

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

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Abstract. Zingiberaceae is a plant family known as empon-empon. Herbal medicine derived from empon-empon has become one of the medicines that has gone viral since the COVID-19 pandemic and is in great demand by the public because it is known to maintain body resistance. Leaves are one of the organs observed in plant morphological observation. Through naked eye, the leaves of some members of the Zingiberaceae are difficult to distinguish from one another. Therefore, it is necessary to provide information about the differences in morphological characteristics of Zingiberaceae, especially the leaves so that the general public can understand the differences between one species and another. 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. Sampling of Zingiberaceae leaves in this study was performed using a simple random sampling method. Morphological observation was done by observing leaves that looked intact and not diseased. The results showed that 16 species of Zingiberaceae were found in Bandar Lampung which were divided into 5 genera. In addition, three variations of leaf shape, leaf bone, and leaf sitting were found

INTRODUCTION

The Covid-19 pandemic has hit Indonesia since 2020. This has had an impact on all aspects of life, from health, education, social to economic fields. Empon-empon as herbal medicine has become one of the things that has been in demand since the Covid-19 pandemic. Empon-empon are increasingly promising profits, because their demand continues to increase from time to time (Suminah *et al.*, 2017). It is widely known that the corona virus easily attacks people with low immune systems and this plant is known to be able to increase the immune system (Wardhani *et al.*, 2020). Empon-empon herbal medicine was chosen because it contains ingredients that are easily available (Chusna *et al.*, 2021).

Indonesia's richness in medicinal plants has been known since ancient times due to the tropical climate with loose and fertile soil. One of the widely used medicinal plants is the Zingiberaceae (Jalil, 2019). According to Trimanto *et al.* (2018), the Zingiberaceae is divided into 51 genera and 1,200 plant species and almost all of them can be found in tropical forests. Zingiberaceae are widely used, among others, as spices, medicine, spices, ornamental plants, cosmetic ingredients, beverage ingredients, hair tonic ingredients, etc (Mahmudi *et al.*, 2020).

Leaves are organs of plants that can be easily observed. Through naked eye, the leaves of some members of the Zingiberaceae are difficult to distinguish. As Lianah (2020) stated that, Zingiberaceae leaves seem to have the same

shape. However, after careful observation, it turns out that each leaf has differences ranging from shape, size, and characteristics. Leaves of the genera *Curcuma* (temu-temuan) will easily roll when exposed to heat, while the leaves of the genera *Alpinia* (Galangal) are heat resistant and do not roll easily.

Data and information on the morphological characteristics of Zingiberaceae leaves in Bandar Lampung hasn't been widely known. Identification needs to be done to determine the morphological characteristics of the leaves of each type. This study aims to determine the morphological characteristics of Zingiberaceae leaves in Bandar Lampung. Observations were made using several parameters, namely: leaf shape, leaf bone, 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 storage plastic bag. While the equipment used in this study were scissors, cameras, labels, and stationary.

Sampling of Zingiberaceae leaves performed using a simple random sampling method based on Kawatu et al. (2019). The selection of the sampling area is done by lottery. Zingiberaceae leaves are selected from plants that appear intact and not diseased. The leaves are then labelled hanging and documented in the form of photographs. The morphological characters observed were leaf shape, leaf bone, and leaf sitting. The data from the observation of Zingiberaceae leaf morphology are presented in the form of tables and figures and analyzed descriptively.

RESULTS AND DISCUSSION

The results showed that there were 16 different Zingiberaceae species in Bandar Lampung and divided into 5 genera, namely: *Curcuma*, *Kaemferia*, *Alpinia*, *Zingiber*, and *Boesenbergia*. The most common genera found was *Zingiber* and the least found genera 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 5 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, appetite, bronchitis, and *Fungus infection, such as Tinea versicolor* (Haryanto, 2012). The rhizome of galangal is easily obtained in Indonesia and was effective as a liniment for skin fungal diseases (phlegm) before modern medicine developed as it is today. 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 Bones	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

The leaf shape found there were three different variations, namely: ovalis, lanceolatus, and orbicularis. Leaves with lanceolatus shape had the highest number, namely 8 species, followed by ovalis with 7 species and orbicularis shape had the smallest number of species. From the three variations of leaf shape, lanceolatus and ovalis are the most common leaf shapes. This is in accordance with Tjitrosoepomo (1993) who explained that Zingiberaceae leaves have a lanceolatus or ovalis shape.

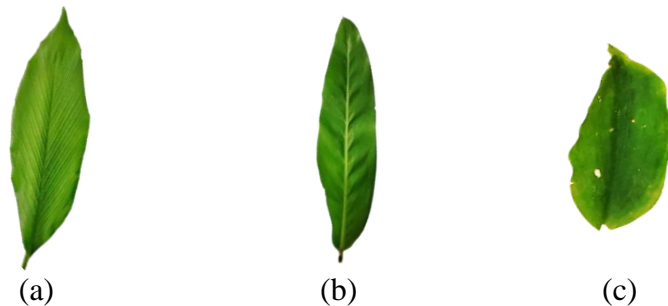


FIGURE 1. The shape of the leaves found
Description: a) Ovalis, b) Lanceolatus, c) Orbicularis
(Personal Documentation, 2021)

There were also three different variations of the leaf veins, namely: penninervis, rectinervis, and cervinervis. From the three variations, the dominant one is penninervis leaf spines with 11 types. In the second position, there are rectinervis leaf veins with 4 types and the last one is cervinervis leaf veins with only 1 type. Of the three variations of leaf veins, penninervis and rectinervis are the most common leaf veins. This is in accordance with Tjitrosoepomo (1993) who explained that Zingiberaceae leaves have penninervis and rectinervis leaf veins.

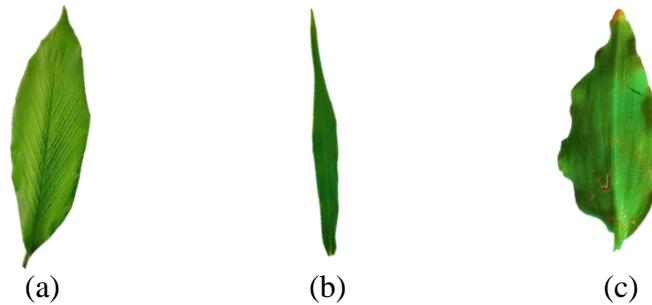


FIGURE 2. Leaf spines found
Description: a) Penninervis, b) Rectinervis, c) Cervinervis
(Personal Documentation, 2021).

There are also three variations of the leaves found, namely: stem rosette, root rosette, and alternate. The most phyllotaxis is alternate with 8 types, followed by stem rosette with 7 types, and the last one is root rosette with only 1 type. From the three variations of phyllotaxis, stem rosettes and alternate are the most common variations. This is in accordance with Tjitrosoepomo (1993) who explained that Zingiberaceae leaves have stems or roots rosette and alternate.

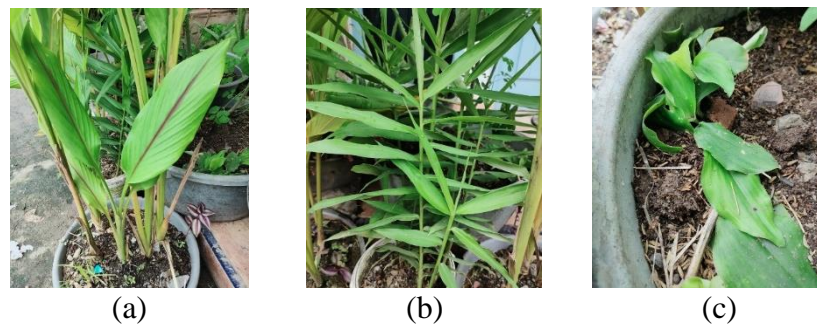


FIGURE 3. Phyllotaxis found
Description: a) Stem rosette, b) Alternate, c) Root rosette
(Personal Documentation, 2021).

Zingiberaceae found have their own characteristics. Temu Lawak and Temu Putih are characterized by the presence of purplish lines along the leaf veins. Meanwhile, Temu Ireng is characterized by a purplish line from the middle of the leaf spine to the tip of the leaf.

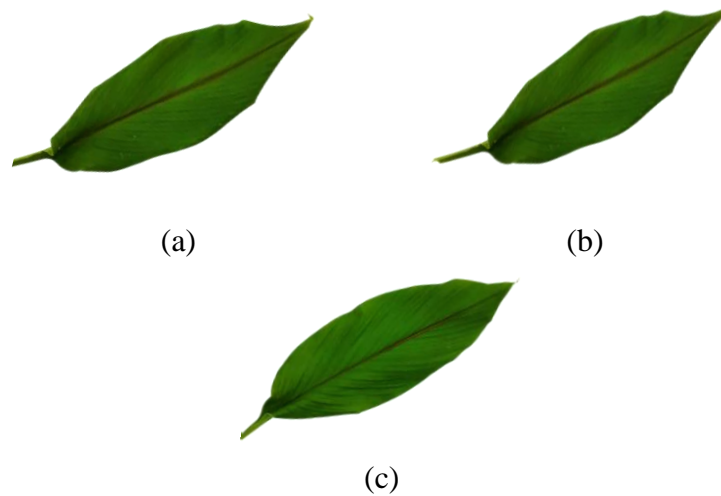


FIGURE 4. Purplish lines on leaf veins
Description: a) Temu Lawak, b) Temu Putih, c) Temu Ireng
(Personal Documentation, 2021).

If no purplish lines are found along the leaf veins as shown in Figure 4., then the types found are Turmeric and Temu Mangga (Figure 5).

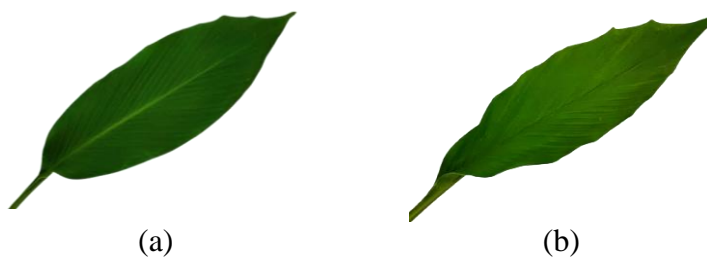


FIGURE 5. Absence of purplish lines on leaf veins
Description: a) Turmeric, b) Temu Mangga
(Personal Documentation, 2021).

White galangal and red galangal are distinguished by the color on the leaf surface. Red Galangal has a darker color. In addition, the stem of Red Galangal will be red at the bottom, while for White Galangal, the stem will be green. Bangle and Lempuyang are distinguished by the characteristic presence of ligules that are clearly visible in Lempuyang.

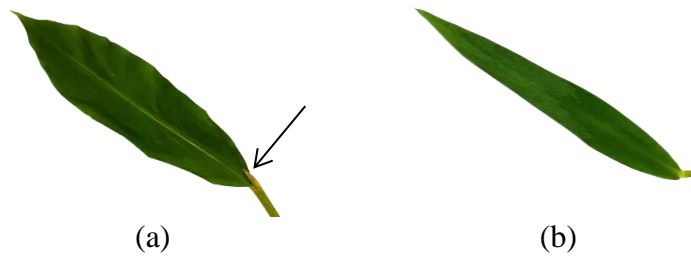


FIGURE 6. Ligula on leaves
Description: a) Lempuyang, b) Bangle
(Personal Documentation, 2021).

Plants that have almost the same morphology can be distinguished by using an organoleptic test, which can be done by tearing a little part of the leaf and smelling the aroma. The rhizome aroma can be smelled from the leaves. All type of ginger found can't be differentiated morphologically. However, Red ginger's smell is stronger than the other.

CONCLUSION

From the research done, it can be concluded that:

1. There are 16 different Zingiberaceae species in Bandar Lampung.
2. The leaf morphology of Zingiberaceae found was found in three variations of leaf shape, leaf bone, and phyllotaxis.

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