SUPPLEMENTAL INFORMATION

Antioxidant and Hepatoprotective Activity of Phenyl Glycosides Isolated from 
*Heliciopsis lobata*

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ABSTRACT

A new macrocyclic glycoside named helilobatoside A (1) and five known phenyl glycosides as 3,5-dimethoxy-4-hydroxyphenyl-1-\(\beta\)-D-glucopyranoside (2), tachioside (3), isotachioside (4), 1-(4-hydroxy-3-methoxyphenyl)-1-propanone-3-\(\beta\)-D-glucopyranoside (5), and 1-(4-hydroxy-3,5-dimethoxyphenyl)-1-propanone-3-\(\beta\)-D-glucopyranoside (6), were isolated from the wood of *Heliciopsis lobata* (Merr.) Sleumer. Their chemical structures were elucidated using combination of HR-ESI-MS, 1D and 2D NMR spectral data as well as by comparison with data in the previous literature. This is the first time the \(^{13}\)C NMR data of compounds 5 and 6 were reported and also were assigned by HSQC and HMBC spectra. Compounds 2-6 were first isolated from *Heliciopsis* genus. The isolated compounds were evaluated for their antioxidant and hepatoprotective activities *in vitro*. Compound 2 showed potential as an antioxidant in a DPPH assay (\(IC_{50} = 6.07 \pm 0.17 \ \mu g/mL\)) and in TBARS assay (\(IC_{50} = 89.55 \pm 8.26 \ \mu g/mL\)). This compound could also reduce the toxic effects CCl\(_4\) on HepG2 survival and significantly protect the viability of cells up to 52.25 \pm 4.36\% at the 100 \(\mu g/mL\) treatment (\(P<0.05\)). Thus, with obtained results, the hepatoprotective activity of 2 could be related to radical scavenging and limited the lipid peroxidative activities.

**Keywords**: Proteaceae, *Heliciopsis lobata*, helilobatoside A, phenyl glycoside, antioxidant activity, hepatoprotective activity
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**Table S1:** The $^1$H and $^{13}$C NMR data for compounds 1 and 1a

|   | 1a $^b$δC  | δC$^{ab}$ | δH$^{abc}$ (mult., $J$ = Hz) |
|---|------------|-----------|-----------------------------|
| 1 | 123.1      | 122.6     | -                           |
| 2 | 112.2      | 131.2     | 7.97 (1H, d, $J$ = 8.5 Hz)   |
| 3 | 148.5      | 115.9     | 7.18 (1H, d, $J$ = 8.5 Hz)   |
| 4 | 150.1      | 160.7     | -                           |
| 5 | 114.4      | 115.9     | 7.18 (1H, d, $J$ = 8.5 Hz)   |
| 6 | 122.5      | 131.2     | 7.97 (1H, d, $J$ = 8.5 Hz)   |
| 7 | 165.3      | 165.0     | -                           |
| 1’| 123.1      | 122.5     | -                           |
| 2’| 112.1      | 112.3     | 7.42 (1H, d, $J$ = 2.0 Hz)   |
| 3’| 148.4      | 148.5     | -                           |
| 4’| 149.8      | 149.9     | -                           |
| 5’| 114.3      | 114.4     | 7.39 (1H, d, $J$ = 8.5 Hz)   |
| 6’| 122.4      | 123.0     | 7.81 (1H, dd, $J$ = 8.5, 2.0 Hz) |
| 7’| 165.2      | 165.3     | -                           |
| 3-OMe | 55.5      | -         | -                           |
| 3’-OMe | 55.5      | 55.6     | 3.79 (3H, s)                |

**Glc**

|   | 1” | 98.2 | 98.3 | 5.25 (1H, d, $J$ = 7.5 Hz) |
|   | 2” | 72.8 | 72.8 | 3.38*                      |
|   | 3” | 76.9 | 76.9 | 3.39*                      |
|   | 4” | 70.6 | 70.7 | 3.18 (1H, t, $J$ = 9.0 Hz)  |
|   | 5” | 73.5 | 73.5 | 3.97 (1H, m)               |
|   | 6” | 65.5 | 65.1 | 4.42 (1H, dd, $J$ = 11.5, 1.5 Hz) |

**All**

|   | 1””| 96.7 | 96.9 | 5.36 (1H, d, $J$ = 8.0 Hz) |
|   | 2””| 71.7 | 69.9 | 3.56 (1H, dd, 8.0, 3.0)   |
|   | 3””| 69.8 | 71.6 | 3.98 (1H, t, $J$ = 3.0 Hz) |
|   | 4””| 68.2 | 68.2 | 3.45 (1H, dd, 9.0, 3.0)   |
|   | 5””| 71.5 | 71.2 | 4.25 (1H, m)              |
|   | 6””| 65.1 | 65.1 | 4.36 (1H, dd, $J$ = 11.5, 2.0 Hz) |

Measured in a)DMSO-d6, b)125 MHz, c)500 MHz, δC of clemahexapetoside B (1a) in DMSO-d6.

Overlapped signals

(Shi SP, Dong CX, Jiang D, Tu PF, Macroyclic glycosides from *Clematis hexapetala*, Helvetica Chimica Acta. 2006;89:3002-3006. doi.org/10.1002/hlca.200690269)
|   | 2                  | 3                        | 4                        |
|---|--------------------|--------------------------|--------------------------|
| C | δ\textsubscript{C} \textsuperscript{a,b} | δ\textsubscript{H} \textsuperscript{a,c} (mult., J = Hz) | δ\textsubscript{C} \textsuperscript{a,b} | δ\textsubscript{H} \textsuperscript{a,c} (mult., J = Hz) |
| 1 | 150.3              | -                        | 154.9                    | -                        |
| 2 | 95.1               | 6.38 (s)                 | 101.9                    | 6.49 (d, 2.5)            |
| 3 | 148.2              | 149.3                    | 152.1                    | -                        |
| 4 | 130.4              | -                        | 141.1                    | -                        |
| 5 | 148.2              | 116.0                    | 120.6                    | 7.03 (d, 8.5)            |
| 6 | 95.1               | 6.38 (s)                 | 107.7                    | 6.32 (dd, 8.5, 2.5)      |
| 3-OMe | 55.9               | 3.71 (s)                 | 56.6                     | 3.83 (s)                 |
| 5-OMe | 55.9               | 3.71 (s)                 |                          |                          |
| 1' | 101.7              | 4.68 (d, 7.5)            | 103.8                    | 4.76 (d, 7.5)            |
| 2' | 73.3               | 3.18 (dd, 9.0, 7.5)      | 75.0                     | 3.43 (dd, 9.0, 7.5)      |
| 3' | 76.8               | 3.28 (dd, 9.0, 9.0)      | 78.1                     | 3.45 (t, 9.0)            |
| 4' | 70.2               | 3.11 (m)                 | 71.6                     | 3.37 (t, 9.0)            |
| 5' | 77.7               | 3.28 (m)                 | 78.2                     | 3.40 (m)                 |
| 6' | 61.0               | 3.43 (dd, 12.0, 6.5)     | 62.7                     | 3.70 (dd, 11.5, 5.5)     |
|   | 3.72 (dd, 12.0, 3.0)|                          | 3.92 (dd, 11.5, 2.5)     | 62.6                     |

Measured in \textsuperscript{a}CD\textsubscript{3}OD, \textsuperscript{b}125 MHz, \textsuperscript{c}500 MHz. NMR data were assigned by 1D and 2D NMR spectra.
Figure S1. HR-ESI-MS of compound 1
Figure S2. $^1$H-NMR spectrum of compound 1 in CD$_3$OD
Figure S3. $^{13}$C-NMR spectrum of compound 1 in CD$_3$OD
Figure S4. H-H COSY spectrum of compound 1
Figure S5. HSQC spectrum of compound 1
Figure S6. HMBC spectrum of compound 1
Figure S7. HR-ESI-MS of compound 2

Figure S8. $^1$H-NMR spectrum of compound 2 in CD$_3$OD
**Figure S9.** $^{13}$C-NMR spectrum of compound 2 in CD$_3$OD

**Figure S10.** HSQC spectrum of compound 2
Figure S11. HMBC spectrum of compound 2
Figure S12. HR-ESI-MS of compound 3
Figure S13. $^1$H-NMR spectrum of compound 3
Figure S14. $^{13}$C-NMR spectrum of compound 3
Figure S15. HSQC spectrum of compound 3
Figure S16. HMBC spectrum of compound 3
Figure S17. HR-ESI-MS of compound 4
Figure S18. $^1$H NMR spectrum of compound 4

Figure S19. $^{13}$C NMR spectrum of compound 4
Figure S20. HSQC spectrum of compound 4

Figure S21. HMBC spectrum of compound 4
Figure S22. HR-ESI-MS of compound 5

Figure S23. $^1$H NMR spectrum of compound 5
Figure S24. $^{13}$C NMR spectrum of compound 5
Figure S25. HSQC spectrum of compound 5

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Figure S27. HR-ESI-MS of compound 6

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