13}C NMR of resveratrol 4′-O-glucoside

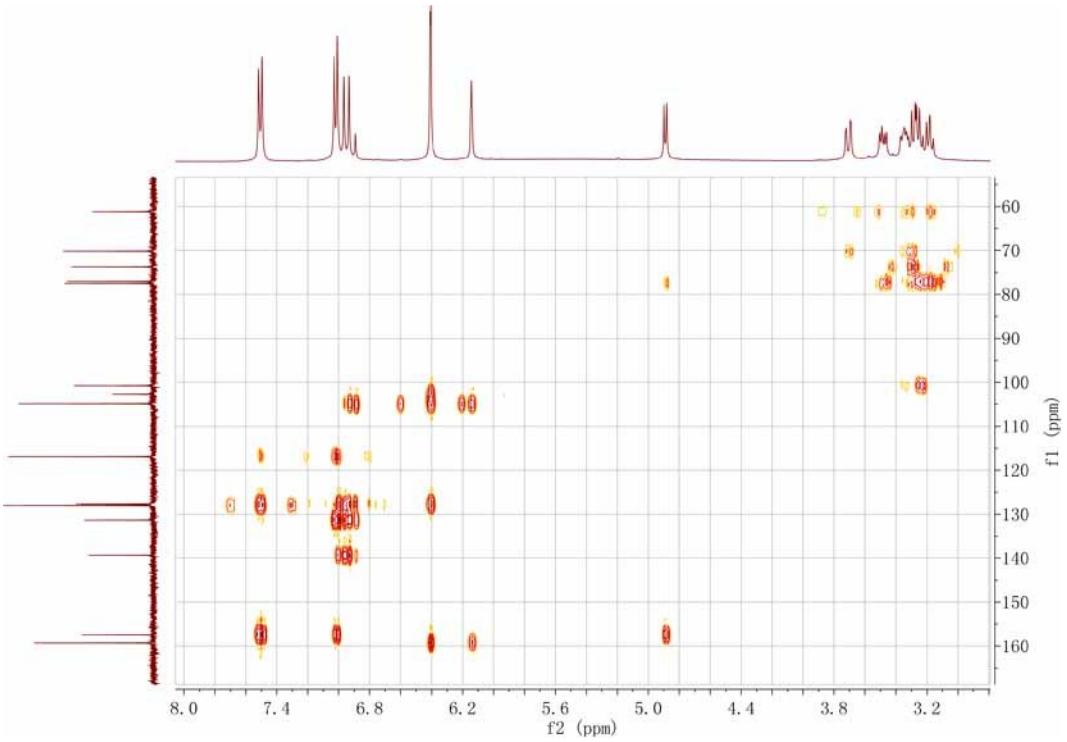

Fig. S11 HMBC NMR of resveratrol 4′-O-glucoside

Table S1: Primers used in mutations

Primer	Sequence (5’ to 3’)
H16A-F	atattcccgctcacggggcgattaatccgacgcttgc
H16A-R	gcaagcgtcggattaatcgccccgtgagcgggaatat
I62A-F	gctcaactaccgctcaactttaaatgccgatccgcagcaa
I62A-R	ttgctgcggatcggcatttaaagttgagcggtagttgagc
N63A-F	ccgctcaactttaaatatcgctccgcagcaaattcgg
N63A-R	ccgaatttgctgcggagcgatatttaaagttgagcgg
N73A-F	gcaaattcgggagctgatgaaagctaaaaaggatatgacacaggct
N73A-R	agcctgtgtcatatccttttagctttcatcagctcccgaatttgc
K74A-F	gcaaattcgggagctgatgaaaaatgcaaaggatatgacacaggct
K74A-R	agcctgtgtcatatcctttgcatttttcatcagctcccgaatttgc
M77A-F	gggagctgatgaaaaataaaaaggatgcgacacaggctccgatg
M77A-R	catcggagcctgtgtcgcatccttttattttcatcagctccc
P81A-F	aataaaaaggatatgacacaggctgcgatgatgtttatgaaagaaa
P81A-R	tttctttcataaacatcatcgcagcctgtgtcatatccttttatt
F111A-F	ctgacctcatccttttgacgctatggccatggcgggaa
F111A-R	ttcccgccatggccatagcgtcaaaaaggatgaggtcag
M112A-F	ctgacctcatccttttgactttgcggccatggcggg
M112A-R	cccgccatggccgcaaagtcaaaaaggatgaggtcag
T133A-F	cggttcgcctttgttctgcatatgcacagaacgaa
T133A-R	ttcgttctgtgcatatgcagaacaaaggcgaaccg
Y134A-F	agaggcggttcgcctttgttctacagctgcacagaacgaa
Y134A-R	ttcgttctgtgcagctgtagaacaaaggcgaaccgcctct
Q136A-F	gttcgcctttgttctacatatgcagcgaacgaacatttttcattcaaatc
Q136A-R	gatttgaatgaaaaatgttcgttcgctgcatatgtagaacaaaggcgaac
F140A-F	tgttctacatatgcacagaacgaacatgcttcattcaaatcaatgtctgaag
F140A-R	cttcagacattgatttgaatgaagcatgttcgttctgtgcatatgtagaaca
K143A-F	tgcacagaacgaacatttttcattcgcatcaatgtctgaagagtttaagatc
K143A-R	gatcttaaactcttcagacattgatgcgaatgaaaaatgttcgttctgtgca
M174A-F	cttccgtcatttaattttgaagaggcgttcgaaccggcaaaattgaaca
M174A-R	tgttcaattttgccggttcgaacgcctcttcaaaattaaatgacggaag
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F236A-R	ctttagggacggcggccaatgcctggccgg
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I62Q-R	aatttgctgcggatcctgatttaaagttgagcggtagttgagcgg
I62N-F	caactaccgctcaactttaaataacgatccgcagca
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I62K-F	cgctcaactaccgctcaactttaaataaagatccgcagcaaatt
I62K-R	aatttgctgcggatctttatttaaagttgagcggtagttgagcg
I62D-F	agccgctcaactaccgctcaactttaaatgatgatccgcagcaaattc
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I62C-R	ttgctgcggatcgcaatttaaagttgagcggtagttgagc
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I62W-R	aatttgctgcggatcccaatttaaagttgagcggtagttgagcgg
I62R-F	gctcaactaccgctcaactttaaatcgcgatccgcagcaa
I62R-R	ttgctgcggatcgcgatttaaagttgagcggtagttgagc
I62S-F	caactaccgctcaactttaaatagcgatccgcagca
I62S-R	tgctgcggatcgctatttaaagttgagcggtagttg
I62G-F	gctcaactaccgctcaactttaaatggcgatccgcagcaa
I62G-R	ttgctgcggatcgccatttaaagttgagcggtagttgagc

Table S2: ^{1}H and ^{13}C NMR data of glucosides of resveratrol

Nr	Resveratrol-4′-O-β-glucoside		Nr	Resveratrol-3-O-β-glucoside (Polydatin)	
	δ_C	δ_H		δ_C	δ_H
1	139.36		1	139.40	
2/6	104.89	6.41 (d, *J* = 1.8 Hz, 2H)	2	107.23	6.73 (s, 1H)
3/5	159.26		3	158.39	
4	102.69	6.14 (s, 1H)	4	104.81	6.34 (s, 1H)
			5	158.92	
			6	102.80	6.57 (s, 1H)
A	127.69	6.91 (d, *J* = 16.3 Hz, 1H)	A	128.03	6.87 (d, *J* = 16.3 Hz, 1H)
A’	127.76	6.97 (d, *J* = 16.3 Hz, 1H)	A’	128.59	7.03 (d, *J* = 16.3 Hz, 1H)
1’	131.33		1’	125.27	
2’/6’	128.03	7.51 (d, *J* = 8.7 Hz, 1H)	2’/6’	127.98	7.40 (d, *J* = 8.6 Hz, 2H)
3’/5’	116.87	7.02 (d, *J* = 8.8 Hz, 1H)	3’/5’	115.57	6.76 (d, *J* = 8.6 Hz, 2H)
4’	157.42		4’	157.34	
1’’	100.77	4.89 (d, *J* = 7.4 Hz, 1H)	1’’	100.72	4.81 (d, *J* = 7.5 Hz, 1H)
2’’	73.72	3.19 (m, 1H)	2’’	73.33	3.18 (m, 1H)
3’’	77.10	3.34 (m, 1H)	3’’	76.75	3.33 (m, 1H)
4’’	70.19	3.26 (m, 1H)	4’’	69.82	3.23 (m, 1H)
5’’	77.53	3.29 (m, 1H)	5’’	77.17	3.27 (m, 1H)
6’’	61.16	3.71 (m, 1H) , 3.48 (m, 1H)	6’’	60.77	3.73 (m, 1H), 3.51 (m, 1H)