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TheGinger family or Zingiberaceae is very well known all over the world.

Zingiberaceae has about 50 genera and over 1600 species worldwide

(Maarten et al.

, 2016). It is easily recognizable as a flowering plant with distinct aromas and rhizome roots. This perennial herb features simple blades of slightly thick, fleshy leaves on erect pseudostem usually green in colour. To locate members of Zingiberaceae family, one must know that the plant thrives warm and sunny areas with damp soil conditions.

Thus, as a tropical plant, it can be found primarily in regions along the equator with environments of adequate humidity and temperature. The plant is widely used as spices in cooking, herbal medicines, and cosmetics. The Indians and ancient Chinese have practiced the use of ginger root to treat various common ailments since olden times. In fact, ginger has been traded throughout history longer than most other spices due to its medicinal merits. Common uses of Zingiberaceae stated by Ibrahim et al. (2017) in the medicinal field include relieving flatulence or stomach ache, post-natal healthcare, treatment for muscle sprains and joint pains and universal health drink.

Basically, the plant is used extensively in modern medicine and pharmacology as well as traditional medicine. Although members of this family are commonly used in various fields, it is quite difficult to recognize and differentiate between species of Zingiberaceae as they all bear multiple resemblance with each other especially without basic expertise and knowledge in taxonomy and ginger morphological description. For example,

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turmeric, common ginger and galangal are widely used in Malay delicacies but to the uninformed eyes, the rhizomes of these species look basically similar and the plants all have large green leaves without much distinction. Thus, this study was carried out to describe the morphological variation of Zingiberaceae and evaluate the distribution of Zingiberaceae family particularly in district of Kuantan, Pahang. This is crucial for better understanding of Zingiberaceae distribution and goes hand in hand to the efforts for recognizing key identification features of Zingiberaceae family.

CHAPTER TWO LITERATURE REVIEW 2.

1 ZINGIBERACEAE 2.

2 Zingiberaceae family Zingiberaceae is a well-known plant with roughly 50 genera and over 1600 species worldwide and about less than a hundred species in Malaysia (Maarten et al., 2016). It is a family of flowering plants of aromatic perennial herbs with creeping horizontal or tuberous rhizomes distributed throughout tropical Africa, Asia, and the Americas. Plants in Zingiberaceae family are herbaceous with distichous leaves that forms pseudostem. The plants are usually terrestrial or epiphytic.

Flowers are hermaphroditic, usually strongly zygomorphic, in determinate cymose inflorescences, and subtended by conspicuous, spirally arranged bracts. The perianth is composed of two whorls, a fused tubular calyx, and a tubular corolla with one lobe larger than the other. Flowers typically have two of their stamens (sterile stamens) fused to form a petaloid lip, and have only one fertile stamen.

The ovary is inferior and topped by two nectaries, the stigma is funnel-shaped. The fruits are capsular, fleshy or dry, dehiscent or indehiscent, sometimes berrylike. Seed may be many or few, arilate, aril, often lobed or lacerate (Jatoi et al.

, 2007). Plants of the Zingiberaceae family mainly reproduce asexually

through underground rhizomes. Kingdom : Plantae Phylum

: Tracheophyta Class : Liliopsida Order

: Zingiberales Family : Zingiberaceae Genus

: Zingiber Species : officinale 2. 2.

1 GENERA Zingiberaceae consist of approximately 50 genera distributed worldwide but according to Ibrahim et al. (2007), only 18 genera have been recorded in Peninsular Malaysia. Below are morphological structures of some common and abundant genera of Zingiberaceae in Malaysia.

2. 2. 1. 1 *Alpinia* ALPINIA Roxburgh The genus is easily distinguished by its terminal inflorescence on leafy shoot, which is emerging above its uppermost leaf sheath, rarely appearing lateral and if so then not densely congested and labellum large and showy (Julius et al., 2010). Rhizomes are creeping and thick. Pseudostems many, well developed and rarely absent.

Leaves are many, leaf blade oblong or lanceolate. Inflorescence at terminal panicle, raceme, or spike, dense or lax. Calyx usually tubular. Corolla central lobe.

Ovary usually 3-loculed and placentation axile. Stigma usually well expanded. Capsule usually globose, dry or fleshy, indehiscent or irregularly dehiscent. Seeds numerous. (Delinet al., 2000).

2. 2. 1.

2 Amomum AMOMUM Roxburgh Amomum is characterised by radical cone-like inflorescences without an involucre of sterile bracts, sometimes stilted root (Julius et al., 2010). Rhizomes are widely creeping.

Pseudostems elongate. Leaf sheath long, leaf blade usually oblong-lanceolate, oblong, or linear. Inflorescence arising from rhizomes, a densely flowered spike or spike-like raceme or panicle. Calyx usually tubular.

Corolla tube cylindrical. Filament well developed. Ovary 3-loculed; ovules many per locule, superposed. Style filiform; stigma usually funnel-form, small, ciliate.

Seeds oblong or many angled. (Delin et al., 2000). 2. 2. 1.

3 Etlingera ETLINGERAGiseke Etlingera is characterised by an involucre of sterile bracts, a short or much elongated peduncle, tubular and elongated bracteoles, and distinct petal lobes, base of filament and labellum (Julius et al., 2010). Rhizomes are creeping. Pseudostems robust. Leaves petiolate, lanceolate, large. Inflorescence arising from rhizomes.

Calyx tubular. Corolla tube equaling or longer than calyx. Lateral staminodes absent. Labellum tongue-shaped. Stamen shorter than labellum. Ovary 3-

loculed; ovules numerous per locule. Capsule fleshy, indehiscent, smooth, longitudinally ridged, or with obtuse warts in rows. (Delinet al.

, 2000). 2. 2. 1. 4 ZingiberZINGIBERMillerZingiberis a monophyletic group which produces radical inflorescenceandcharacterised by having pulvinus petiole and anther crest wrapped around theexerted style (Julius et al.

, 2010). Rhizomesbranched, tuberous, aromatic. Pseudostems erect, leafy. Leaves distichous petioleswollen, leaf blade oblong, lanceolate, or linear. Inflorescences conical, arising from rhizomes on peduncle. Calyx tubular. Corolla tube slender. Filament short.

Ovary 3-loculed; placentation axile. Style slender, stigma notexpanded. Capsule dehiscent loculicidally or irregularly. Seeds black. (Delin et al., 2000). 2.

2. 2 Ecologyand HabitatZingiberaceaeare easily found in tropical and subtropical regions, primarily in tropical Asiawhich posses moist and hot climate as well as large variety of habitats that probablyfavored the development and differentiation of these plants. (Jatoi et a. l, 2007). They not only compromisea prominent fraction of the undergrowth of tropical rain and monsoon forest butare also sometimes found in secondary forest.

2. 2. 3 GeographicaldistributionMalaysiais among one of the countries with the greatest number of Zingiberaceae speciesin South East Asia besides Thailand. Of 60% of tropical rainforest coveringMalaysia, over 320 species of 21 genera of Zingiberaceae have been discoveredas stated by Ibrahim et al. (2007) albeit there are disputes to the exactnumber of genera of

Zingiberaceae found in Malaysia due to the persistent process of evolution of the plant. 2. 2. 4 Uses The Zingiberaceae species have long been exploited for a wide range of uses and have been part of the Asian culture for centuries.

In Malaysia, plants of Zingiberaceae family are used as flavoring, spices, vegetables, medicine and religious practices. Recently, cultivated gingers are utilized for pharmaceutical and cosmeceutical field. (Ibrahim et al., 2007). Almost a fifth of the Peninsular Malaysian gingers are consumable and eaten fresh or cooked. Almost all parts of the plants can be eaten which includes mainly rhizomes but also fruits, seeds, young shoots and flower. (Ibrahim et al.

, 2007). Some species of Zingiberaceae are also used in post-natal healthcare and post-partum medicine as it is believed to be able to help the process of internal healing in confinement period of new mothers Kumar et al. (2013) stated that the plants are characterized by the presence of valuable volatile oils. Almost all of Zingiberaceae species have aromatic rhizome and fruit which can act as tonics and stimulants. The plants also can be processed into astringent and diaphoretic juice as utilized in Ayurvedic medicine.

More recent studies into pharmacological potential of Zingiberaceae revealed anti-cancer and anti-microbial properties obtained from ginger extracts as revealed by Wohlmuth (2008) which is a spectacular finding in the ultimate search for the cure to cancer. 2. 3 Recent collection and checklist (Malaysia, Pahang and Kuantan) There are approximately 160 species of

Zingiberaceae belonging to 18generain Peninsular Malaysia as mentioned by Ibrahim et al.

(2007) as described in Table2. 1