ISOLATION AND MS STUDY OF FRIEDELINOL FROM THE LEAVES OF TERAP (ARTOCARPUS ODORATISSIMUS BLANCO)

*ERWIN¹, SRI SULISTYANINGSIH¹ AND IRAWAN W. KUSUMA²

¹Department of Chemistry, Faculty of Mathematics and Natural Sciences, Mulawarman University, Samarinda, East Kalimantan
²Department of Forest Products, Faculty of Forestry, Mulawarman University, Samarinda, East Kalimantan

ABSTRACT

Artocarpus odoratissimus Blanco (local name: Terap) is one of the Artocarpus species was taken from the tropical forests of East Kalimantan. A friedelinol (triterpene) was isolated from the leaf extracts of the plant and the compound structure was established from the FT-IR and mass spectral data and confirmed by a standard compound. The compound has moderate cytotoxicity against a brine shrimp, A. salina with LC₅₀ 48.39 ppm.

KEYWORDS: Artocarpus, Terap, friedelinol.

ERWIN
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Mulawarman University, Samarinda, East Kalimantan

*Corresponding author
INTRODUCTION

Moraceae is a large plant family consists of 60 genera and 1400 species, three of them include a large genus: they are, Artocarpus, Morus, and Ficus. Artocarpus, one of the main genus of Moraceae consisting of 50 species and spread on tropical and sub-tropical region from South Asia, Southeast Asia to the Solomon Islands, Pacific Islands, North Australia and Central America. Economically, the genus is of appreciable importance as a source of edible fruit, and yield fairly good timber. Artocarpus typically grows as large and tall trees. The wood can be used as building materials, home furnishings, and bridges. In Indonesia, the first several of Artocarpus species are widely used in folk medicines as root decoction of Artocarpus integra Merr. finel used to treat fever. Various species of this plant have been creating as a traditional medicine known as jamu (Indonesia). In Borneo, there are 25 species, and 13 species are endemic, but only two species are used. Several species of Artocarpus produce many triterpene, terpenoids, steroids, and phenolics including; flavonoids, stilbenoid, arilbenzofuran, jacalin, and Diels-Alder addition compounds. The unique structure of secondary metabolites in Artocarpus produce a very wide effect, such as anti-bacterial, anti-platelet, antifungal, antimalarial, toxic and cytotoxic, and antidiabetic. Artocarpus odoratissimus Blanco is one of the Artocarpus species was found as endemic species in tropical forests of Kalimantan (Borneo), Indonesia. Traditionally, local people used leaves of A. odoratissimus as diabetic-treating drug and ash obtained from leaves is used as an antidote for centipede bite and scorpion stings, while the wood and bark were used as an anti-malarial. In Sumatera (Indonesia), A. odoratissimus used as a natural pesticide to repel mice. Fruits and their by-products are rich sources of antioxidant, with significant high level of phenolic and flavonoid content. Previous studies on A. odoratissimus reported the availability of artosimmin, traxateryl acetate and anthocyanin. Our further work on the genus Artocarpus was to investigate the leaves of A. odoratissimus and to elucidate one of the molecular structure of triterpene type compounds.

MATERIALS AND METHODS

Materials

The leaves of of A. odoratissimus were collected from Sungai Siring, Samarinda city, East Kalimantan. The plant was identified by a staff at the Laboratory of Physiology, Mulawarman University. The silica gel used for flash column chromatography was a silica gl 60, 230-400 mesh (Merck, Darmstadt-Germany). Thin layer chromatography aluminium sheets (Silica gel 60 F254, 0,25 mm) were purchased from Merck (Darmstadt, Germany). All other materials or solvents were of the highest purity or high-performance liquid chromatography (HPLC) grade.

Instrumentation

IR spectra were measured with PERKIN ELMER Spectrum one L.R. 64912C spectrophotometers. Mass spectra was recorded on a Shimadzu GC-MS QP 5050A (Shimadzu Corp., Kyoto, Japan) at an electron energy of 70 eV (direct inlet). Melting point of the compound was measured by using Yanaco micro melting point apparatus (Yanaco Co., Ltd., Kyoto, Japan) and were uncorrected.

Extraction

The dried powder of the plant’s leaves (3 kg) were macerated with methanol for 24 h at room temperature and repeated 4 times. The methanol extract obtained was concentrated by using a rotary vacuum evaporator to yield 40.19 g of total extract. Furthermore, the total extract was fractionated with n-hexane and concentrated by using a rotary vacuum evaporator to obtain 18.95 g of solid.

Isolation and purification

n-Hexane fraction from the methanol extract of A. odoratissimus leaves were subjected to a flash column chromatography over silica gel using the n-hexane and ethyl acetate in
increasing polarity. The column chromatography yielded 50 tubes fractions that were pooled together based on their polarity into 4 fractions, fraction A (tubes 1-7, 190 mg), fraction B (tubes 8-15, 410 mg), fraction C (tubes 16-22, 1000 mg), and fraction D (tubes 23-50, 2790 mg). Fraction B was in the form of white crystals. Ten milligrams of the crystal B was recrystallized by using hot n-hexane to yield 6 mg of the pure compound 1.

**Phytochemical test**
1 mg of compound 1 was put into a test tube following by the addition of 2 drops of anhydride acetate and 1 drop of sulfuric acid (Liebermann-Burchard reagent). The formation of green indicates the presence of steroid.

**Biological assay**
Compound 1 was tested for the toxicity by the brine shrimp lethality test against *Artemia salina* using previous report 24.

RESULT AND DISCUSSION

Compound 1 was obtained as a white powder having melting point at 285 - 287°C. It showed positive reaction with Liebermann Burchard reagent indication of terpenoid. Mass spectral data showed a peak at m/z 428 (M⁺) that in accordance with molecular formula C₃₀H₅₂O. IR spectral data showed maximum absorbance at 3479.58 cm⁻¹, suggested stretching absorption of hydroxy group. This suggestion was supported by appearance of bending absorption of secondary cyclic C-OH at 1018.41 cm⁻¹. Peaks with sharp intensity at 2931.8 cm⁻¹ and 2870.08 cm⁻¹ showed a C-H stretching of CH₃ and CH₂, that was supported by a bending at 1388.75 cm⁻¹. A peak with sharp intensity at 1705.07 cm⁻¹ suggested the occurrence of non conjugated C=O. Peak at 1635.64 cm⁻¹ suggested the presence of non conjugated C=C. A fingerprint area at 1172.72 cm⁻¹ suggested the presence of C-O bond. Based on infra red spectral data, it was concluded that compound 1 consisted hydroxyl, CH₃ and CH₂, C=O, C=C double bond and C-O groups.
Figure 2

**MS spectrum of friedelinalol**

**Tabel 1**

*Comparison of Mass Fragmentation of Compound 1 and Friedelinol.*

<table>
<thead>
<tr>
<th>No</th>
<th>Mass spectra fragmentation pattern</th>
<th>Compound 1 (m/z)</th>
<th>Friedelinol (m/z)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>428</td>
<td>428</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>413</td>
<td>413</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>382</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>341</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>275</td>
<td>275</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>257</td>
<td>257</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>231</td>
<td>231</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>206</td>
<td>206</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>191</td>
<td>189</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>177</td>
<td>177</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>165</td>
<td>165</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>149</td>
<td>147</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>135</td>
<td>137</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>123</td>
<td>125</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>109</td>
<td>109</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>55</td>
<td>55</td>
</tr>
</tbody>
</table>
The result of GC-MS analysis displayed a molecular peak at m/z 428 (M⁺) suggested the molecular weight of compound 1, that matched to the molecular formula C₃₀H₅₂O. Fragmentation pattern of compound 1 was presented at Fig 1 and indicated the possibility of the compound 1 as a triterpene, friedelinol. Comparison of mass spectral fragmentation pattern of compound 1 to that of friedelinol was presented at Table 1, it showed a good match. Based on the description of physicochemical properties, therefore, the compound 1 was identified as friedelinol.

CONCLUSION

Based on the spectroscopical analysis of FT-IR and GC-MS, an isolated compound from A. odoratissimus was identified as triterpene, friedelinol. The compound has moderate cytotoxicity against a brine shrimp, A. salina with LC₅₀ 48.39 ppm.
ACKNOWLEDGEMENT

A kind support from Prof. Sanro Tachibana of Ehime University, Japan in measurement of GC-MS spectra and melting point is gratefully acknowledged.

REFERENCES

19. Shaffiq, S. M. S., Sidik, B. J., Harah, Z.M., and Devi, R.S., Marketable wild fruits of Serawak, Borneo: Their mode of...