Identification of Secretory Structure and Histochemical of Family Araceae as Medicinal Plants by Dayak Kenyah Tribe

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Abstract: Indonesia is a tropical country that has abundant natural resources. There are many species of medicinal plants that used for treatment various human diseases. Dayak Kenyah tribe is the native people of Borneo, Indonesia. These people in the forest are commonly used medicinal plants to protect against and cure from diseases treatment such as family Araceae (Raphidophora sp., Spathiphyllum sp., Alocasia heterophylla (C. Presl.) Merr., Homalomena gadutensis M. Hotta, and Homalomena cordata Scott.). Most medicinal plants have secretory structures. The function of secretory structures to product or accumulate the secondary metabolites. So that, the aims of this study was to determine the type, location of secretory structures and metabolite content in those secretory structures in the fifth medicinal plants that used as medicine by Dayak Kenyah Tribe. To identify the secretory structures, we used light microscope. Wagner reagent, cupric acetate and sudan IV staining were used for histochemical analysis. The results showed that idioblast cells the most common structure was found in all plant organs observed. Idioblast cells were found in the tuber of Alocasia heterophylla (C. Presl.) Merr., Homalomena gadutensis M. Hotta, and Homalomena cordata Scott., in root, stem and leaf of Raphidophora sp., and the leaf of Spathiphyllum sp. Most of idoblast cells contained alkaloid. Terpenoid and lipophilic compounds was also found in the secretory structures. Those compounds is very useful to healing various human diseases.

Keywords: Medicinal plants; secretory structures; secondary metabolites; Dayak Kenyah.

1. Introduction

Tropical rain forest in Indonesia has a various plants species used as traditional medicinal. Traditional medicinal plants in Indonesia are very important role for the community in limited health facilities area. There are about 21,000 plants species in the world that can be used as medicinal ingredients [1]. The various tribes in Indonesia commonly use plants as medicine to cure various kinds of diseases. Dayak Kenyah tribe usually use medicinal plant based on knowledge from their ancestors. They use medicinal plants such as Lembang pait (Eurycoma longifolia), tana lirang ' (Euphorbia sp.), abung aa ' (Ficus glomerata), a'bung bileng (Ficus hemsleyana), paung lung (Xanthosoma sp.), and aka 'lembo (Passiflora sp).[2]. Dayak Kenyah tribe take it in Kayan Mentarang National Park Forest.

Medicinal plants have different potential that supposedly have a bioactive compounds as medicine. Therefore, the research about detection of chemical compounds in the medicinal plants which are exploited by the kenyah dayak tribe is very necessary. Scientific studies referred to can be either a medicinal plants based on screening cell-producing metabolites compounds. Through scientific studies, we can found cells as producing secondary metabolites in medicinal plants. Scientific research about screening these medicinal plants can be considered as basic information for the development local potential.
2. Material & Methodology

2.1. Study Area

The area of study in Setulang Forest (Setulang Village) (Figure 1).

![Figure 1. Located of study areas (arrow)](image)

2.2. Plant Material

Plants are collected from Setulang Forest (Setulang Village) and they were identified by Herbarium Bogoriense LIPI. Fresh organs of plant were collected for the histochemical test.

2.3. Procedures

In exploration of medicinal plants used by Dayak Kenyah tribe, start from visit located of study areas (Figure 2). We were recorded through personal interview. Interview were conducted with the knowledgeable persons. Plants sample were collected during the exploration was preserved as herbarium specimens. The plant samples were identified by Herbarium Bogoriense LIPI. Plants of Araceae family selected in this study to identified secretory structures and histochemical compounds.

![Figure 2. Research procedure of medicinal plants](image)

2.4. Data Analysis

For the histochemistry test, fresh samples were transversely sectioned, the sections were then treated with specific reagents to identify the locality presence of terpenoid, alkaloid, and lipophilic compounds. Terpenoid presence in the sample tissues was identified by soaking a section in 5% cupric acetate solution as suggested in Harbone method [3]. A positive test for terpenoids was indicated by appearance of yellow or brownish-yellow color. Alkaloid presence was tested for by soaking a sections in Wagner reagent; a positive result was indicated by the presence of reddish-brown or yellow deposits. The
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presence of lipophilic compounds was tested for using sliced samples washed in 70% alcohol for one minute, then soaked in 0.03% sudan IV and heated in a water bath at 40 °C for 30 minutes. The slice samples were then rinsed in 30 % glicerine, furthermore observed using a light microscope. The presence of lipophilic compounds was indicated by the production of red, yellow, orange colors [4].

3. Results and Discussion

3.1. The Medicinal plants of Araceae family used by Dayak Kenyah tribe

The organs of a plant that used are tuber, roots, stems, leaves. Five species selected based on Araceae family utilization as drugs by Dayak Kenyah tribe (Table 1 and Figure 3).

The medicinal plants are consumed directly or indirectly. The use of directly, namely by way of drinking, eaten, chewed, and pasted rubbed. While the use of indirectly is to be further eroded, boiled, crushed, burned and heated.

Table 1. Medicinal plants used by the Dayak Kenyah

<table>
<thead>
<tr>
<th>No</th>
<th>Local name</th>
<th>Species</th>
<th>Family</th>
<th>Part used</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aka bakung 1</td>
<td>Raphidophora sp.</td>
<td>Araceae</td>
<td>Root, stem and leaf</td>
<td>For Swollen</td>
</tr>
<tr>
<td>2</td>
<td>Aka bakung 2</td>
<td>Spathiphyllum</td>
<td>Araceae</td>
<td>Tip of leaf</td>
<td>Swollen, suppurate</td>
</tr>
<tr>
<td>3</td>
<td>Nut nan 1</td>
<td>Alocasia sp.</td>
<td>Araceae</td>
<td>Tuber</td>
<td>suppurate, wound</td>
</tr>
<tr>
<td>4</td>
<td>Pa‘ung long Merah</td>
<td>Homalomena gadutensis</td>
<td>Araceae</td>
<td>Tuber</td>
<td>wound, queasy, gastric, headache, catch a cold</td>
</tr>
<tr>
<td>5</td>
<td>Pa‘ung long Putih</td>
<td>Homalomena cordata</td>
<td>Araceae</td>
<td>Tuber</td>
<td>I wound, queasy, gastric, headache, catch a cold</td>
</tr>
</tbody>
</table>

Figure 3. Morphology of medicinal plants (a). Raphidophora sp. (b). Spathiphyllum sp., (c). Alocasia sp. (d). H. gadutensis (e). H. Cordata

Figure 4. Idioblast cells in the roots (a, b,c), stems (d, e, f) and leaf (g, h, i) of Raphidophora sp. Histochemical test using cupri acetate for terpenoid(a, d, g), Sudan IV test for lipophilic (b, e, h), Wagner test for alkaloid compounds (c, f, i).
3.2. Compounds in the secretory structure

Five plants were found have the secretory structure. Secretory structure were found in the form of idioblast cells, channels cavities and glandular trichomes. Secretory structure in plants which examined some of which contains secondary metabolites form these terpenoid, alkaloid and lipophilic compounds. (Figure 4-8 and Table 2).

Table 2. Secondary metabolites in the secretory structures

<table>
<thead>
<tr>
<th>Species</th>
<th>Type of Secretory Structures</th>
<th>Alkaloids</th>
<th>Terpenoids</th>
<th>Lipophilic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raphidophora sp.</td>
<td>Idioblast cells</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Spathiphyllum sp.,</td>
<td>Idioblast cells</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Alocasia sp.</td>
<td>Idioblast cells</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>H. gadutensis</td>
<td>Idioblast cells</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>H. Cordata</td>
<td>Idioblast cells</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

Histochemical tests, idioblast cell spositive contains terpenoids (Figure 6a), as indicated by a yellow coloured response with cupric acetate reagent (Figure 6c). The presence of alkaloids as indicated by a brownish yellow response with Wagner's reagent threated. Lipophilic compound as indicated by a yellow to red colour (Figure 6b). Histochemical tests on the idioblast cells in the tip of leaf
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Spatiphyllum did not detect terpenoids and lipophilic in these structures. However these cells tested positive to containing alkaloids compound, as indicated by yellow to orange colours (Figure 4). Histochemical tests on the idioblast cells in the tuber H. Cordata Scott. did not detect terpenoids in these structures. However, these cells tested positive to containing alkaloids and lipophilic compounds (Figure 8). Various plants of araceae family that use as medicinal such as Raphidophora decursiva Roxb. Schott used in anti-malaria [5] Alocasia indica (Lour) used in tonsillitis [6] Acorus calamus L. used in antibacterial activity [7] and Amorphophallus paeonifolius (Dennst.) Nicolson used in the treatment dysentery and rheumatism [8]. Idioblast cells do not all contains various secondary metabolites. Sometimes, it just contains an alkaloids in the Spatiphyllum sp.. Furthermore, idioblast cells of araceae family not commonly contains alkaloids, terpenoids and lipophilic compounds because they contains calcium oxalate crystal. Calcium oxalate were found in various species such as A. paeonifolius (Dennst.) Nicolson [8] and Syngonium podophyllum Schott [9].

4. Conclusion

The results of a research are screening of medicinal plants in the border region of Northern Borneo based on cell-producing compounds Secondary metabolites. Five kinds of medicinal plants in Araceae family are used by dayak kenyah tribe in the forest of setulang village. There are Raphidophora sp., Spatiphyllum sp., Alocasia sp., H. gadutensis, H. Cordata. Secrectory structure have been identified in the organs. Commonly, the Idioblast cells were found on the organ of medicinal plants that observed. Idioblast cells were found commonly contained terpenoids, alkaloids and lipophilic. The discovery of the cell as the accumulation of the metabolite compounds found in medicinal plants can be developed through in vitro culture and improved compounds via pathway engineering synthesis. While the content of compounds in plant cell can be developed in testing anti oxidant, anti infection, anti-inflammatory, anti-bacterial, anti-viral and anti-cancer to get plants that have the potential of modern medicine from various plants that are examined.

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References