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# Two new xanthons from *Garcinia rigida* leaves

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Two new xanthons, musaxanthone (**1**) and asmaxanthone (**2**) were isolated from the leaves of *Garcinia rigida*. The structures were determined by means of spectroscopic analysis.

*Keywords*: *Garcinia rigida*; Guttiferae; Musaxanthone; Asmaxanthone



## 1. Introduction

Plants of genus *Garcinia* (Guttiferae) grow mainly in Southeast Asia. We here report on the isolation and structural elucidation of two new xanthons, Musaxanthone (**1**) and Asmaxanthone (**2**) from the hexane extract.

## 2. Results and discussion

The hexane extract of *Garcinia rigida* leaves was fractionated on silica gel column, affording 8 fractions. Fraction 5 gave **1** (40 mg) and fraction 7 gave **2** (132 mg).

Musaxanthone (**1**), isolated as yellow light needles, had a molecular formula $C_{20}H_{16}O_6$ (352.1020 Calcd 352.1025). In the $^1$H-NMR spectrum, one aromatic proton singlet [$\delta$ 6.44 (1H, s, H-2)], two *cis*-olefinic protons in doublets [$\delta$ 6.85 (1H, d, $J = 8.5$ Hz, H-7) and 7.86 (1H, d, $J = 8.5$ Hz, H-8)], implying the presence of a dimethylchromene ring were fused in a shoulder fashion to the xanthon nucleus. The orientation of the dimethylchromene ring was precisely determined by 2D NMR techniques (HMQC and HMBC). The spectrum further showed the presence of two *cis*-olefinic protons in doublets [$\delta$ 6.61 (1H, d, $J = 10.0$ Hz, H-1′) and 5.58 (1H, d, $J = 10.0$ Hz, H-2′)]. All carbons bearing protons were assigned from $^1$H–$^{13}$C COSY NMR spectrum are

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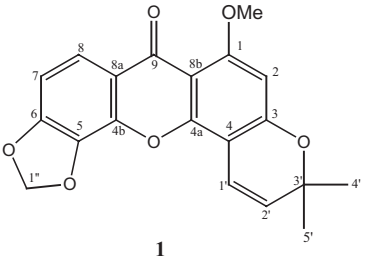
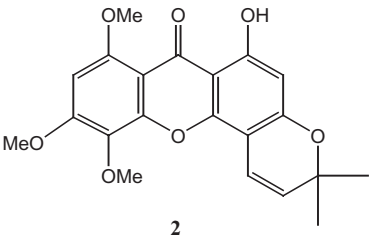
shown in table 1. In the ROESY, cross peak was observed between the H at 1-OMe and H-2. This structural assignment was confirmed by its HMBC and ROESY (figure 1) spectra.

Asmaxanthone (**2**) isolated as yellow needles, had a molecular formula $C_{21}H_{20}O_7$ (384.1281 Calcd 384.1287) in the HREIMS spectrum. A comparison of the $^1$H- and $^{13}$C-NMR data of **2** with those of **1** revealed that the only difference was the substituent at $C_1$, $C_5$, $C_6$, and $C_8$, the methoxyl group in **1** was replaced by the hydroxyl group in **2**, the methylendioxy in **1** was replaced by the methoxyl groups in **2** and the proton in **1** was replaced by methoxy in **2**. In the HMBC spectrum and the proton in **1** replaced by methoxy in **2**, cross peaks between proton C-1′ and C-2 ($\delta$ 94.9), C-4 ($\delta$ 105.2), C-4a ($\delta$ 158.9), C-5′ ($\delta$ 28.2) were observed. On the other hand, in the HMBC spectrum cross peaks between proton C-7 and C-5 ($\delta$ 130.1), C-6 ($\delta$ 158.4), C-8 ($\delta$ 159.4) and C-8a ($\delta$ 159.4) were observed. In the ROESY cross peaks were observed between the H at 6-OMe and H-7; and between the H-7 and H at 8-OMe (figure 1). All carbons bearing protons were assigned from $^1$H–$^{13}$C COSY NMR spectrum, shown in table 1.




**1**




**2**

Table 1. $^{13}$C-NMR assignment for musaxanthone (**1**) and asmaxanthone (**2**) in $CDCl_3$.

| | **1** | | **2** | |
|---|---|---|---|---|
| C | $^1$H | $^{13}$C | $^1$H | $^{13}$C |
| 1 | – | 159.4 | – | 159.9 |
| 2 | 6.44 (1H, s) | 91.4 | 6.30 (1H, s) | 91.6 |
| 3 | – | 158.1 | – | 151.4 |
| 4 | – | 107.2 | – | 105.2 |
| 4a | – | 155.4 | – | 158.0 |
| 4b | – | 152.3 | – | 155.9 |
| 5 | – | 133.6 | – | 130.1 |
| 6 | – | 155.4 | – | 157.7 |
| 7 | 6.85 (1H, d, $J=8.5$ Hz) | 107.2 | 6.68 (1H, s) | 94.5 |
| 8 | 7.86 (1H, d, $J=8.5$ Hz) | 121.4 | – | 157.3 |
| 8a | – | 119.3 | – | 104.7 |
| 9 | – | 174.0 | – | 181.1 |
| 8b | – | 112.8 | – | 103.3 |
| 1′ | 6.61 (1H, d, $J=10.0$ Hz) | 115.8 | 6.66 (1H, d, $J=10.0$ Hz) | 115.5 |
| 2′ | 5.58 (1H, d, $J=10.0$ Hz) | 127.7 | 5.71 (1H, d, $J=10.0$ Hz) | 127.1 |
| 3′ | – | 79.1 | – | 77.9 |
| 4′ | 1.55 (3H, s) | 27.8 | 1.43 (3H, s) | 28.2 |
| 5′ | 1.55 (3H, s) | 27.8 | 1.43 (3H, s) | 28.2 |
| 1″ | 6.16 (2H, s) | 102.9 | – | – |
| 1-OMe | 3.89 (3H, s) | 55.9 | – | – |
| 5-OMe | – | – | 3.84 (3H, s) | 61.5 |
| 6-OMe | – | – | 3.95 (3H, s) | 56.4 |
| 8-OMe | – | – | 4.03 (3H, s) | 56.2 |

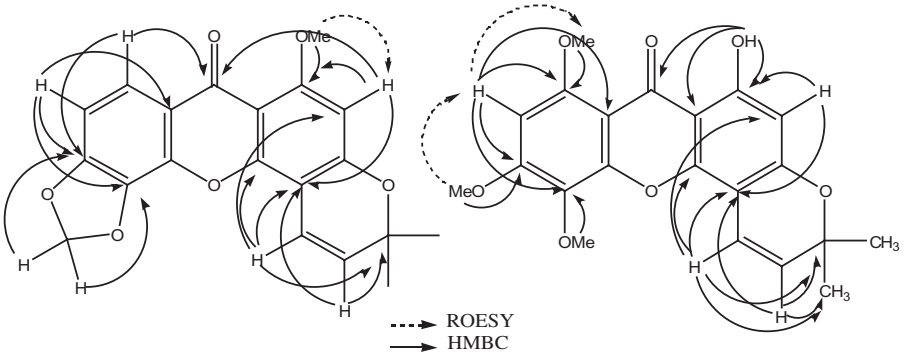



Figure 1. Selected HMBC and ROESY correlations.

## 3. Experimental

### 3.1. *General experimental procedures*

FTIR spectra were measured on Bio-Rad Merlin Spectrophotometer. MS were performed on an Autospec 3000 spectrometer at 70 eV. The NMR spectra were recorded on Bruker AM-400 and DRX-500 spectrometers.

### 3.2. *Plant material*

The leaves of *G. rigida* (Guttiferae) were collected in Bogor, Indonesia, in October 2002. A voucher specimen has been deposited in the Pharmacy Department of the University of Indonesia.

### 3.3. *Extraction and isolation*

The air-dried leaves (900 g) were extracted with hexane for a week. The extract hexane was concentrated to give a residue (10.0 g) that was subjected to column chromatography on Silica gel with petroleum ether–ethyl acetate system, affording 8 fractions. Fraction 5 gave **1** (40 mg) and fraction 7 gave **2** (132 mg).

Musaxanthone (**1**): Yellow light needles, m.p. 141.0–143.0°C, IR$\nu_{max}$ 3068, 2959, 2927, 2870, 1656, 1590, 1444, 1295 and 1122 cm$^{-1}$. EIMS *m/z* 352 $[M]^+$, 337, 322, 294, 168. HREIMS $[M]^+$ *m/z* 352.1020 (Calcd 352.1025) for $C_{20}H_{16}O_6$. $^1$H- and $^{13}$C-NMR assignments are shown in table 1.

Asmaxanthone (**2**): Yellow needles, m.p. 173.0–175.0°C, IR$\nu_{max}$ 2968, 2843, 2676, 1610, 1657, 1568, 1292 and 1156 cm$^{-1}$. EIMS *m/z* 384 $[M]^+$, 369, 339, 184, 177, 163. HREIMS $[M]^+$ *m/z* 384.1281 (Calcd 384.1287) for $C_{21}H_{20}O_{7.}$ $^1$H- and $^{13}$C-NMR assignments are presented in table 1.

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