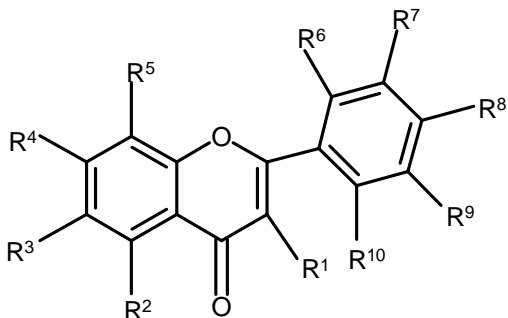
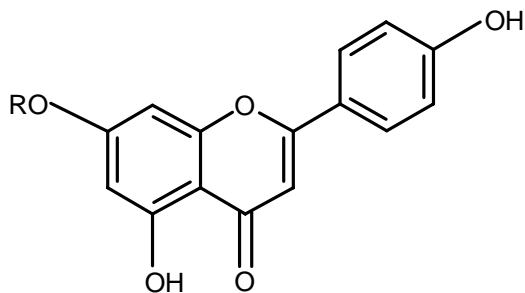


Fig. 1 Structures of antioxidant flavonoids

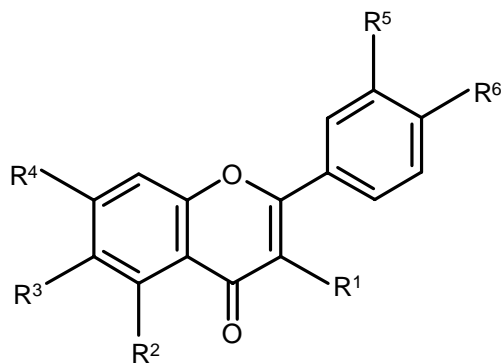


only non-H substituents(R) are indicated

- 1 R¹=R⁴=R⁸=MeO, R²=OH
- 2 R¹=R⁸=MeO, R²=R⁴=OH
- 3 R²=R⁴=R⁸=MeO, R¹=OH
- 4 R¹=R²=R⁴=R⁸=MeO
- 5 R⁴=R⁸=OMe, R¹=R²=OH
- 6 R²=R⁸=OH, R³=R⁴=R⁷=MeO
- 7 R²=R⁵=R⁸=OH, R³=R⁴=R⁷=MeO
- 8 R¹=R⁴=MeO, R²=R⁵=R⁷=R⁸=R⁹=OH
- 9 R¹=R²=R⁴=R⁸=OH, R⁶=MeO
- 10 R²=R⁴=R⁷=R⁸=OH
- 11 R²=R⁷=R⁸=OH, R⁴=(β-D-Glc)O
- 12 R²=R⁴=R⁷=OH, R⁸=(β-D-Glc)O
- 13 R²=R⁷=R⁸=OH, R⁴=(Rut)O
- 14 R²=R⁴=R⁸=OH, R⁷=(β-D-Glc)O
- 15 R¹=(α-L-Rha)O, R²=R⁴=R⁷=R⁸=R⁹=OH
- 16 R¹=R²=R⁷=R⁸=R⁹=OH, R⁴=[β-D-Glc-(1→6)-β-D-Glc]O
- 17 R¹=R²=R⁷=R⁸=R⁹=OH, R⁴=[α-L-Rha-(1→6)-β-D-Glc]O



18 R= β-D-glucopyranosyl



only non-H substituents (R) are indicated

- 19** $R^1=R^2=R^4=R^5=R^6=OH$
20 $R^1=R^2=R^6=OH, R^4=R^5=OMe$
21 $R^1=R^2=R^5=R^6=OH, R^4=OMe$
22 $R^2=R^4=R^5=R^6=OH$
23 $R^1=[\alpha\text{-L-(5''-O-galloyl)Ara(furanose)]O, R^2=R^4=R^5=R^6=OH$
24 $R^1=R^6=(\beta\text{-D-Glc})O, R^4=(\alpha\text{-L-Rha})O, R^2=R^5=OH$
25 $R^1=(\beta\text{-D-Glc})O, R^2=R^4=R^5=R^6=OH$
26 $R^1=(\alpha\text{-L-Rha})O, R^2=R^4=R^5=R^6=OH$
27 $R^1=(\beta\text{-D-Galac})O, R^2=R^4=R^5=R^6=OH$
28 $R^1=[(6''\text{-O-malonyl)Glc}]O, R^2=R^4=R^5=R^6=OH$
29 $R^1=[(6''\text{-O-malonyl)Galac}]O, R^2=R^4=R^5=R^6=OH$
30 $R^1=(\beta\text{-D-Glc})O, R^2=MeO, R^4=R^5=R^6=OH$
31 $R^1=(Rut)O, R^2=R^4=R^5=R^6=OH$
32 $R^1=R^2=R^3=R^5=R^6=OH, R^4=(\beta\text{-D-Glc})O$
33 $R^1=R^2=R^3=R^5=R^6=OH, R^4=[(6''\text{-O-acetyl)Glc}]O$
34 $R^1=(\alpha\text{-L-Rha})O, R^2=R^4=R^5=R^6=OH$
35 $R^1=[(6''\text{-O-p-coumaroyl})\text{-}\beta\text{-D-Glc-(1}\rightarrow\text{2)-}\alpha\text{-L-Rha}]O, R^2=R^4=R^6=OH, R^5=MeO$
36 $R^1=(\beta\text{-D-Glc})O, R^2=R^4=R^5=R^6=OH$
37 $R^1=R^2=R^4=R^5=R^6=OH, R^3=MeO$
38 $R^1=R^2=R^5=R^6=OH, R^3=MeO, R^4=(\beta\text{-D-Glc})O$
39 $R^1=R^2=R^5=R^6=OH, R^3=MeO, R^4=[(6''\text{-isovaleryl})\beta\text{-D-Glc}]O$
40 $R^1=R^2=R^5=R^6=OH, R^3=MeO, R^4=[(6''\text{-isobutyryl})\beta\text{-D-Glc}]O$
41 $R^1=R^2=R^5=R^6=OH, R^3=MeO, R^4=[\{6''\text{- (2-methylbutyryl)}\}\beta\text{-D-Glc}]O$
42 $R^2=R^5=R^6=OH, R^3=Me, R^4=(\beta\text{-D-Glc})O$
43 $R^1=R^2=MeO, R^2=R^4=R^5=R^6=OH$
44 $R^1=R^2=R^4=R^6=OH$
45 $R^1=[(6''\text{-O-Z-p-coumaroyl})\text{-}\beta\text{-D-Glc}]O, R^2=R^4=R^6=OH$
46 $R^1=R^4=(\alpha\text{-L-Rha})O, R^2=R^6=OH$
47 $R^1=R^2=R^3=R^6=OH, R^4=(\beta\text{-D-Glc})O$
48 $R^1=R^2=R^3=R^6=OH, R^4=[(6''\text{-O-acetyl)Glc}]O$
49 $R^1=(\beta\text{-D-Glc})O, R^2=R^4=R^6=OH, R^3=MeO$
50 $R^1=(\alpha\text{-L-Rha})O, R^2=R^4=R^6=OH$
51 $R^1=[(6''\text{-O-p-coumaroyl})\text{-}\beta\text{-D-Glc-(1}\rightarrow\text{2)-}\alpha\text{-L-Rha}]O, R^2=R^6=OH, R^4=(\beta\text{-D-Glc})O$

52 $R^1 = [\alpha\text{-L-Rha-(1}\rightarrow\text{6)-}\beta\text{-D-Glc-(1}\rightarrow\text{2)-}\beta\text{-D-Glc}]O$, $R^2=R^4=R^6=OH$

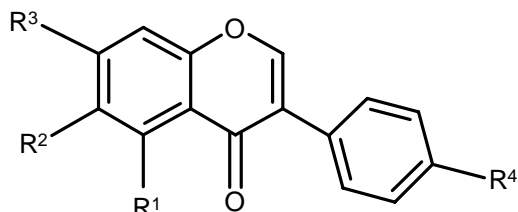
53 $R^1 = [\beta\text{-D-Glc-(1}\rightarrow\text{6)-}\beta\text{-D-Glc}]O$, $R^2 = (\alpha\text{-L-Rha})O$, $R^4=R^6=OH$

54 $R_1 = [\{2''\text{-O-(E-6''-O-feruloyl)-}\beta\text{-D-Glc}\}\text{-}\beta\text{-D-Glac}]O$

55 $R^1=R^2=R^6=OH$, $R^4 = (\alpha\text{-L-Rha})O$

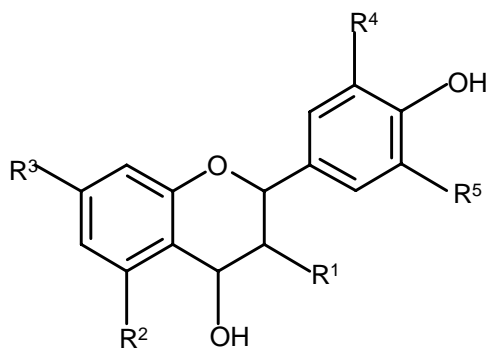
56 $R^1 = (\alpha\text{-L-Rha})O$, $R^2=R^6=OH$, $R^4 = (\beta\text{-D-Glc})O$

57 $R^1 = (\alpha\text{-L-Rha})O$, $R^2=R^4=R^6=OH$



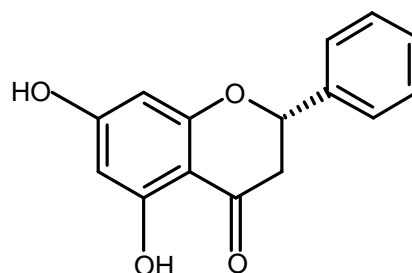
58 $R^1=R^3=R^4=OH$ (Genistein)

59 $R^1=R^3=R^4=OH$, $R^2=MeO$ (Tectorigenin)

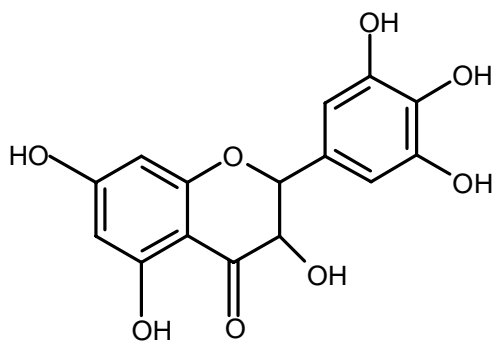


60 $R^1=[\alpha\text{-L-Rha}]O$, $R^2=R^3=MeO$, $R^4=R^5=H$

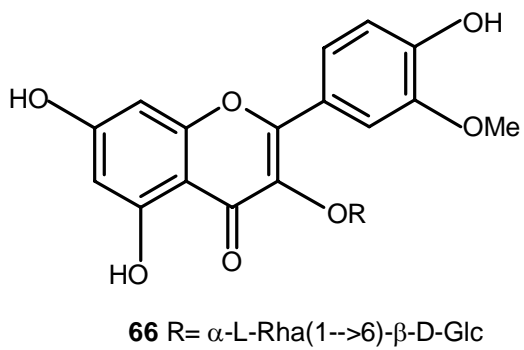
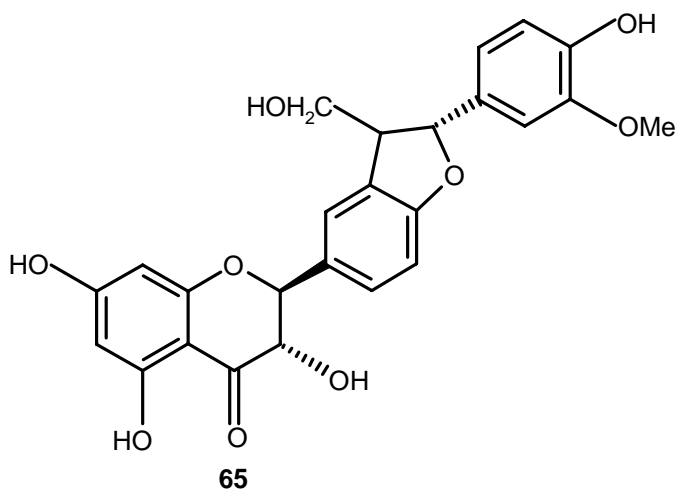
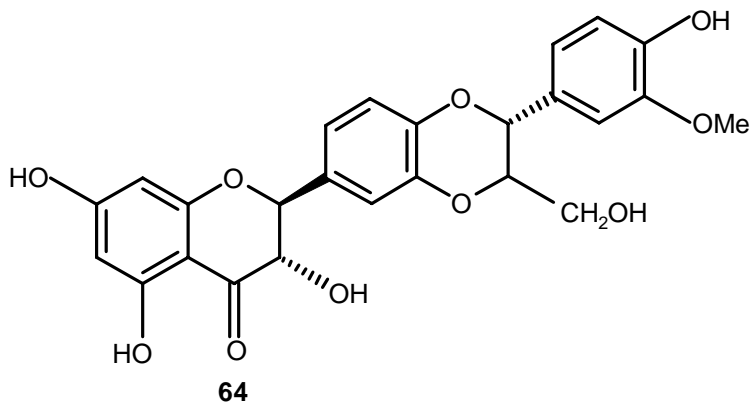
61 $R^1=[(\alpha\text{-D-galac})\text{Cello}]O$, $R^2=R^4=MeO$, $R^5=OH$

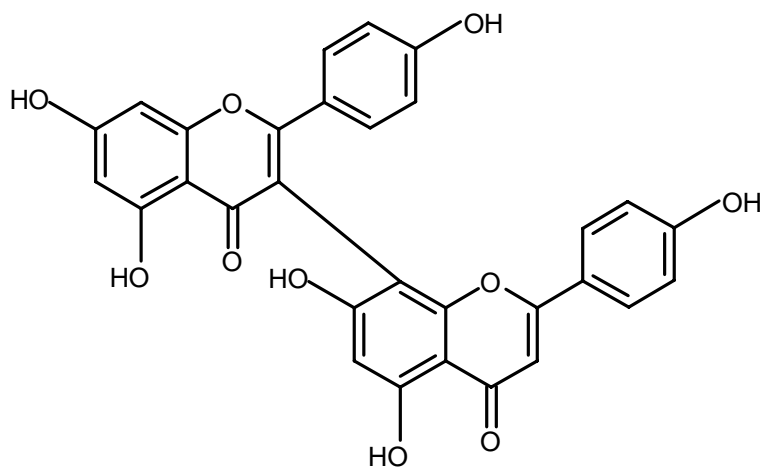


62 Pinocembrin

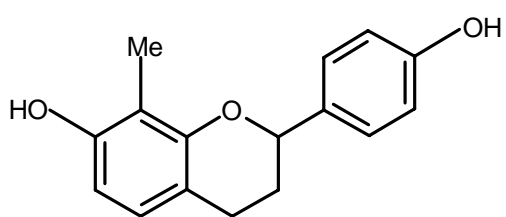


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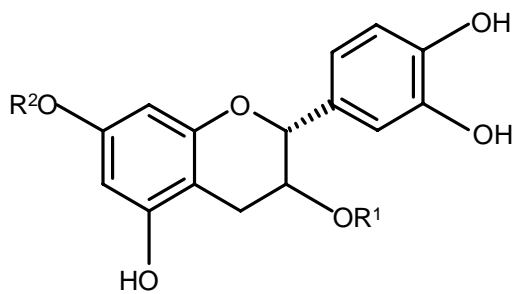




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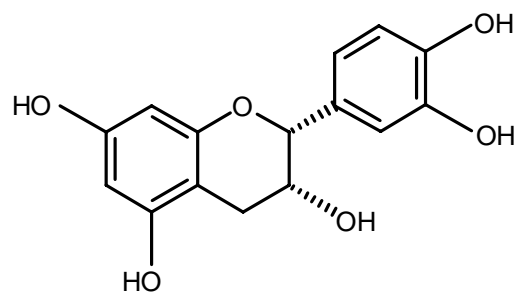
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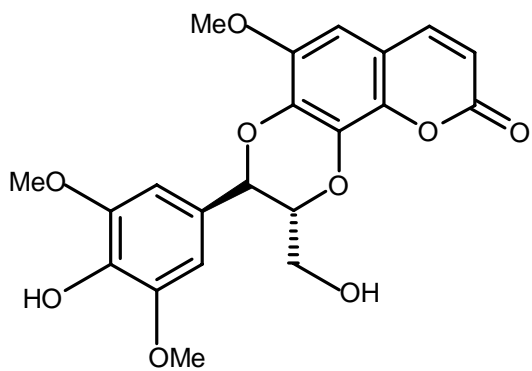
69 R¹=R²=H

70 R=H, R²=[β-D- Xylo]O, R=H

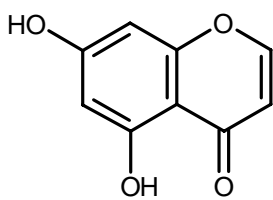
71 R=H, R²=[β-D- Apiofurano]O



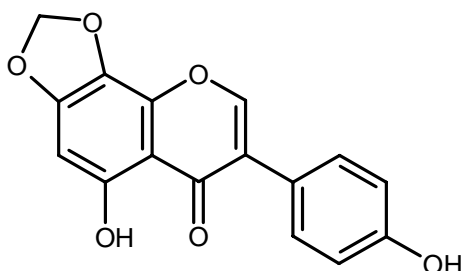
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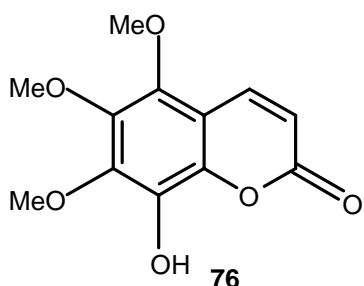
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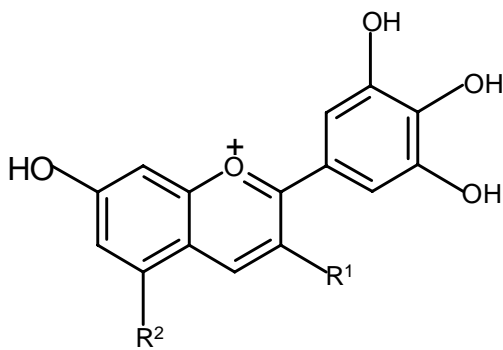
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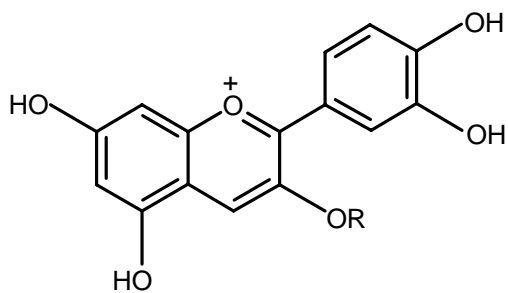


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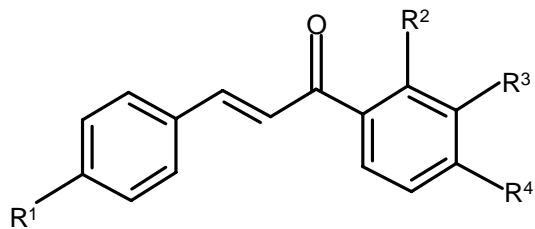
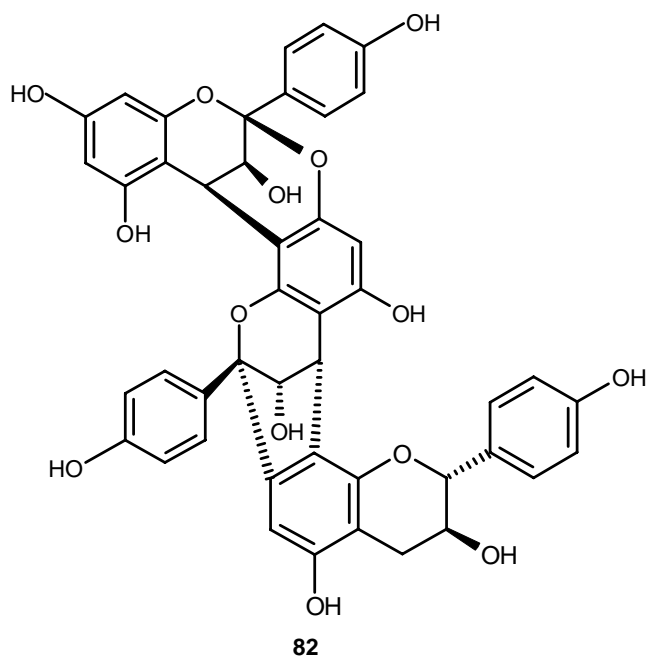
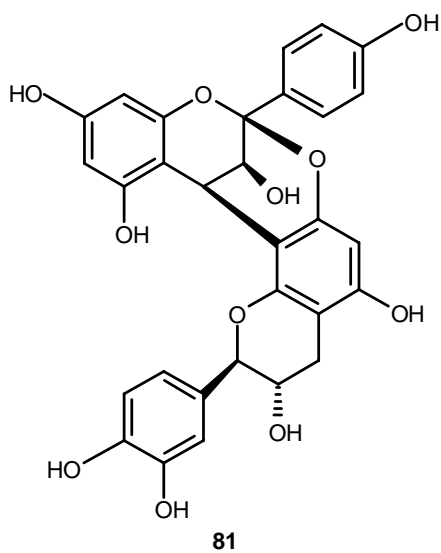
77 R¹=[(Xylo)galac]O, R²=[acetyl Glc]O

78 R¹=[(Xylo)galac]O, R²=[β-D-Glc]O



79 R= [(Glc) Rutin]O

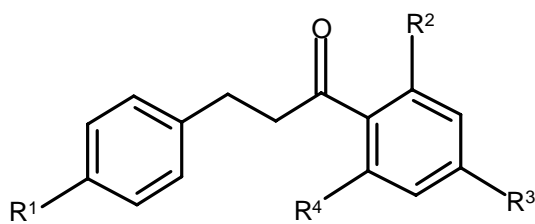
80 R= [Rutin]O



84 $R^1=R^2=R^3=OH, R^4=[\beta-D-(2''-O-acetyl-6''-cinnamoyl)-Glc]O$

85 $R^1=R^2=R^3=OH, R^4=[\beta-D-(2''-p-Coumaroyl)-Glc]O$

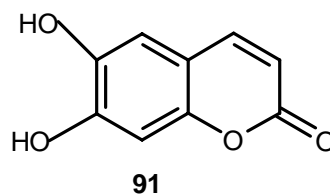
86 $R^1=R^2=R^3=OH, R^4=[\beta-D-(2''-p-Coumaroyl-6''-O-acetyl)-Glc]O$



88 $R^1=R^3=R^4=OH, R^2=[\beta-D-Glc]O$

89 $R^1=R^3=R^4=OH, R^2=[6''-O-acetyl-\beta-D-Glc]O$

90 $R^1=R^4=OH, R^3=MeO, R^2=[\beta-D-Glc]O$



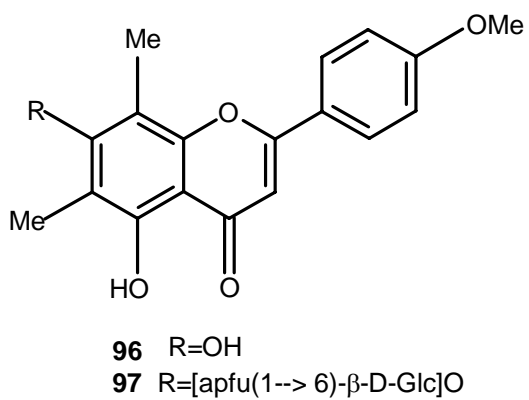
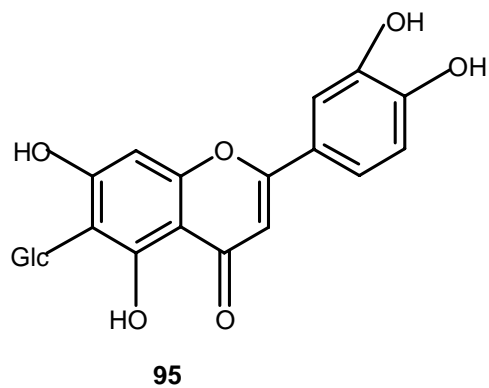
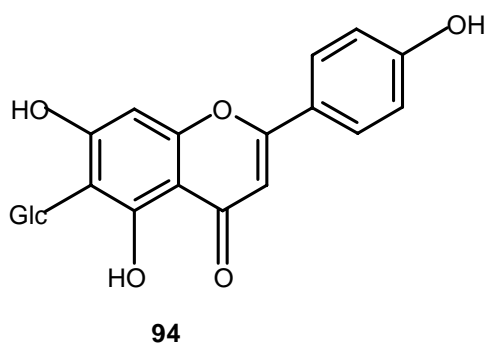
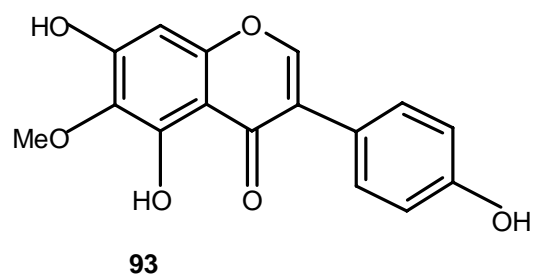
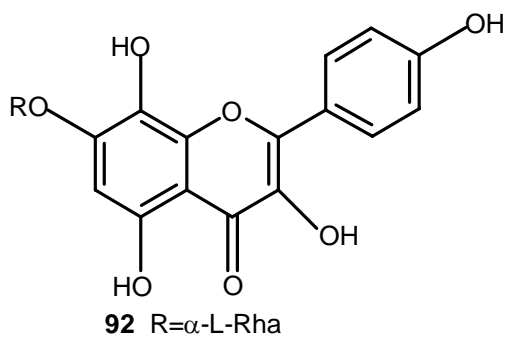
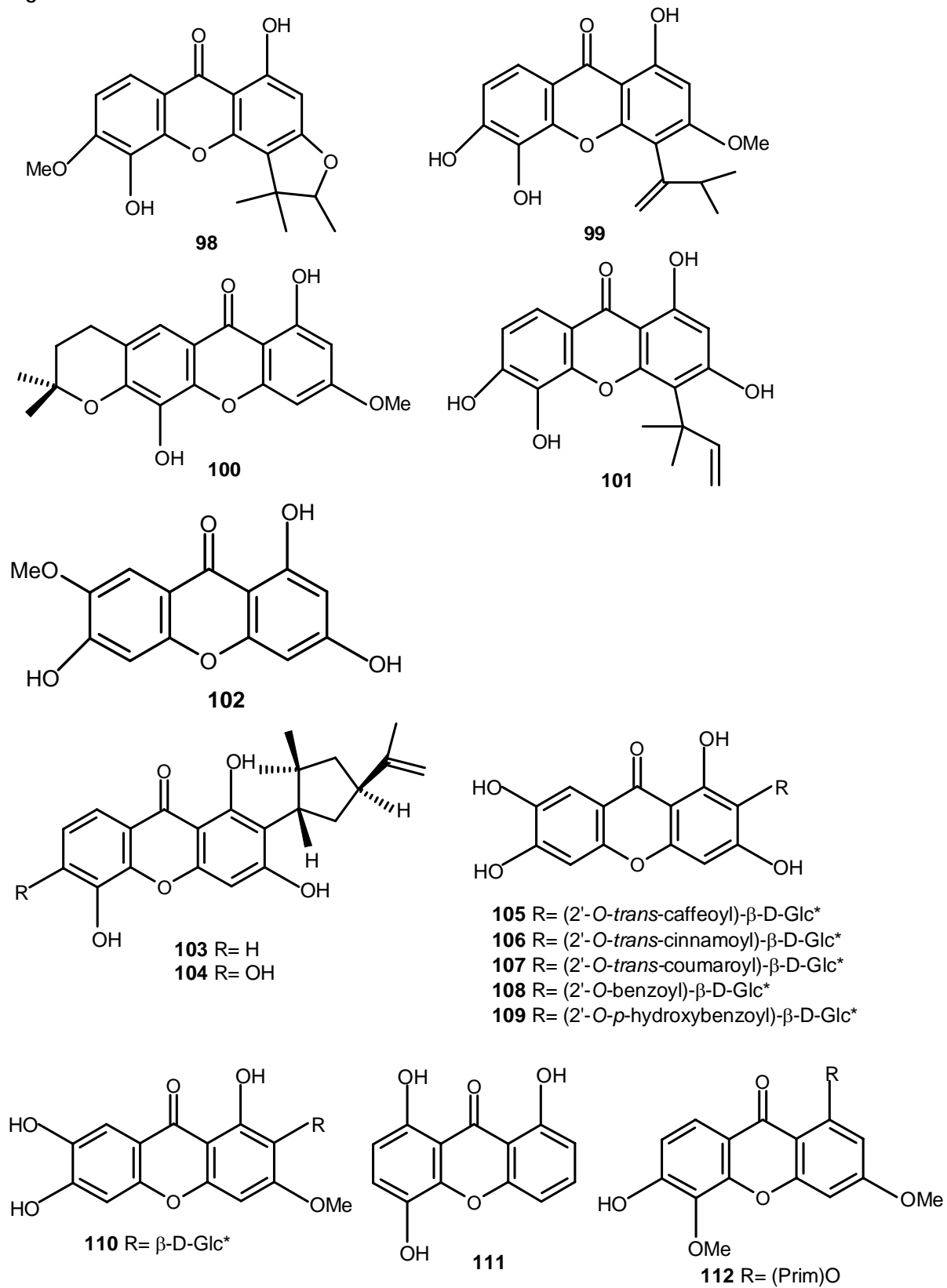
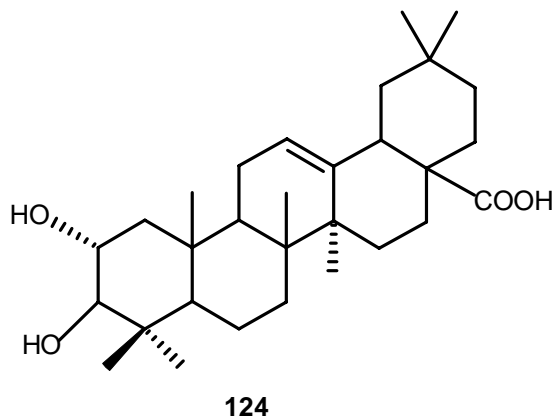
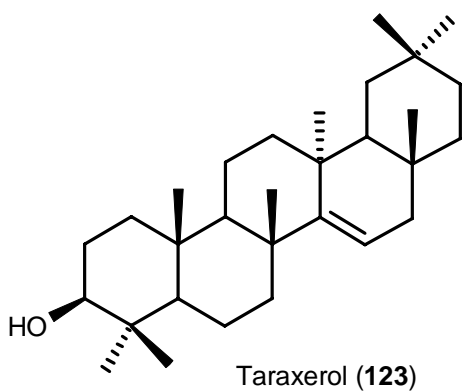
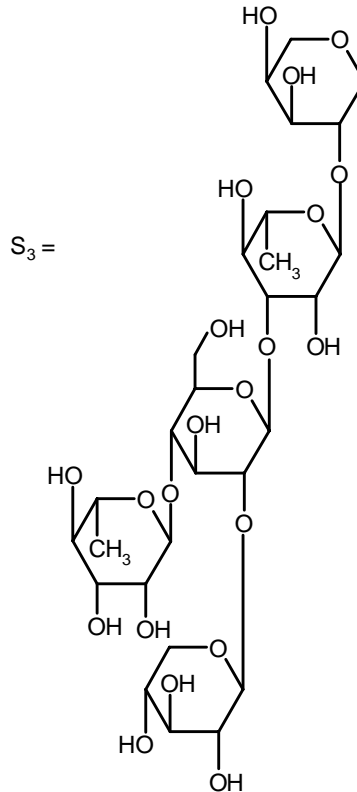
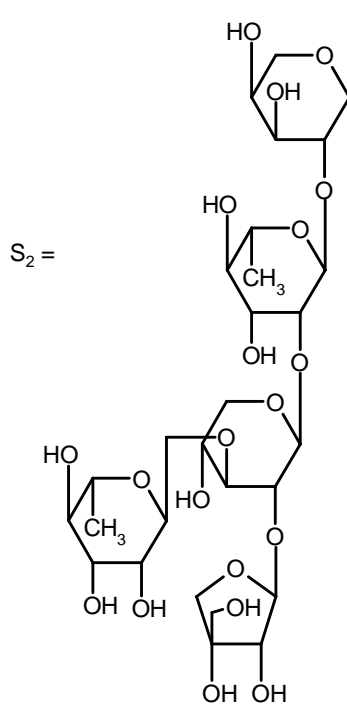
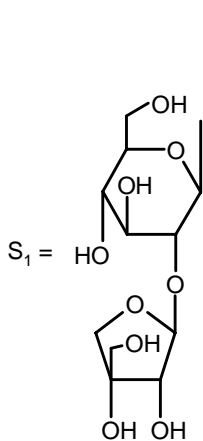
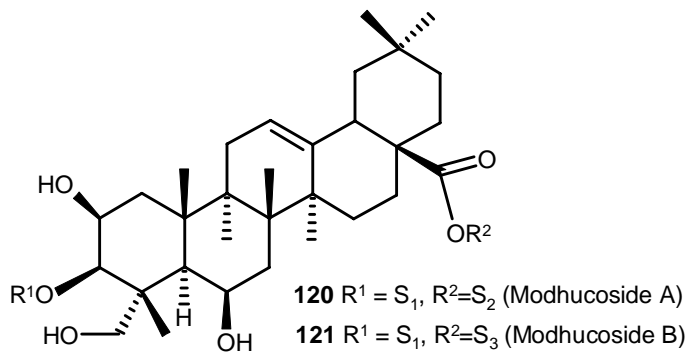
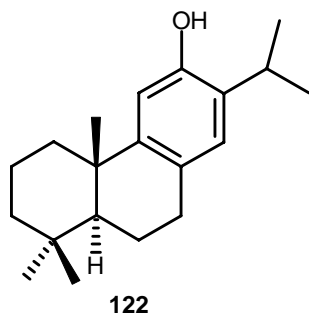
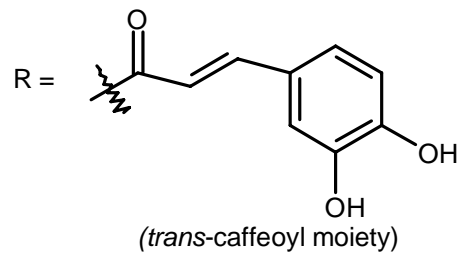
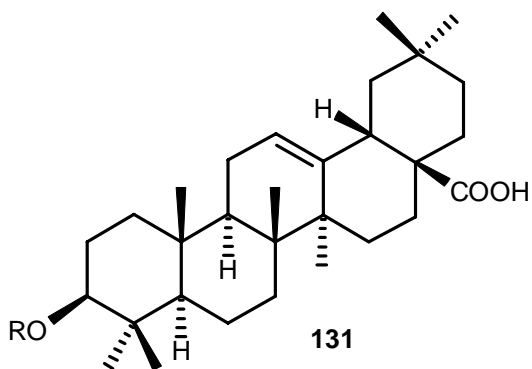
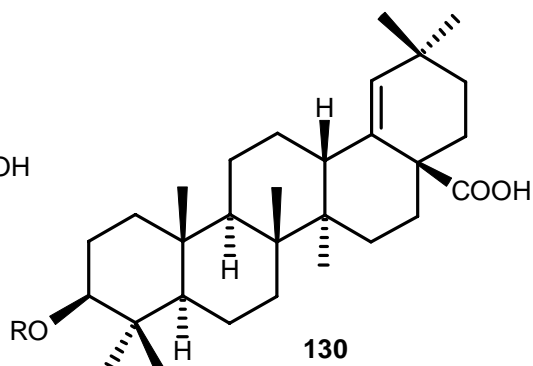
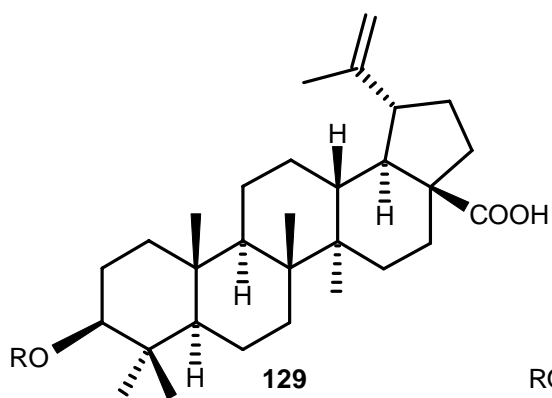
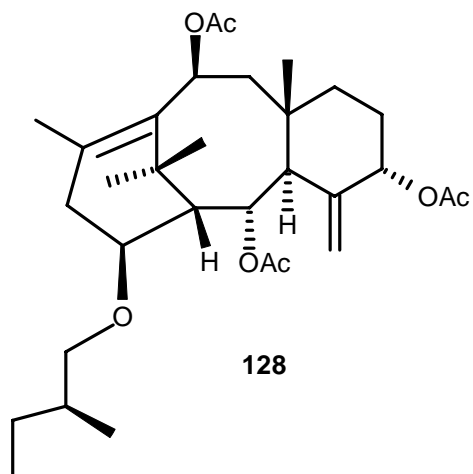
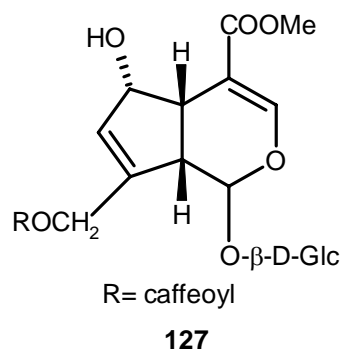
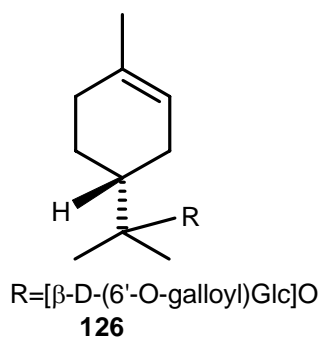
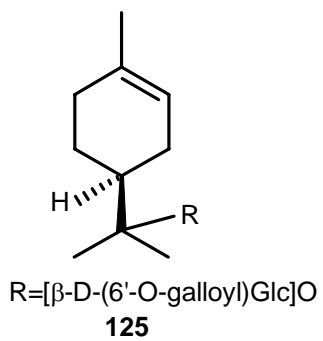


Fig. 2 Structures of antioxidant xanthonoids







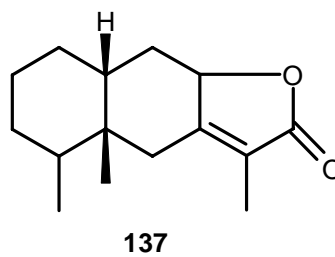
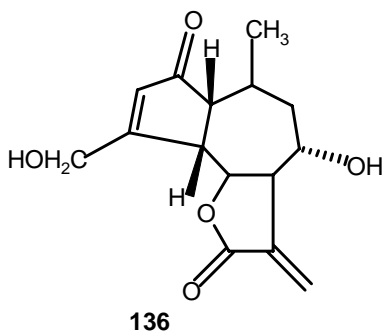
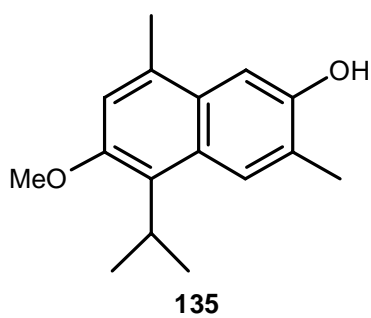
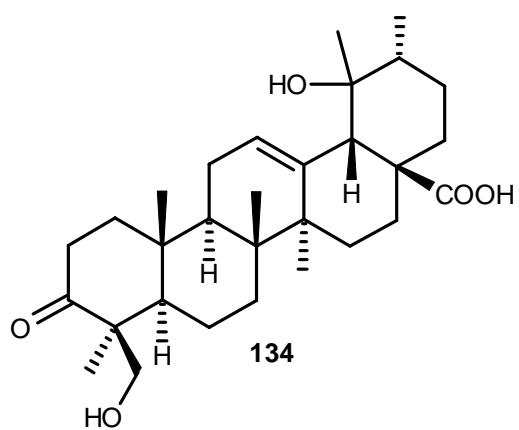
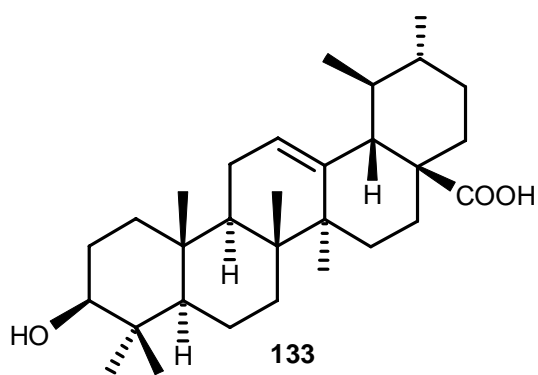
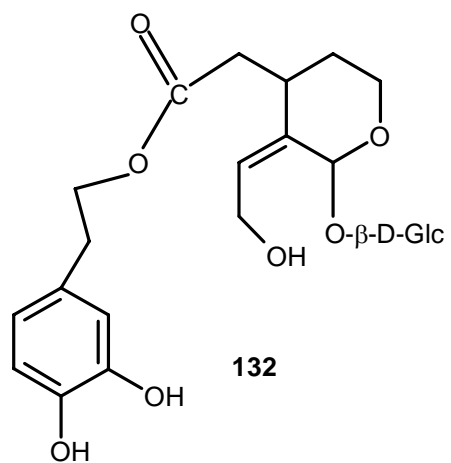


Fig. 4 Structures of antioxidant alkaloids

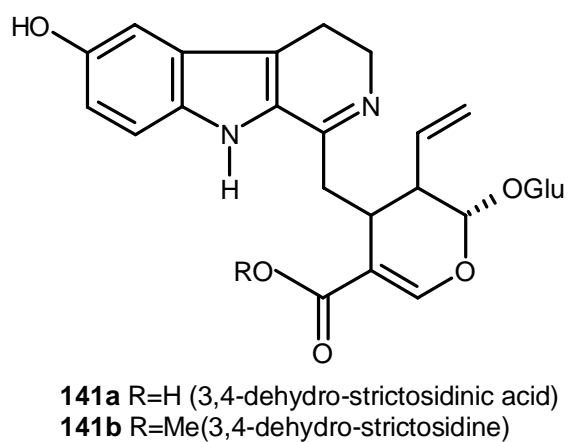
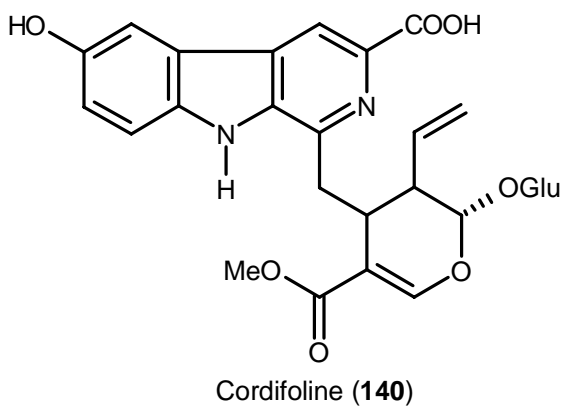
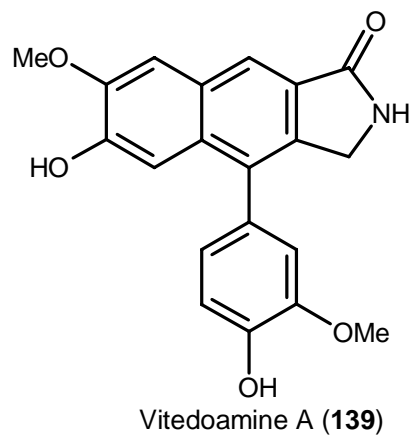
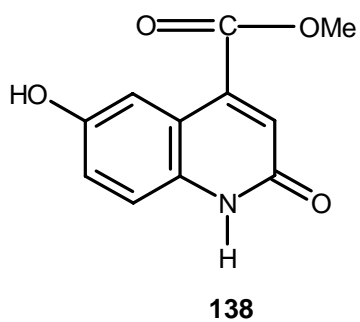
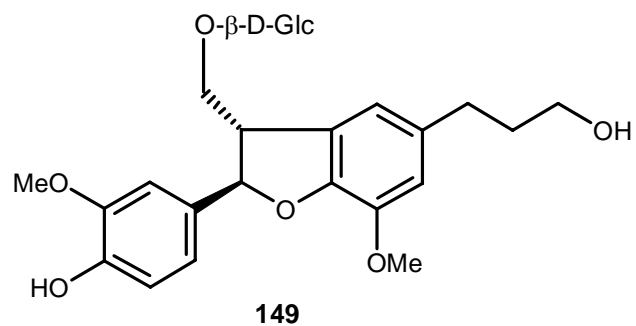
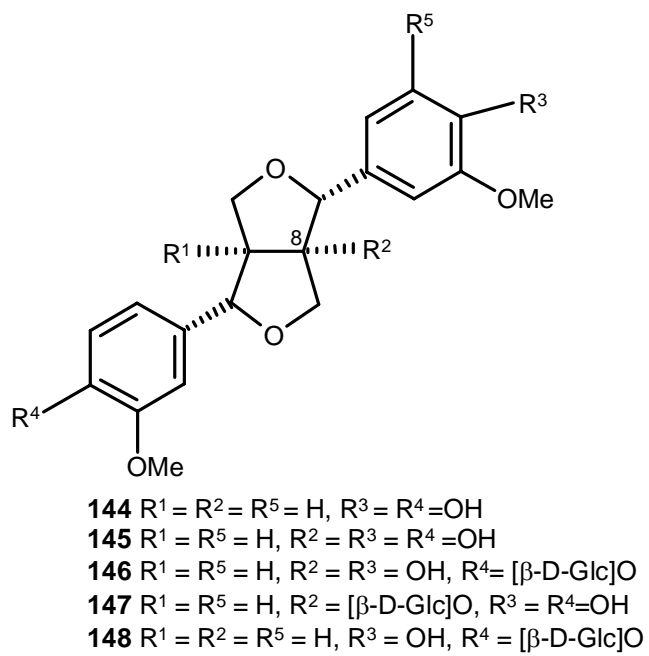
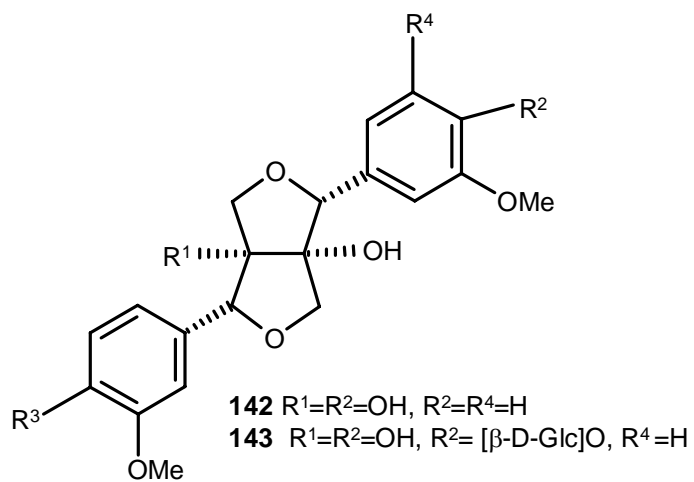
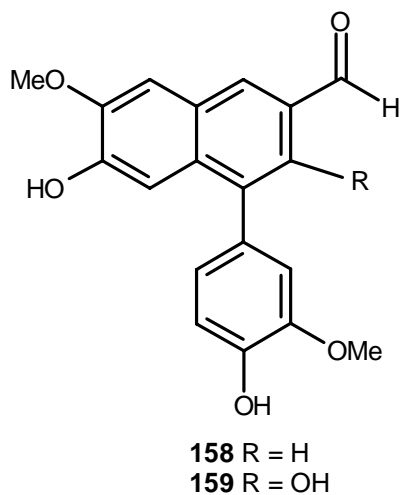
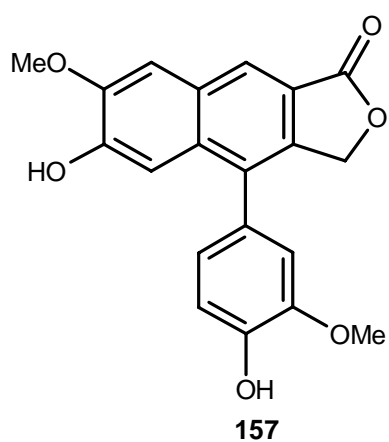
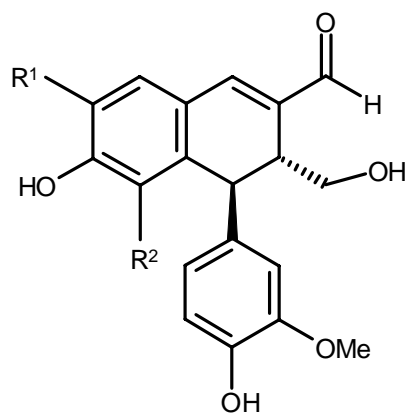
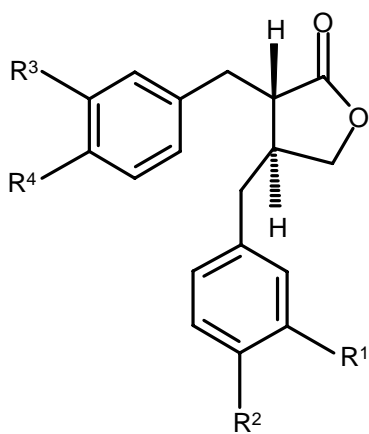
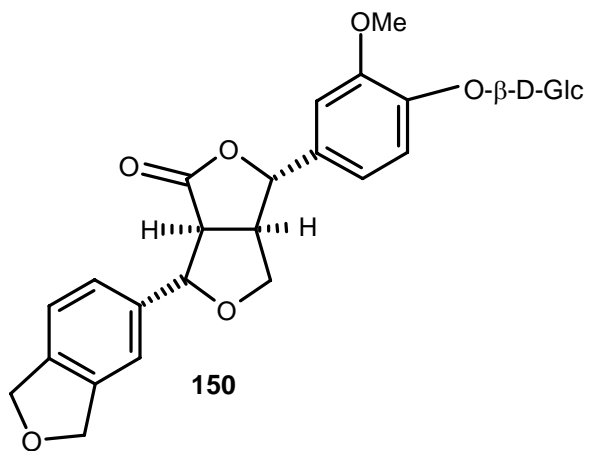
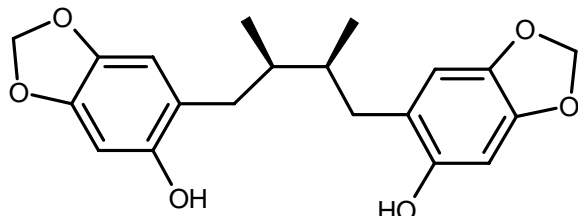


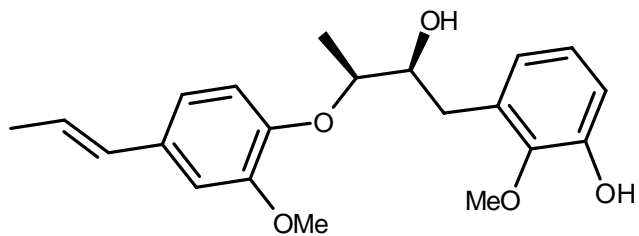
Fig. 5 Structures of antioxidant lignans



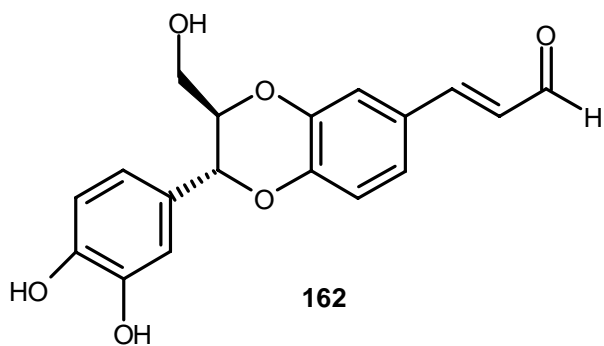




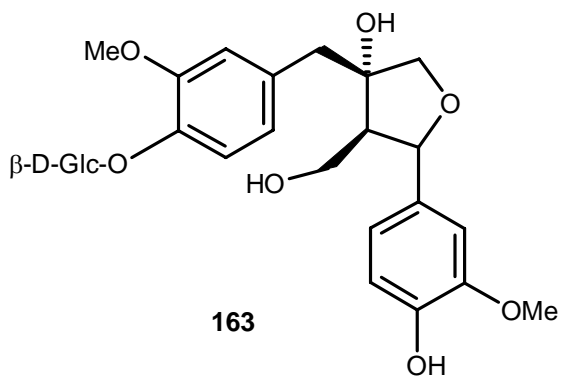
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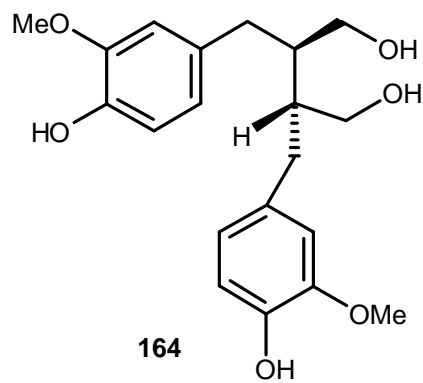
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162



163



164

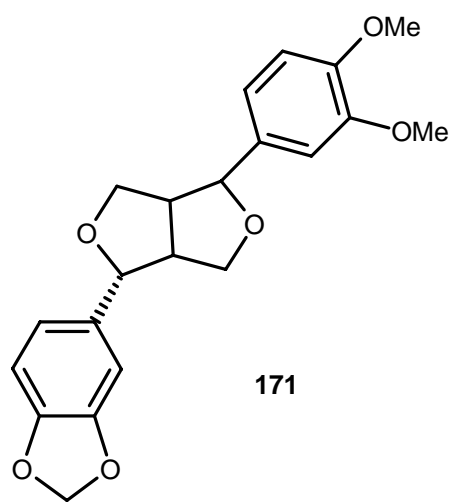
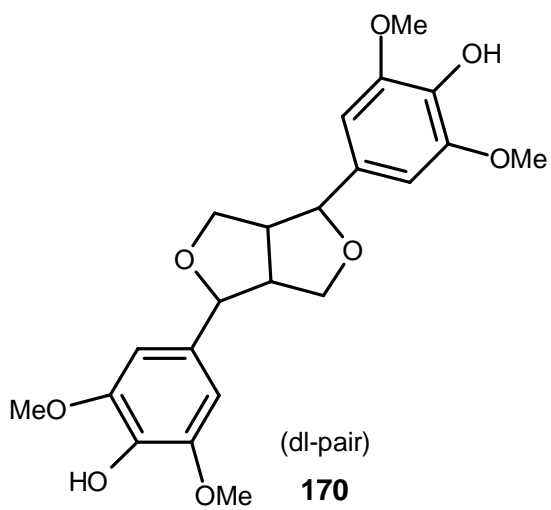
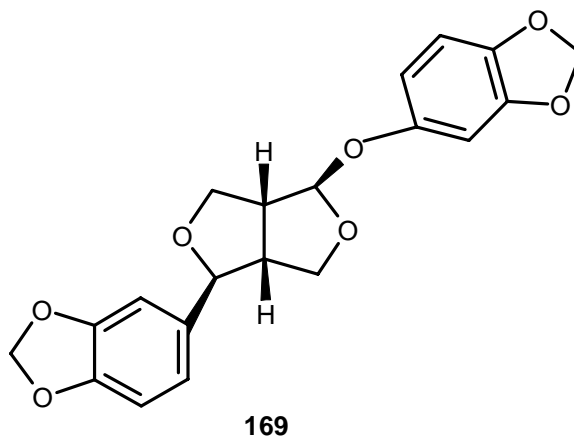
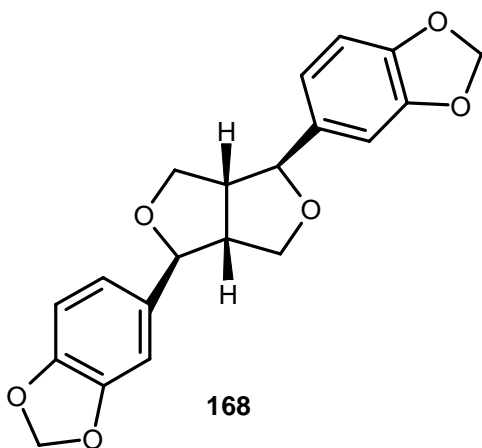
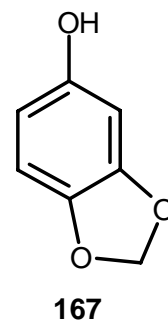
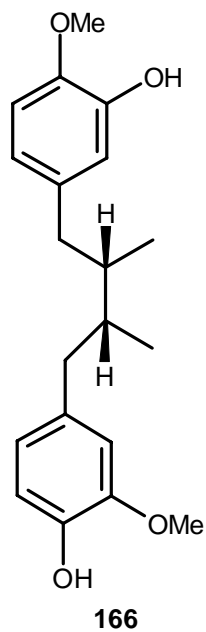
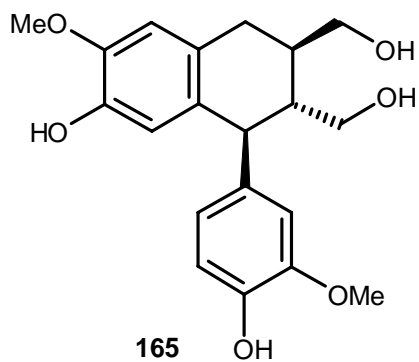
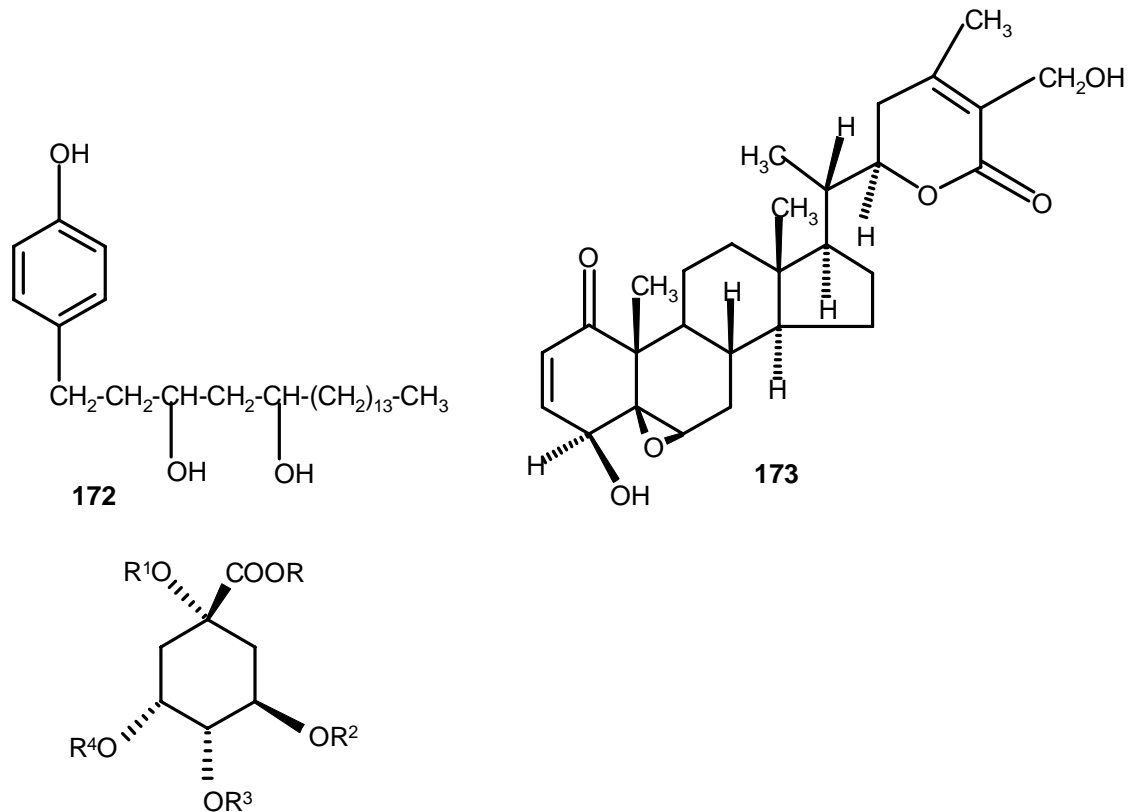
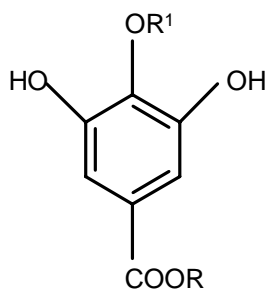


Fig. 6 Structures of antioxidant miscellaneous compounds



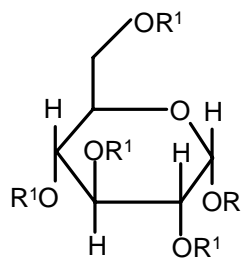
- 174 $\text{R}^4 =$ caffeoyl, $\text{R} = \text{R}^1 = \text{R}^2 = \text{R}^3 = \text{H}$
 175 $\text{R}^4 = p\text{-}(O\text{-galloyl})\text{caffeoyl}$, $\text{R} = \text{Me}$, $\text{R}^1 = \text{R}^2 = \text{R}^3 = \text{H}$
 176 $\text{R}^4 = p\text{-}(O\text{-galloyl})\text{caffeoyl}$, $\text{R} = \text{R}^1 = \text{R}^2 = \text{R}^3 = \text{H}$
 177 $\text{R}^4 =$ caffeoyl, $\text{R} = \text{Me}$, $\text{R}^1 = \text{R}^2 = \text{R}^3 = \text{H}$
 178 $\text{R}^3 =$ galloyl, $\text{R} = \text{R}^1 = \text{R}^2 = \text{R}^4 = \text{H}$
 179 $\text{R}^2 =$ 3-methylcaffeoyl, $\text{R} = \text{R}^1 = \text{R}^3 = \text{R}^4 = \text{H}$
 180 $\text{R}^4 =$ caffeoyl, $\text{R}^3 = \text{Me}$, $\text{R} = \text{R}^1 = \text{R}^2 = \text{H}$
 181 $\text{R}^2 =$ caffeoyl, $\text{R}^1 = \text{Me}$, $\text{R} = \text{R}^3 = \text{R}^4 = \text{H}$
 182 $\text{R} = \text{R}^1 = \text{Me}$, $\text{R}^2 = \text{R}^4 =$ caffeoyl, $\text{R}^3 = \text{H}$
 183 $\text{R}^4 =$ methylcaffeoyl, $\text{R} = n\text{-butyl}$, $\text{R}^1 = \text{R}^2 = \text{R}^3 = \text{H}$
 184 $\text{R}^2 = \text{R}^4 =$ caffeoyl, $\text{R} = \text{R}^1 = \text{R}^3 = \text{H}$
 185 $\text{R}^3 =$ succinyl, $\text{R}^2 = \text{R}^4 =$ caffeoyl, $\text{R} = \text{R}^1 = \text{H}$



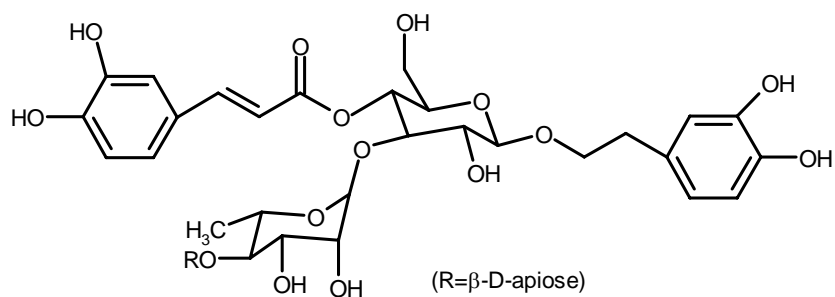
186 R=R¹=H

187 R=H, R¹=β-D-Glc

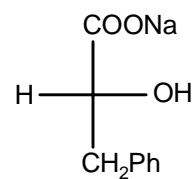
188 R=Me, R¹=H



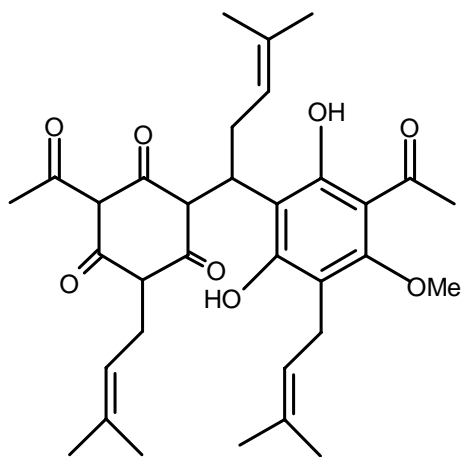
190 R=R¹=gallose



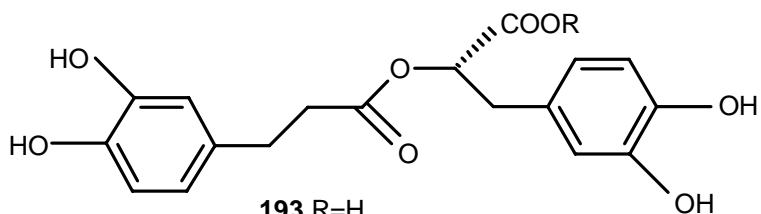
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191



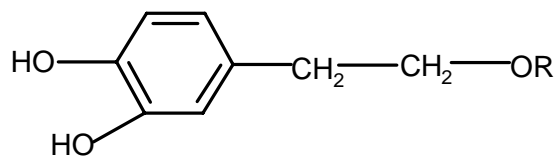
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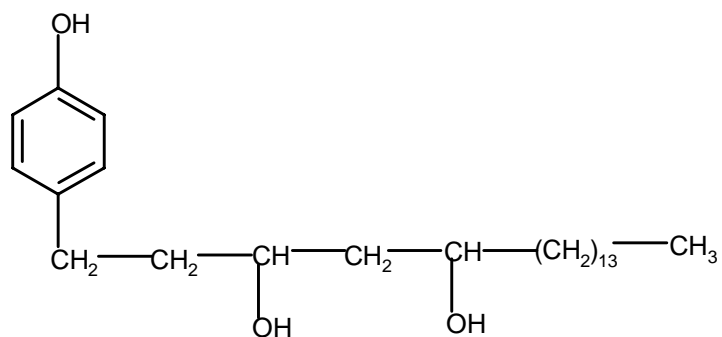
193 R=H

194 R=Me

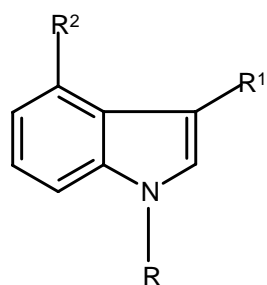
195 R=Et



196 R=sugar



197

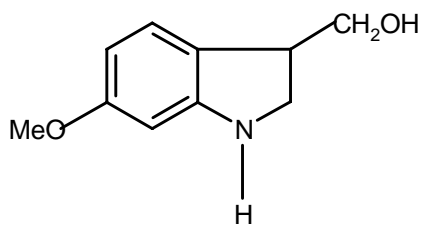


198 R=-CH₂CN,

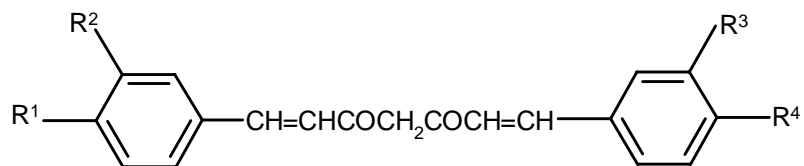
199 R=-CH₂CN, R¹=H, R²=OH

200 R=-CH(Ph)CN, R¹=H, R²=OH

201 R=R²=H, R¹=COOH,



202

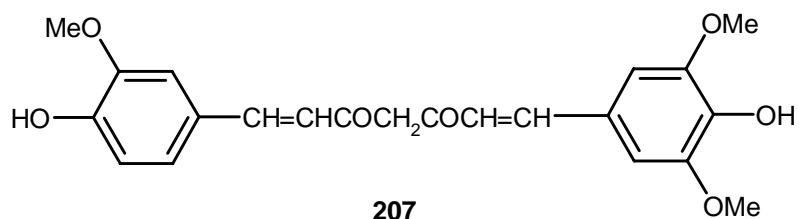


203 R¹=R⁴=OH, R²=R³=MeO

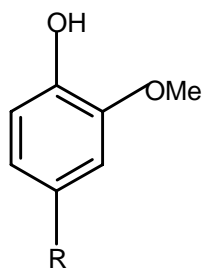
204 R¹=R⁴=OH, R²=R³=H

205 R¹=R²=R³=R⁴=MeO

206 R¹=R⁴=OH, R²=R³=H

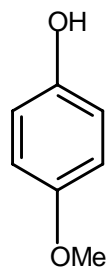


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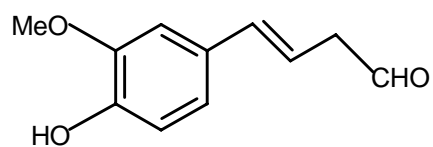


208 R=Me

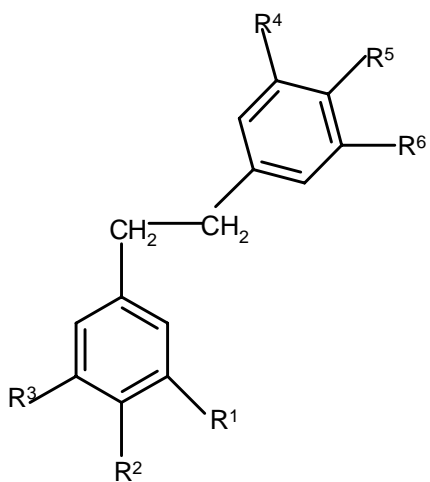
209 R=H



210



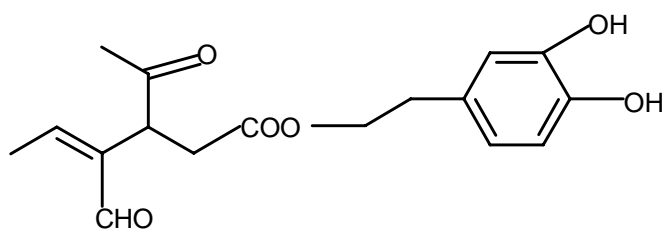
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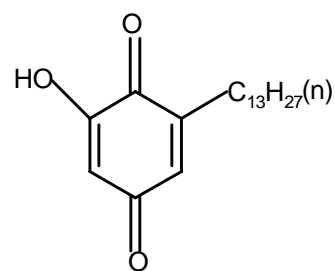
212 R¹=R³=R⁵=OH, R²=R⁶= *i*-pentenyl, R⁴=H

213 R¹=R³=R⁴=R⁵=OH, R⁶= *i*-pentenyl, R²=H

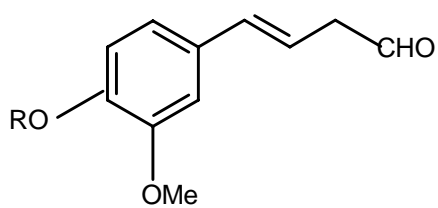
214 R¹=R³=R⁴=OH, R⁵=MeO, R⁶= *i*-pentenyl, R²=H



215

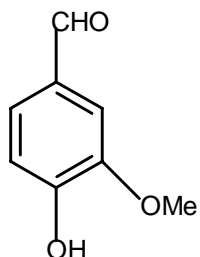


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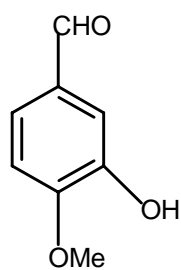


217 R=H

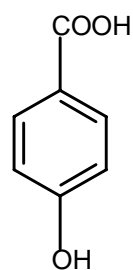
218 R=Me



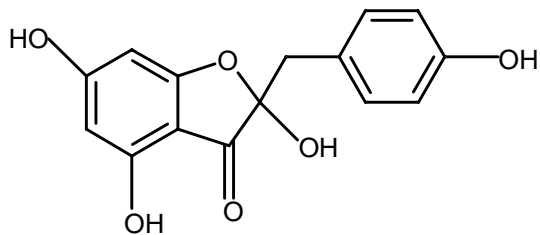
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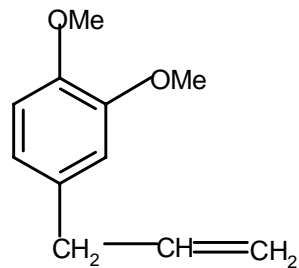
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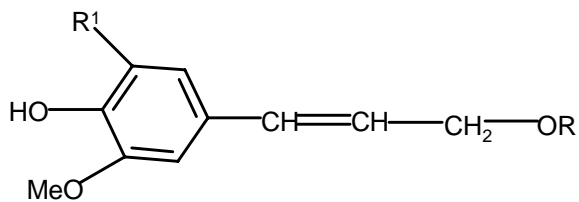
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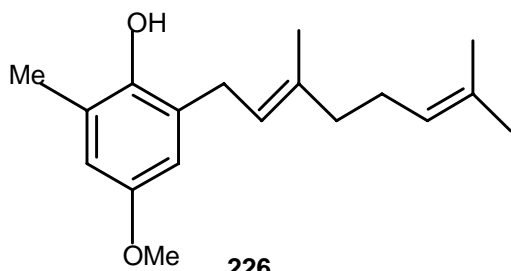


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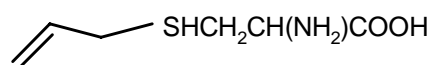


224 R=β-D-apfu(1→6)-O-β-D-Glc , R¹=H

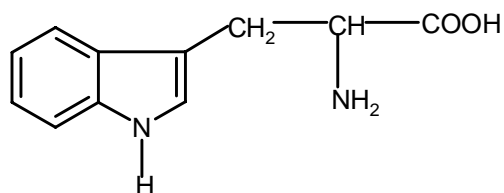
225 R=β-D-apfu(1→6)-O-β-D-Glc , R¹=OMe



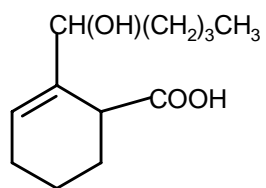
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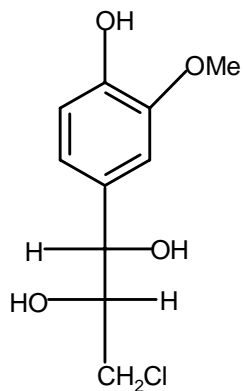
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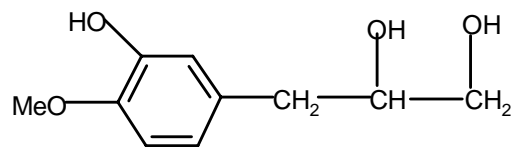
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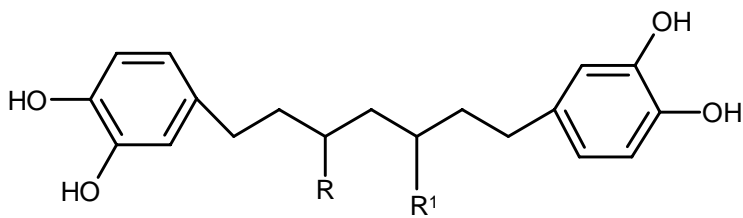
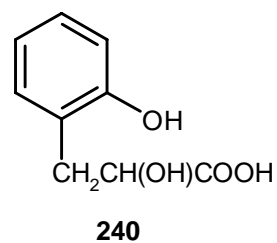
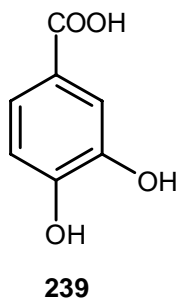
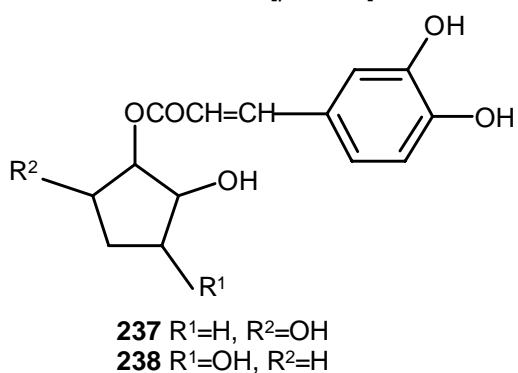
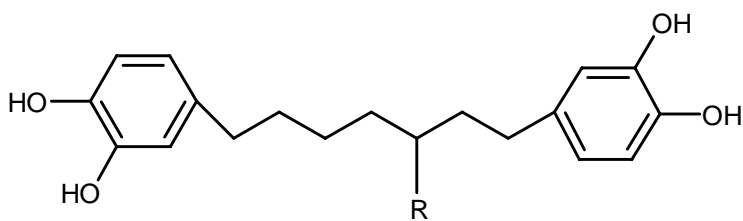
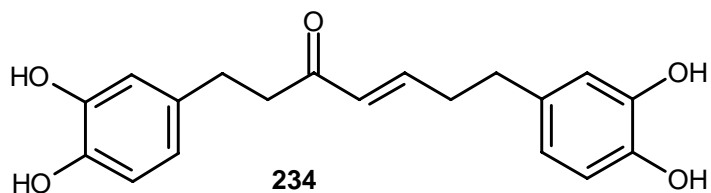
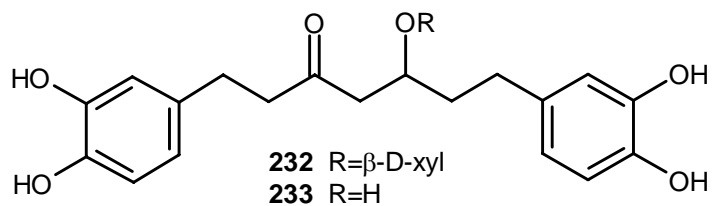
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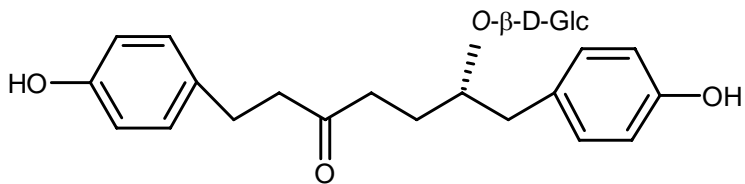


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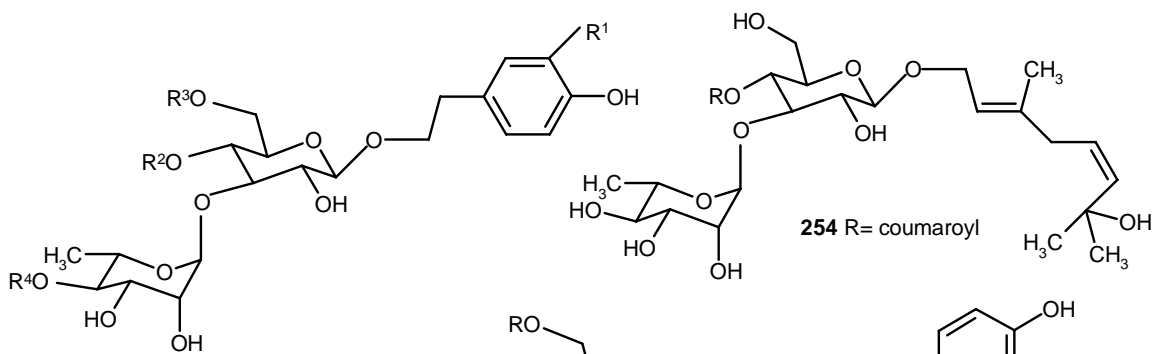


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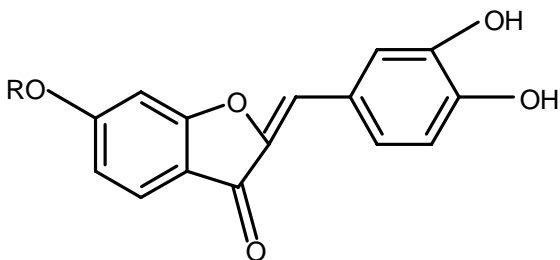


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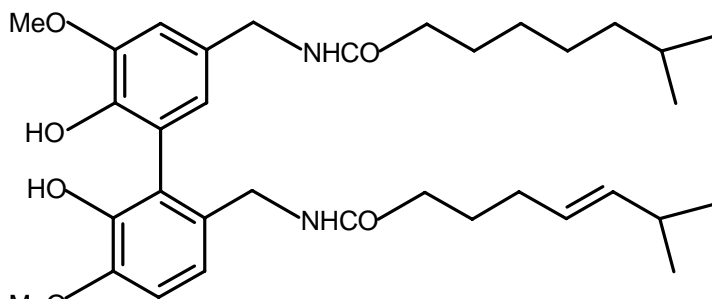


- 247** R¹=R²=R³=H, R⁴=Rha
248 R¹=R³=H, R²=caffeoyl, R⁴=Rha
249 R¹=R³=R⁴=H, R²=coumaroyl
250 R¹=R²=R⁴=H, R³=coumaroyl
251 R¹=OH, R²=caffeoyl, R³=R⁴=H
252 R¹=OH, R²=caffeoyl, R³=H, R⁴=Rha
253 R¹=R³=H, R²=coumaroyl, R⁴=Rha

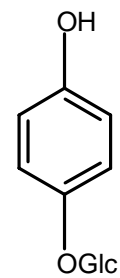
- 254** R= coumaroyl
255 R=H
256 R=Rha



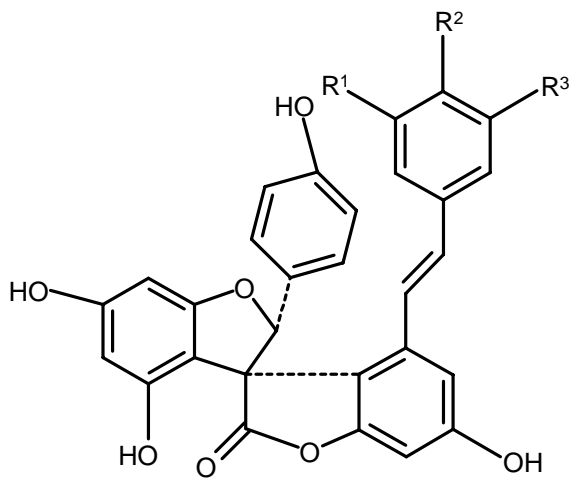
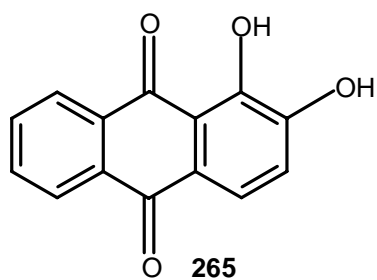
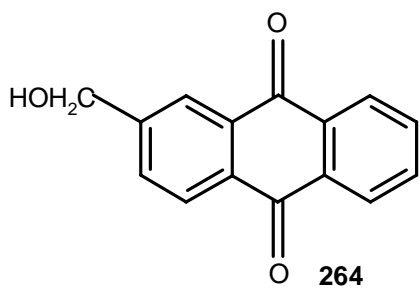
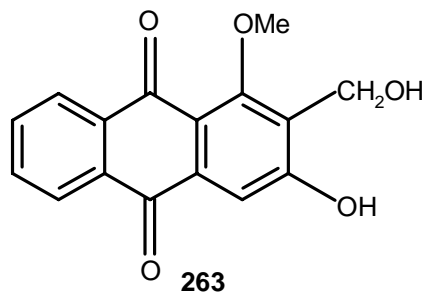
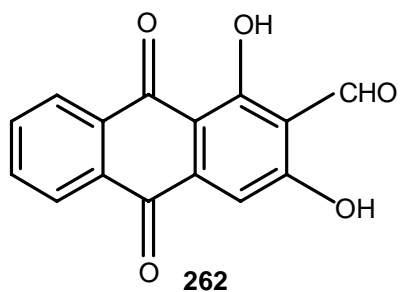
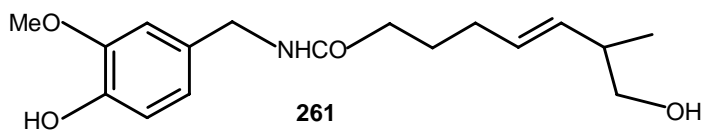
- 257** R=H
258 R=Glc



259

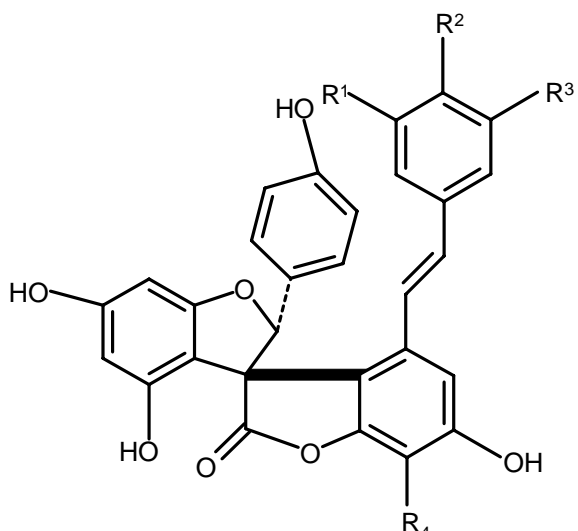


260



266 R¹=H, R²=OH, R³=H

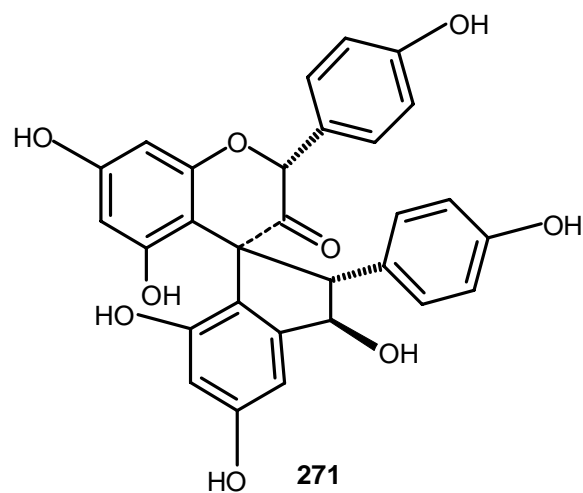
267 R¹=OH, R²=OMe, R³=OH



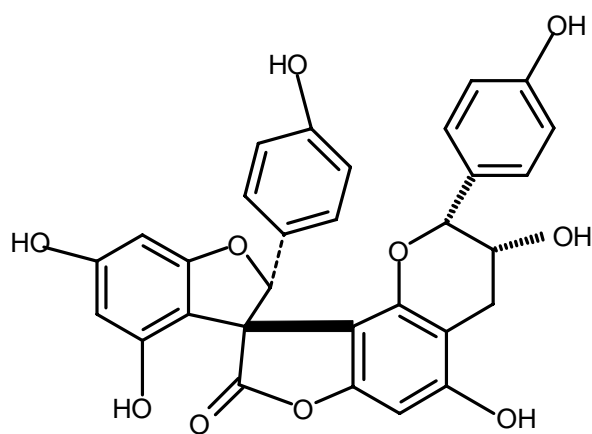
268 R¹=H, R²=OH, R³=H, R⁴=H

269 R¹=OH, R²=OMe, R³=OH, R⁴=H

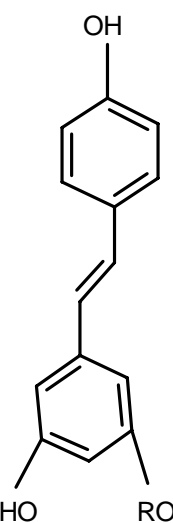
270 R¹=OH, R²=H, R³=OH, R⁴=OMe



271



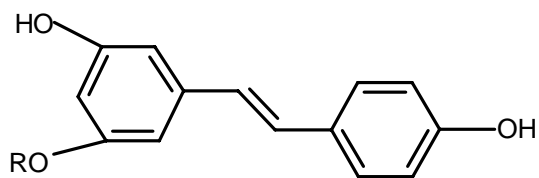
272



273 R= H

274 R=(6''-galloyl)-O-β-D-Glc

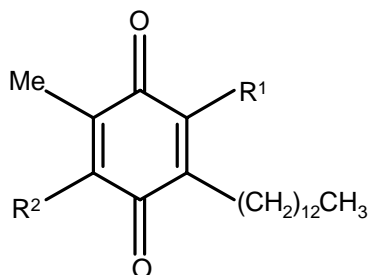
275 R=(4''-acetyl)-O-β-D-Xyl



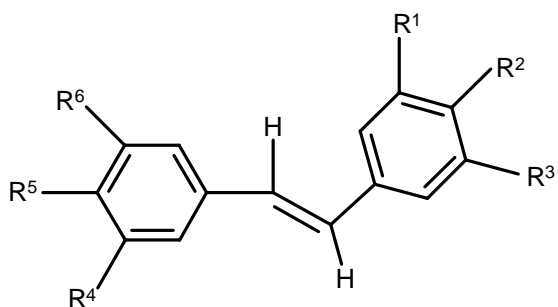
273 R= H

274 R=(6''-galloyl)-O-β-D-glucopyranosyl

275 R=(4''-acetyl)-O-β-D-xylopyranosyl

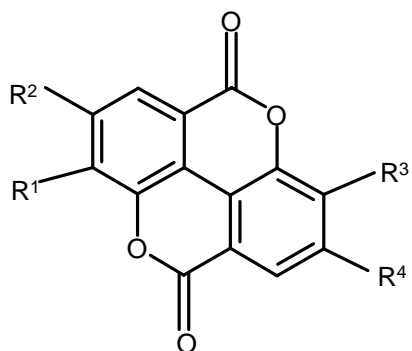


276 R¹=AcO, R²=OH
277 R¹=OH, R²=AcO

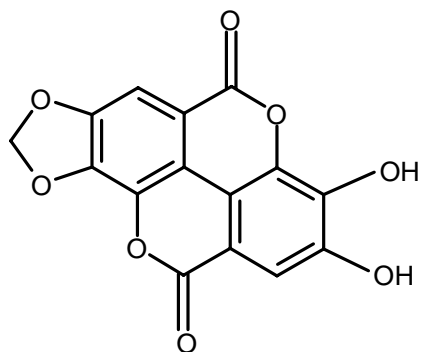


non-hydrogen substituents (R) are indicated

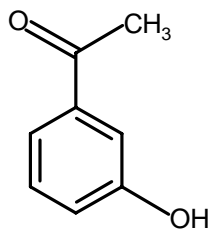
278 R¹=MeO, R³=R⁵=OH
279 R¹=R³=OH, R⁵=MeO
280 R¹=R³=R⁴=R⁶=OH, R²=MeO



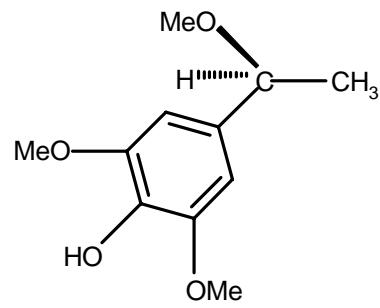
281 R¹=R²=R³=R⁴=OH
282 R¹=R³=MeO, R²=R⁴=OH
283 R¹=R³=R⁴=MeO, R²=OH
284 R¹=MeO, R³= [α-L-(3''-O-acetyl)Rha]O, R²=R⁴=OH
285 R¹=MeO, R³= [α-L-(2''-O-acetyl)Rha]O, R²=R⁴=OH
286 R¹=MeO, R³= [α-L-(4''-O-acetyl)Rha]O, R²=R⁴=OH



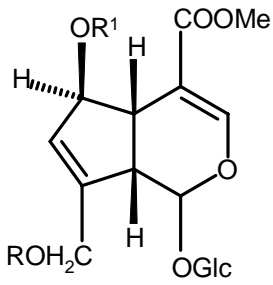
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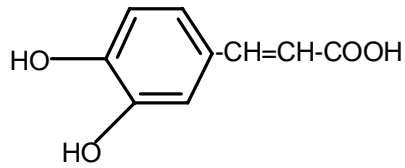
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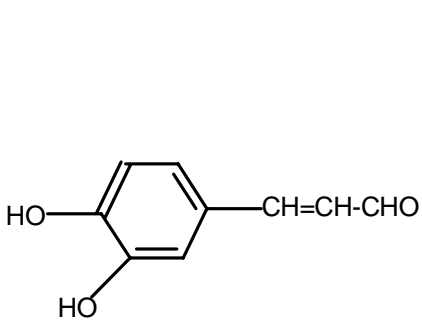
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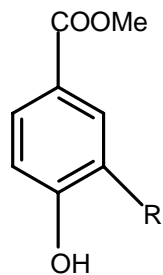
290 R=caffeoyl, R¹= H
291 R= H, R¹=Me
292 R=R¹=H



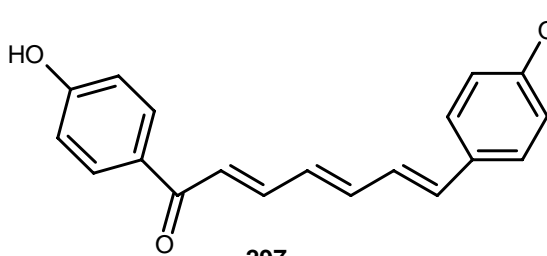
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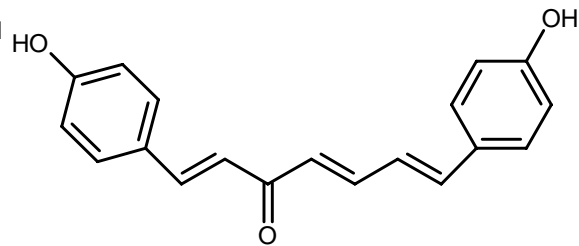
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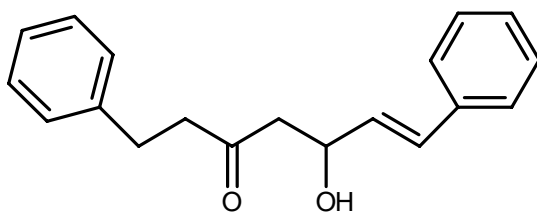
295 R=H
296 R=OH



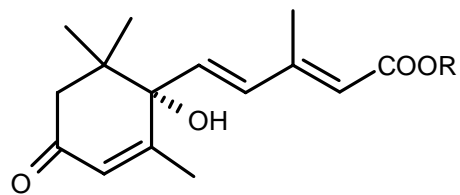
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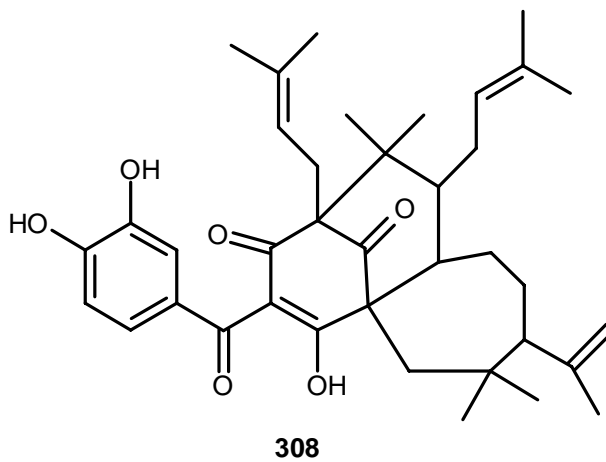
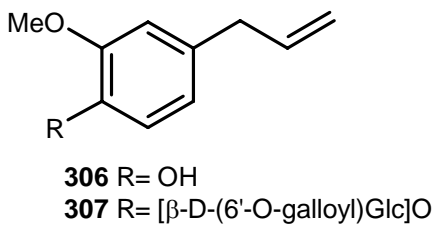
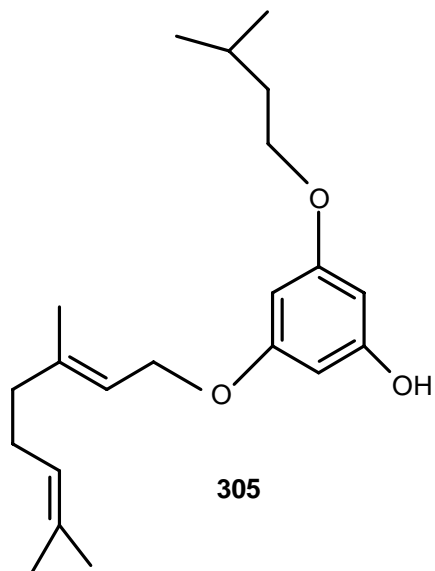
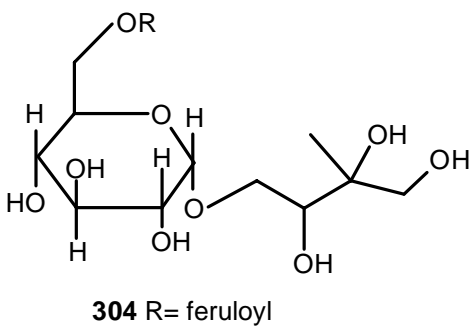
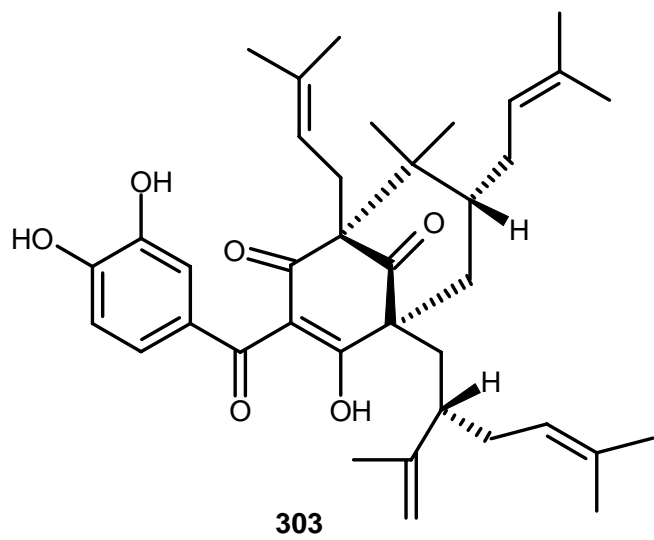
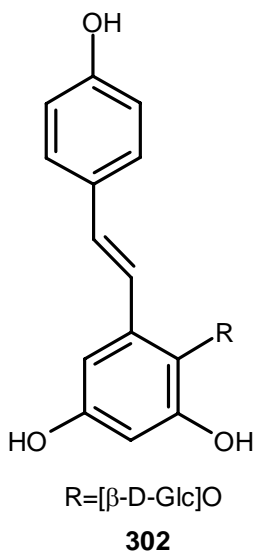
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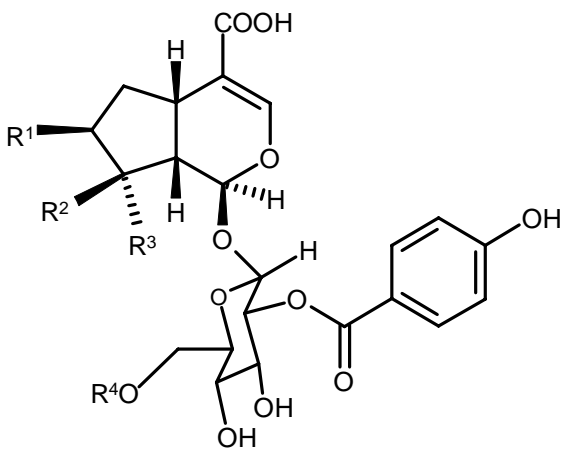
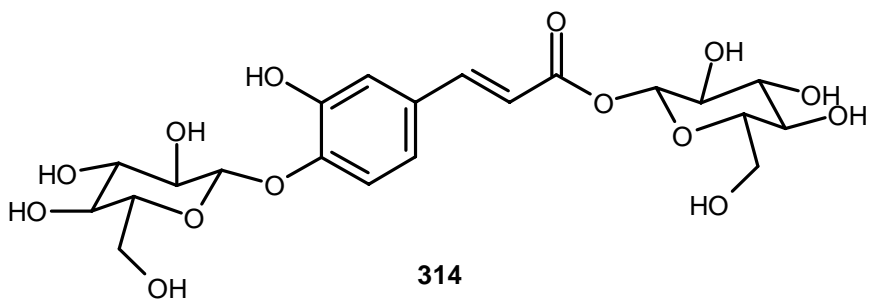
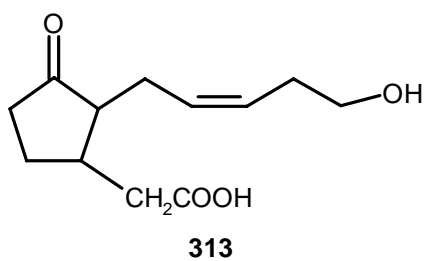
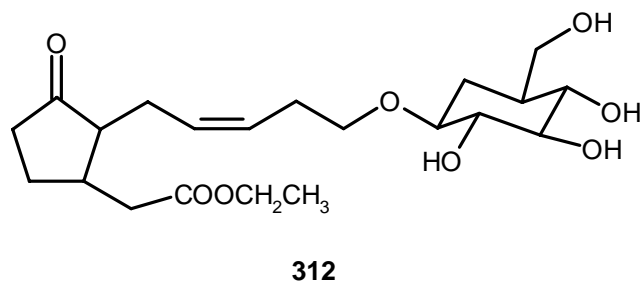
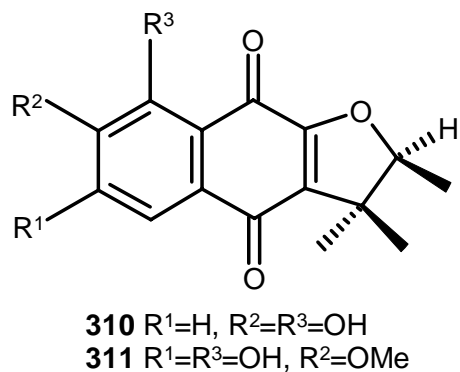
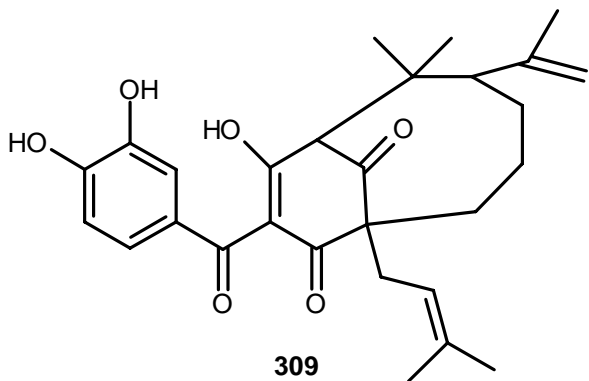


299



300 R= H
301 R= β-D-Glc





Abbreviations: Glc = glucopyranosyl (* denotes C-glycoside); Ara = arabinopyranosyl; Galac = galactopyranosyl; Gent = gentiobiosyl; Prim = primverosyl; Rha = rhamnopyranosyl; Xyl = xylopyranosyl; cell = cellobiosyl.

Systematic name: Primverosyl = (O-[[5-methoxy-2-(methoxycarbonyl)]phenyl]- β -D-glucopyranosyl)-(6 \rightarrow 1)-xylopyranosyl; Gentiobiosyl = 6-O-(β -D-glucopyranosyl)- β -D-glucopyranosyl; Feruloyl = 3-(4-hydroxy-3-methoxyphenyl)prop-2-enoyl; *p*-Coumaroyl = 3-(4-hydroxyphenyl)prop-2-enoyl

