Polyisoprenoid composition in chengham (*Scyphiphora hydrophyllacea*, Gaertn. f., Rubiaceae)

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Abstract. Chengham (*Scyphiphora hydrophyllacea* Gaertn. f., Rubiaceae) is a mangrove shrub or tree commonly in landward mangrove zones having some biological activities. All parts of *S. hydrophyllacea* have shown some components benefits to biological and pharmaceutical properties. This present study aimed to analyze the distribution and composition of polyisoprenoid in senesence leaves, fruits and branches of *S. hydrophyllacea*. Polyisoprenoid pattern was evaluated by two-dimensional thin layer chromatography (2D-TLC) approach. The total lipid (TL) content of five samples ranged from 5.7 mg/g in branches to 10.0 mg/g in the old leaves. Additionally, the percentage of polypropenol of senescence leaves slightly abundance compare to dolichol in the polyisoprenoid presence. Overall, polypropenol was found in higher content than dolichol in the yellow leaves. Results of this study found the type-II of *S. hydrophyllacea* fruits was in line with earlier reports on the plant fruits. The present study provided the occurrence of polypropenols and dolichols in *S. hydrophyllacea* tested organs.

1. Introduction

Ecology feature of chengham (*Scyphiphora hydrophyllacea*) grows on mud, sand and coral substrates on the edge of mangrove land or on embankments [1]. This minor mangrove seems to be intolerant of long-term inundation of fresh water and habitually occupies locations that are commonly inundated by tides [2]. It has been reported to grow in locations that are not suitable for colonization by other mangrove species. The inflorescences are present all year round, possibly self-pollinated or by insects [3]. Nectar is produced by glandular discs at the base of the flower crown [4]. A lot of fruit is produced, but seed reproduction is relatively low. The fruit is well adapted to dispersal by water because of its light, buoyant skin [4,5].

*Scyphiphora hydrophyllacea* distributed from India, Sri Lanka, Malaysia, all of Indonesia, Papua New Guinea, Philippines, Solomon Islands and Tropical Australia [3]. Larger pieces of *S. hydrophyllacea* wood are used to make household items such as spoons, while smaller pieces are used to make fence posts and firewood [4]. The ethnobotanical use has been reported as an extract of the leaves could be used for stomachaches [3-5]. Furthermore, anti-hepatocarcinogenic and anti-oxidant
effects of *S. hydrophyllacea* has been described [6]. *S. hydrophyllacea* has the potential to be developed as antimicrobial and anticancer compounds [7, 8]. Despite the importance characterization of ecological and pharmacological in *S. hydrophyllacea*, no information on the polyisoprenoid composition of this plant, therefore this work purposed to analyze the distribution and composition of polyisoprenoid in senesce leaves, fruits and branches of *S. hydrophyllacea*.

2. Materials and methods

2.1. Plant materials

The leaves (young, old, and yellow), fruits and branches of *Scyphyphora hydrophyllaceae* Gaertn. F. (Rubiaceae), were sampled from Lubuk Kertang, North Sumatra, Indonesia. These minor mangrove are tree or shrub height up 3 m. These plants have simple leaves (Fig. 1 A, B, C) and fruit diameter 0.4-0.5 cm, green to brown color, glabrous, and deeply grooved, longitudinally like small pinion-gear (Fig. 1D) with maroon branches (Fig. 1E).

Figure 1. Sampling of *S. hydrophyllaceae* organ, young leaves (A), old leaves (B), yellow leaves (C), fruits (D), and branches (E).

2.2. Extraction of polyisoprenoid

The previously described procedures for isolating polyisoprenoids was applied to this work [9, 10]. The dried tissue was ground into a fine powder and absorbed in 30 ml of chloroform/methanol (2/1, v/v) solvent for two days, then it's over. The un-saponifiable lipids extracted from the tissue sample with hexane and the organic solvent were dried and re-dissolved in hexane.
2.3. **Determination by two-dimensional thin layer chromatography (2D-TLC)**

The longitudinal edge of the 1D-TLC plate was 1 cm wide, and the concentration zone of a reversed-phase C-18 glass TLC was tightened using two magnetic bars (4.0 1.1 0.8 cm) that met each gel phase. The bound TLC plate was then developed vertically to the 1D in order to transfer polyprenol or dolichol to the reversed-phase TLC plate's concentration zone. The 2D-TLC reversed-phase C-18 silica gel was done for approximately 40 minutes with acetone as the solvent. Using a Canon E-470 series printer, the developed chromatographic images were captured and scanned digitally.

3. **Results and Discussions**

3.1. **Polysioprenoid profile and composition**

The search for polyisoprenoids in the senescence leaves, fruits, and branches of *S. hydrophyllacea* in North Sumatra province, Indonesia, was carried out using 2D-TLC [11, 12], which revealed a clear separation of polyprenols and dolichols based on carbon chain length.

| Species            | Tissue | TL (mg/g dw) | PI (mg/g dw) | Pol (mg/g) | Dol (mg/g) | % in total lipid | % in polyisoprenoid | Type |
|--------------------|--------|--------------|---------------|------------|------------|----------------|---------------------|------|
| *S. hydrophyllacea* | young leaves | 9.8 ±1.0 | 2.6 ±0.6 | 1.5 ±0.2 | 1.1±0.4 | 57.6 | 15.3 | 42.3 | 58.7 | 41.3 | II |
| *S. hydrophyllacea* | old leaves | 10.0 ±1.4 | 3.8 ±1.8 | 2.1±0.1 | 1.700.6 | 65.7 | 21.0 | 44.7 | 60.5 | 39.5 | II |
| *S. hydrophyllacea* | yellow leaves | 9.5 ±0.7 | 2.4±0.6 | 1.3 ±0.2 | 1.1 ±0.4 | 59.5 | 13.7 | 45.8 | 63.6 | 36.4 | II |
| *S. hydrophyllacea* | fruits | 7.6 ±0.3 | 4.9±2.2 | 1.3±0.7 | 3.7±0.1 | 89.4 | 24.5 | 64.9 | 25.7 | 74.3 | II |
| *S. hydrophyllacea* | branches | 5.7 ±0.9 | 7.0±2.2 | 4.3±1.4 | 2.7 ±2.0 | 95.2 | 38.6 | 56.6 | 38.2 | 61.8 | II |

nd= not detected, TL = Total lipids, PI = Polyisoprenoids, Pol = Polyprenols, Dol = Dolichols. Data are expressed as mean of triplicate analyses.

Table 1 illustrates the total lipid (TL) content of five samples ranged from 5.7 mg/g in branches to 10.0 mg/g in the old leaves. Furthermore, the percentage of polypropenol in senescence leaves was slightly higher than that of dolichol in the presence of polyisoprenoid. (Table 1). This work was supported by foregoing findings on the type-II of aging leaveas of mangroves *in Excoecaria agallocha, Lumnitzera racemosa, Rhizophora stylosa, R. lamarkii* [13], *K. obovata* yellow leaves [14], *Chromolaena odorata* old leaves [15].

3.2. **Analysis polyisoprenoid by 2D-TLC**

The polyprenols and dolichols found in the leaves, fruits, and branches were discovered to belong to a precedingly established categorization, type-II. In the leaves, the composition became one group, group-II, as they showed the occurrence of both polyprenols and dolichols.

Furthermore, the finding of this study found the type-II of *S. hydrophyllacea* fruits was in line with earlier reports on the fruits of *Elaeis guineensis* [16], *Nephelium lappaceum* fruits [17], fruits of *Amorphophallus paoniifolius*, *Guettarda speciosa*, and *Jatropha curcas* categorized as type-II of polyisoprenoid [18], and *Thespesia populnea* fruits [19]. By contrast several plant fruits were reported as type-I such as, *Barringtonia racemosa* and *Xylocarpus granatum* [19].
Furthermore, the presence of ficaprenols (C60) in old leaves and fruits of *S. hydrophyllacea* samples was investigated. Furthermore, the dolichol content of the leaves was found to be unaffected by senescence (Figure 2). Longer polyprenols were found in yellow leaves, but no longer carbon chain of dolichols were found. A similar report was detected in *R. apiculata* and *R. lamarkii* old leaves [13] and *X. granatum* fruits [19]. By contrast longer carbon chain of polyprenols as well as dolichols have been reported in *E. agallocha* and *L. racemosa* yellow leaves [13]. The carbon chain length of polyprenols and dolichols due to the habitat and environmental differentiation and biosynthetic pathways to produce a variety of polyisoprenoids in tropical and subtropical plants [13-15, 20].

![Figure 2](image_url)

**Figure 2.** 2D-TLC chromatograms hexane extracts of polyisoprenoids of *S. hydrophyllacea* organ, young leaves (A), old leaves (B), yellow leaves (C), fruits (D), and branches (E).

### 4. Conclusions

The present study provided the presence of polyprenols and dolichols in *S. hydrophyllacea* detected tissues.
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