A new xanthone from the pericarp of *Garcinia mangostana*

Tao Xu, Yunxia Deng, Shengyin Zhao and Zhiyu Shao*

College of Chemistry, Chemical Engineering and Biotechnology, Donghua University, 2999 Renmin North Road, Shanghai, 201620, P.R. China

Mangostanate, a new prenylated xanthone, 1,3,6-trihydroxy-2-(3-methylbut-2-enyl)-8-(3-formyloxy-3-methylbutyl)-xanthone, has been isolated from the pericarp of *Garcinia mangostana*, together with five known compounds. The structures were elucidated using spectroscopy. All the components were tested for antioxidant activity.

**Keywords:** *Garcinia mangostana*, mangostanate, xanthone, antioxidant activity

The Guttiferae family has approximately 40 genera,\(^1\) including *Garcinia*, *Mesua* and *Cratoxylum*.\(^2\) Mangosteen is a famous fruit referred to as the 'Queen of Fruits'.\(^3\) The pericarp of *Garcinia mangostana* has also been used in traditional folk medicine to treat gonorrhea, bladder infections and skin rash for hundreds of years in Southeast Asia.\(^4\) Extracts from the pericarp of *Garcinia mangostana* show anticancer, antiviral and antioxidant activities.\(^5\) Several flavonoids and phenolic compounds have reported from *Garcinia mangostana*.\(^6\) We have examined the plant for biologically active and structurally unique compounds, and this has resulted in the isolation of a new xanthone named as mangostanate (1), along with five known xanthones: \(\alpha\)-mangostin (2), \(\gamma\)-mangostin (3), gartanin (4),\(^10\) garcinone D (5)\(^11\) and 6-methoxy–bis pyrano xanthone (6).\(^12\) We now describe the new compound 1, together with its antioxidant activity (Fig.1).

![Chemical structures of compounds 1–6 isolated from the pericarp of *Garcinia mangostana*](image)

Table 1 \(^1\)\(^{13}\)C and \(^1\)H NMR data of 1 in DMSO-\(d_6\) (400 MHz for \(^1\)H, 100 MHz for \(^13\)C)

<table>
<thead>
<tr>
<th>No.</th>
<th>(^{13})C</th>
<th>(^1)H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>159.8</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>109.6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>162.3</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>92.2</td>
<td>6.35(1H, s)</td>
</tr>
<tr>
<td>4</td>
<td>154.1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>101.8</td>
<td>6.81(1H, s)</td>
</tr>
<tr>
<td>5a</td>
<td>154.5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>156.8</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>143.4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>136.9</td>
<td></td>
</tr>
<tr>
<td>8a</td>
<td>109.9</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>181.2</td>
<td></td>
</tr>
<tr>
<td>9a</td>
<td>101.8</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>20.9</td>
<td>3.20(2H, d, (J=7.2)Hz)</td>
</tr>
<tr>
<td>11</td>
<td>122.4</td>
<td>5.18(1H, 1, (J=7.2)Hz)</td>
</tr>
<tr>
<td>12</td>
<td>130.3</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>17.6</td>
<td>1.73(3H, s)</td>
</tr>
<tr>
<td>14</td>
<td>25.4</td>
<td>1.62(3H, s)</td>
</tr>
<tr>
<td>15</td>
<td>21.2</td>
<td>3.32(2H, m)</td>
</tr>
<tr>
<td>16</td>
<td>41.1</td>
<td>1.94(2H, 1, (J=8.1)Hz)</td>
</tr>
<tr>
<td>17</td>
<td>82.1</td>
<td></td>
</tr>
<tr>
<td>18 &amp; 19</td>
<td>26.2</td>
<td>1.54(6H, s)</td>
</tr>
<tr>
<td>20</td>
<td>161.9</td>
<td>8.37(1H, s)</td>
</tr>
<tr>
<td>1-OH</td>
<td>13.75(1H, s)</td>
<td></td>
</tr>
<tr>
<td>3-OH</td>
<td>10.83(1H, s)</td>
<td></td>
</tr>
<tr>
<td>6-OH</td>
<td>11.07(1H, s)</td>
<td></td>
</tr>
<tr>
<td>7-OH</td>
<td>60.4</td>
<td>3.75(3H, s)</td>
</tr>
</tbody>
</table>

* Correspondent. E-mail: zyshao@dhu.edu.cn
and elucidated as 1,3,6-trihydroxy-2-(3-methylbut-2-enyl)hydroazyl). Compounds 2–6 showed antioxidant activity with IC50 values of 35.03, 21.52, 25.61, 73.79 and 48.67 μg mL−1, but failed.

All the isolated compounds were tested for their antioxidant activity with DPPH (2,2-diphenyl-1-(2,4,6-trinitrophenyl)hydrazyl).26 Compounds 2–6 showed antioxidant activity with IC50 values of 35.03, 21.52, 25.61, 73.79 and 48.67 μg mL−1, but compound 5 showed no antioxidant activity.

Experimental

UV spectra were recorded on a Unico UV-4802 spectrophotometer. IR spectra were recorded on a Varian 640IR spectrometer and high-resolution MS spectra on a Bruker Daltonics, Inc. 1D (1H, 13C,DEPT) and 2D (HSQC, HMBC) NMR spectra were recorded on a Bruker AV-500 spectrometer. Chemical shifts are given as δ values with reference to tetramethylsilane (TMS) as an internal standard. Melting points were measured on an X-4 digital display micromelting point apparatus to tetramethylsilane (TMS) as an internal standard. Melting points were measured on an X-4 digital display micromelting point apparatus to tetramethylsilane (TMS) as an internal standard. Melting points were measured on an X-4 digital display micromelting point apparatus to tetramethylsilane (TMS) as an internal standard. Melting points were measured on an X-4 digital display micromelting point apparatus.