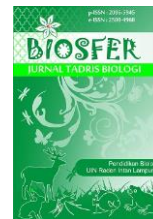




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Potential Exploration and The Morphology of Zingiberaceae Leaves as Medicinal Plants in Bandar Lampung

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ABSTRACT

This study aimed to determine how many species of Zingiberaceae are in Bandar Lampung through leaf morphology observations. This research was conducted from January to March 2021 at the Botanical Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, University of Lampung. The sampling of Zingiberaceae leaves was determined via a simple random sampling technique. Morphological observations were performed by observing the narrowest and widest leaves that looked intact and not ravaged by disease. The results showed that 16 species of Zingiberaceae were found in Bandar Lampung, which was divided into five genera. Also, three variations of leaf shape, leaf-spine, and leaf sitting were found.

Eksplorasi dan Morfologi Daun Zingiberaceae yang Berpotensi Sebagai Obat di Bandar Lampung

ABSTRAK: Tujuan dilakukan penelitian ini yaitu untuk mengetahui berapa banyak spesies Zingiberaceae di Bandar Lampung melalui pengamatan morfologi daun. Penelitian ini dilakukan pada bulan Januari-Maret 2021 di Laboratorium Botani Jurusan Biologi Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Lampung. Pengambilan sampel daun Zingiberaceae dalam penelitian ini dilakukan dengan metode sampling acak sederhana. Pengamatan morfologi dilakukan dengan mengamati daun tersempit dan terlebar yang tampak utuh dan tidak terserang penyakit. Hasil penelitian menunjukkan bahwa ditemukan 16 jenis Zingiberaceae di Bandar Lampung yang terbagi ke dalam 5 marga. Selain itu, ditemukan tiga variasi bentuk daun, pertulangan daun, dan duduk daun.

INTRODUCTION

The Covid-19 pandemic has hit Indonesia since 2020. It affects all aspects of life, from health, education, and society, to economics. *Empon-empon* as an herbal medicine has been in demand since the Covid-19 pandemic. It possesses promising

profits because its demand continues to increase from time to time (Suminah et al., 2017). It is widely known that the coronavirus easily spreads to people with low immune systems; thus, this plant is known to increase the immune system (Wardhani et al., 2020). *Empon-empon* herbal medicine was chosen because it contains

easily available ingredients (Chusna et al., 2021).

Indonesia's richness in medicinal plants has been known since ancient times due to the tropical climate and fertile soil. One of the widely used medicinal plants is Zingiberaceae (Jalil, 2019). According to Trimanto et al. (2018), Zingiberaceae is divided into 51 genera and 1,200 plant species. Almost all of them can be found in tropical forests. Zingiberaceae comprises around 141 species distributed throughout tropical Asia, Australia, and Southeast Asia (Odyuo et al., 2019). This family comprises many medicinal plants and is characterized by volatile compounds, oils, terpenoids, and oleoresins (Zahara, 2019). Zingiberaceae are widely used as spices, medicine, ornamental plants, cosmetic ingredients, beverage ingredients, hair tonic ingredients, and others (Mahmudi et al., 2020).

Leaves are organs of plants that can be easily observed. Through the naked eye, the leaves of some members of the Zingiberaceae are difficult to distinguish. Lianah (2020) states that Zingiberaceae leaves have the same shape. However, after careful observation, it turns out that each leaf has differences ranging in shape, size, and characteristics. Leaves of the genus *Curcuma* (*temu-temuan*) will easily roll when exposed to heat, while the genus *Alpinia* (Galangal) leaves are heat resistant and do not roll easily. Zingiberaceae contain antioxidants and antibacterial that can be processed from the leaves and other organs (Silalahi et al., 2021).

Data and information on the morphological characteristics of Zingiberaceae leaves in Bandar Lampung have not been widely known. Identification needs to be done to determine the morphological characteristics of the leaves of each type. The morphological characters have been widely used to help describe and identify the plant in the taxonomy field (Zahara 2020; Hassemmer et al., 2020). Traditionally, plant taxonomy relies on morphological characteristics for group

division (Windarsih, et al., 2021) to reveal the development, form, and external structure of plants that are useful for studying the similarity of plants and origin. This study aimed to determine the morphological characteristics of Zingiberaceae leaves in Bandar Lampung. Observations were done using several parameters: leaf shape, leaf-spine, and leaf sitting.

METHOD

This research was conducted from January to March 2021 at the Botanical Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, University of Lampung. The materials used in this study were samples of Zingiberaceae leaves in Bandar Lampung and a storage plastic bag. The equipment used in this study were scissors, cameras, labels, and stationery.

The sampling of Zingiberaceae leaves was determined by a simple random sampling technique based on Kawatu et al. (2019). The selection of the sampling area was done by lottery. The Zingiberaceae leaves were selected from plants that appeared intact and not ravaged by disease. The leaves were then labeled hanging and documented in the form of photographs. The morphological characters observed were leaf shape, leaf-spine, and leaf sitting. The data from the observation of Zingiberaceae leaf morphology are presented in the form of tables and figures that had been analyzed descriptively.

RESULTS AND DISCUSSION

The analysis showed that there were 16 different Zingiberaceae species in Bandar Lampung. They are further divided into five genera: *Curcuma*, *Kaemferia*, *Alpinia*, *Zingiber*, and *Boesenbergia*. The most common genus found was *Zingiber*, and the least found genus was *Boesenbergia*. The total sample found in all sampling locations was 108. The most common species found at sampling locations were White Galangal (*Alpinia galanga* (L.) Willd.), Turmeric (*Curcuma longa* L.), and *Temu Lawak*

(*Curcuma zanthorrhiza* Roxb). These three types are ranked in the top five export commodities of Lampung Province for members of the Zingiberaceae (Dinas Perdagangan Provinsi Lampung, 2018). From 21 sampling locations, white galangal was found in 19 locations.

Galangal can treat rheumatic pain, spleen pain, boost appetite, bronchitis, and

Fungus infection, such as *Tinea versicolor* (Haryanto, 2012). The rhizome of galangal was easily obtained in Indonesia and was effective as a liniment for fungal skin diseases (phlegm) before modern medicine developed (Kaliyadasa and Samarashinghe, 2019). Galangal rhizome is also used as a cooking spice for many years and has never caused problems (Handajani and Tjahjadi, 2008).

Table 1. Leaf Morphology Data of Zingiberaceae

No.	Local Name	Genus	Scientific Name	Number of Sample Locations	Leaf Shape	Leaf Spines	Phyllotaxis
1	Lengkuas Merah	<i>Alpinia</i>	<i>Alpinia purpurata</i> (Vieill.) K.Schum.	9	Lanceolatus	Penninervis	Alternate
2	Lengkuas Putih	<i>Alpinia</i>	<i>Alpinia galanga</i> (L.) Willd.	19	Lanceolatus	Penninervis	Alternate
3	Temu Kunci	<i>Boesenbergia</i>	<i>Boesenbergia rotunda</i> (L.) Mansf.	2	Ovalis	Penninervis	Stem Rosette
4	Kunyit	<i>Curcuma</i>	<i>Curcuma longa</i> L.	15	Ovalis	Penninervis	Stem Rosette
5	Temu Ireng	<i>Curcuma</i>	<i>Curcuma aeruginosa</i> Roxb	3	Ovalis	Penninervis	Stem Rosette
6	Temu Lawak	<i>Curcuma</i>	<i>Curcuma zanthorrhiza</i> Roxb	13	Ovalis	Penninervis	Stem Rosette
7	Temu Mangga	<i>Curcuma</i>	<i>Curcuma mangga</i> Valetton & Zijp	5	Ovalis	Penninervis	Stem Rosette
8	Temu Putih	<i>Curcuma</i>	<i>Curcuma zedoaria</i> (Christm.) Roscoe	4	Ovalis	Penninervis	Stem Rosette
9	Temu Rapet	<i>Kaempferia</i>	<i>Kaempferia rotunda</i> L.	4	Ovalis	Penninervis	Stem Rosette
10	Kencur	<i>Kaempferia</i>	<i>Kaempferia galanga</i> L.	3	Orbicularis	Cervinervis	Root Rosette
11	Bangle	<i>Zingiber</i>	<i>Zingiber montanum</i> (J.König) Link ex A.Dietr.	13	Lanceolatus	Penninervis	Alternate
12	Jahe	<i>Zingiber</i>	<i>Zingiber officinale</i> Roscoe	6	Lanceolatus	Rectinervis	Alternate
13	Jahe Emprit	<i>Zingiber</i>	<i>Zingiber officinale</i> Roscoe	1	Lanceolatus	Rectinervis	Alternate
14	Jahe Gajah	<i>Zingiber</i>	<i>Zingiber officinale</i> Roscoe	1	Lanceolatus	Rectinervis	Alternate
15	Jahe Merah	<i>Zingiber</i>	<i>Zingiber officinale</i> Roscoe	2	Lanceolatus	Rectinervis	Alternate
16	Lempuyang	<i>Zingiber</i>	<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	8	Lanceolatus	Penninervis	Alternate

There were three leaf shape variations: ovalis, lanceolatus, and orbicularis. Leaves with a lanceolatus shape had the highest number with eight species, followed by ovalis with seven species, and orbicularis shape had the smallest number

out of the three. Of the three leaf shape variations, lanceolatus and ovalis are the most common leaf shapes. Tjitrosoepomo (1993) asserts that Zingiberaceae leaves have lanceolatus or ovalis shapes.

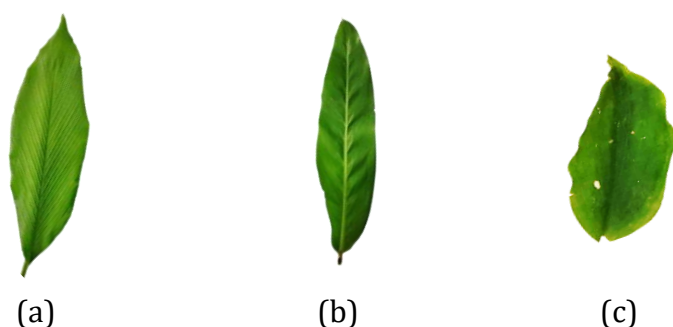


FIGURE 1. The Shape of the Leaves
Description: a) Ovalis, b) Lanceolatus, c) Orbicularis
(Personal Documentation, 2021)

The leaves of the studied *Curcuma* spp. had a glabrous texture on the upper and lower surfaces, pinnate veins, acuminate or acute leaf apex, and elliptic leaf shape. Some species have oblong-lanceolate, ovate, and lanceolate leaves (Sungkawati et al., 2019).

There were also three different variations of the leaf veins: penninervis, rectinervis, and cervinervis. Of the three variations, the dominant one is penninervis

leaf spines, with eleven types. In the second position, there are rectinervis leaf veins with four types, and the last one is cervinervis leaf veins with only one type. Of the three variations of leaf veins, penninervis and rectinervis are the most common. Tjitrosoepomo (1993) claims that Zingiberaceae leaves have penninervis and rectinervis leaf veins.

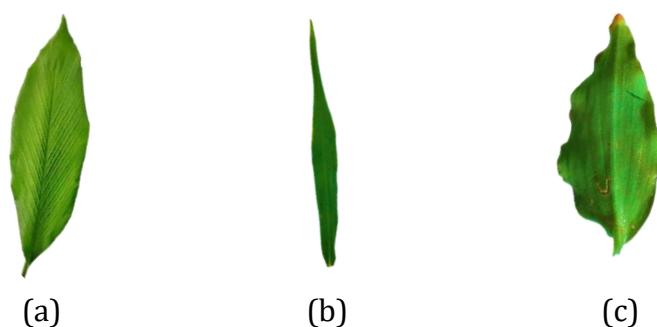


FIGURE 2. Discovered Leaf Spines

Description: a) Penninervis, b) Rectinervis, c) Cervinervis (Personal Documentation, 2021).

There are also three variations of the leaves found: stem rosette, root rosette, and alternate. The most phyllotaxis was found in alternate with eight types, followed by stem rosette with seven types, and the last root rosette with only one type. From the three

variations of phyllotaxis, stem rosettes and alternate were the most common variations. Tjitrosoepomo (1993) explains that Zingiberaceae leaves have stems or roots rosette and alternate.

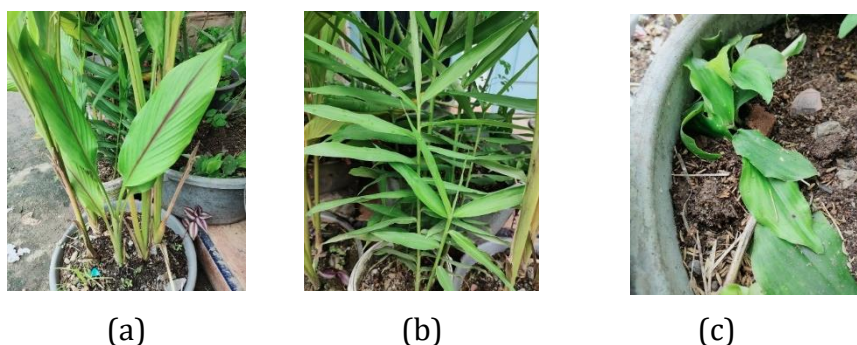


FIGURE 3. Discovered Phyllotaxis

Description: a) Stem rosette, b) Alternate, c) Root rosette (Personal Documentation, 2021).

The Zingiberaceae were found to have their characteristics. *Temu lawak* and *temu putih* are characterized by purplish lines along the leaf veins. On the other hand, *temu*

ireng is characterized by a purplish line from the middle of the leaf-spine to the tip of the leaf.

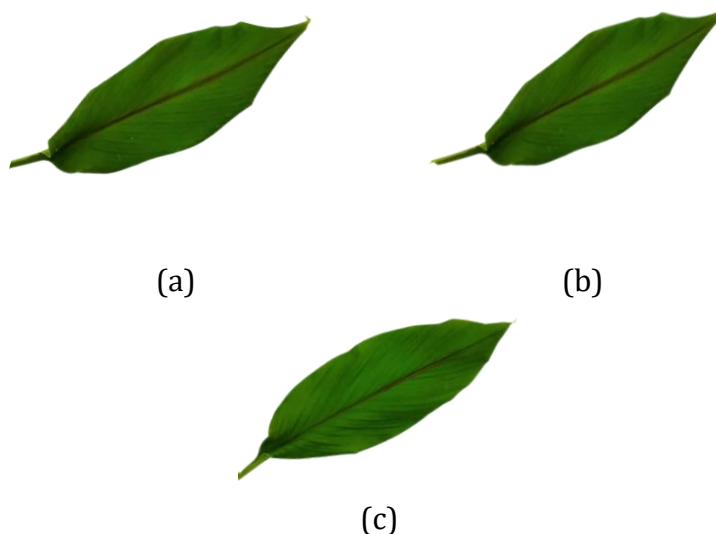


FIGURE 4. Purplish Lines on the Leaf Veins
Description: a) *Temu Lawak*, b) *Temu Putih*, c) *Temu Ireng*
(Personal Documentation, 2021).

If no purplish lines are found along the leaf veins, as shown in Figure 4, then the plants are turmeric and *temu mangga* (Figure 5).



FIGURE 5. Absence of Purplish Lines on Leaf Veins
Description: a) Turmeric, b) *Temu Mangga*
(Personal Documentation, 2021).

The color of the leaf surface distinguishes white galangal and red galangal. Red Galangal has a darker color. Furthermore, the stem of the red galangal is

at the bottom, while the white galangal's stem is green. The characteristics of *bangle* and *lempuyang* are distinguished by the presence of ligules visible in *lempuyang*.

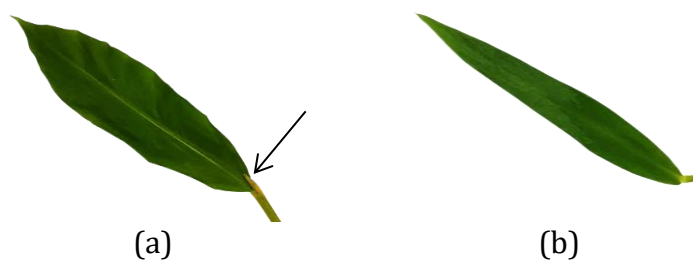


FIGURE 6. Ligula on The Leaves
Description: a) *Lempuyang*, b) *Bangle*
(Personal Documentation, 2021).

Plants with almost the same morphology can be distinguished using an organoleptic test by tearing a little part of the leaf and smelling the aroma. The rhizome aroma can be smelled from the leaves. All types of ginger found cannot be differentiated morphologically. However, red ginger's smell is stronger than the other.

CONCLUSIONS AND SUGGESTIONS

Based on the analysis, it can be concluded that: There are 16 different Zingiberaceae species in Bandar Lampung. The leaf morphology of Zingiberaceae found was found in three variations of leaf, spine, and phyllotaxis.

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