

Identification of *Zingiberaceae* as medicinal plants in Gunung Cut Village, Aceh Barat Daya, Indonesia

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ABSTRACT

Zingiberaceae is well known as gingers family with abundant numbers of spices widely used in Southeast Asia, because of their unique flavors, ornamental and also the medicinal values. The extracts of *Zingiberaceae* rhizome contain many essentials oils, including terpenes, alcohols, ketones, flavonoids and phytoestrogens that use as medicine. *Zingiberaceae* grow vigorously in a wide range of habitats ranging from riverine to the limestone area, from lowland to the upper mountain regions. They often grow in shady area but some of the native species are able to tolerate to the sun exposure. The cultivation of this family was developed widely. Gunung Cut Village is one the villages in Aceh Barat Daya district which cultivated four species of this family: *Zingiber officinale*, *Curcuma domestica*, *Alpinia galanga* and *Kaempferia galanga*. They mainly use for medicinal purposes as it can cure many diseases traditionally.

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1. INTRODUCTION

Zingiberaceae is well known as gingers family with abundant numbers of spices widely used in Southeast Asia because of their unique flavors, ornamental and also the medicinal values (Aggarwal and Shishodia, 2006). The extracts of *Zingiberaceae* rhizome contain many essentials oils, including terpenes, alcohols, ketones, flavonoids and phytoestrogens that use as medicine. *Zingiberaceae* grow vigorously in a wide range of habitats ranging from riverine to the limestone area, from lowland to the upper mountain regions, they often grow in shady area but some of the native species are able to tolerate to the sun exposure (Larsen, 1999). Jatoi et al. (2007) mentioned that *Zingiberaceae* as the largest families in the plant kingdom, are distributed mainly in the tropical Asia. They comprise not only a prominent fraction of the undergrowth of tropical rain forest and monsoon forest, but also found in the secondary forest (Chen, 1989). As used gingers, this family consists of some genera such as; *Alpinia*, *Amomum*, *Curcuma*, and *Zingiber*, followed by *Boesenbergia*, *Kaempferia*, *Elettaria*, *Elettariopsis*, *Etlingera*, and *Hedychium* are the most important. Most of the species are rhizomatous where the propagation often occurs through rhizomes (Jatoi et al., 2007).

Members of *Zingiberaceae* are usually aromatic in all part of plant, has functions as natural sources of spices, herbal medicine, natural dyes, perfumes and multipurpose of aesthetic compounds (Sirirugsa, 1999 in

Jatoi et al., 2007). *Zingiberaceae* vary in height and size, from gigantic erect leafy shoots, which in some species achieve more height more than 8 m (e.g., *Etlingera elatior*), to plant as small as 10 cm or at nearly ground level such as *Kaempferia galanga* (Larsen et al., 1999). *Zingiberaceae* grown almost in all gardens in Gunung Cut Village. This village is the capital city of Tengan-tengan district in Aceh Barat Daya, Aceh, Indonesia with total area about 1.046 Ha. This area belongs to the tropical rain forest, where the society has a main job in growing *Zingiberaceae*s medicinal and economical values. They use *Zingiberaceae* for many diseases such as; ear inflammation, cataract, kidney, infertility and others.

2. MATERIALS AND METHODS

2.1 Study area

The research was conducted from July to August 2018. All areas in Gunung Cut Village were selected for data collections.

2.2 Data collection

Data were collected through observation, documentation and personal interviews with the society (informant) using *Snowball sampling* (*Chain sampling*), where the information obtained from the main sources then could developed for further information's. The informant determined based on the information from the leader in

Gunung Cut Village such as; tribal leader, the head of the village, and trusted sources who know deeply related to research activities carried out.

3. RESULTS AND DISCUSSION

The results obtained in this study, from the informants, herbal medicine practitioner and the society in Gunung Cut Village mainly grow four species of *Zingiberaceae* (Table 1.). Those species found could recover some diseases. Nature has been a source of medicinal agents for thousands of years and a lot of number of modern drugs has been isolated from natural sources that play a vital role in treatment of diseases (Cragg and Newman, 2001). Traditional medicinal plants usage are often cheaper, locally available and easily consumable, raw or as simple

medicinal preparations. These simple medicinal preparations often bring out beneficial responses due to their active chemical constituents (Park and Pezutto, 2002). Natural chemical content in medicinal plants are generally known as "Chemical Goldmines" which are acceptable to human and animal system. Those important chemical cannot be synthesized in the laboratories. A lot of secondary metabolites in plant are commercially important and find use for pharmaceutical compounds. Human beings have been dependent on plants for their health care needs since the beginning of civilization. More than 80.000 plant species on earth are medicinal use (Dhanik et al, 2017).

Table 1. Species from *Zingiberaceae* grown in Gunung Cut Village, Aceh Barat Indonesia

No.	Local Name	Scientific Name	Main traditional medicine usage
1.	Jahe (Ginger)	<i>Zingiber officinale</i> Rosc.	Anti-inflammatory, relieve pain, anti-bacteria.
2.	Kunyit (Turmeric)	<i>Curcuma domestica</i> Val.	Gastritis, dyspepsia, joint pain, reduce pain during menstruation
3.	Lengkuas (galangal)	<i>Alpinia galangal</i> L.	Relieve chest pain, sore throat, antifungal
4.	Kencur	<i>Kaempferia galanga</i> L.	Fever, swollen, rheumatism

3.1 *Zingiber officinale*

Zingiber officinale (Figure 1) is well known as ginger, one of the most important members from *Zingiberaceae* family. It values for medicinal, nutritional, and ethnobotanical and extensively use worldwide as a spice, flavoring agent and herbal remedy (Grzanna et al, 2005; Dhanik et al, 2017). Phytochemical studies of gingers show that the rhizome contains a wide variety of biologically active compounds which impart medicinal property. Ginger is reported to possess essential oils, phenolic compound, flavonoids, carbohydrates, proteins, alkaloids, glycosides, saponins, steroid, terpenoids and tannin as the major phytochemical groups (Dhanik et al, 2017). Ginger in Gunung Cut Village mainly used as herbal medicine to cure variety diseases; nausea, vomiting, asthma, cough, palpitation, inflammation, dyspepsia, loss of appetite, constipation, indigestion and pain.

Scientific classification:

Kingdom : Plantae
 Division : Magnoliophyta
 Class : Liliopsida
 Order : Zingiberales
 Family : Zingiberaceae
 Genus : Zingiber
 Species : *Zingiber officinale* Rosc.
 (Gupta and Sharma, 2014).



Figure 1. Rhizome of *Zinger officinale* (Gupta and Sharma, 2014).

According to Food and Agricultural Organization of United Nations: Economic and Social department: The statistical division (2013), Indonesia is one of top ten gingers producing country in the world (Table 2).

Table 2. Top ten gingers producing country

No	Country	Producing (Tonnes)
1.	India	683.000
2.	China	425.000
3.	Nepal	235.033
4.	Indonesia	232.669
5.	Nigeria	16.000
6.	Thailand	14.000
7.	Bangladesh	69.000
8.	Japan	57.835
9.	Cameroon	46.350
10.	Philippines	28.216

3.2 *Curcuma domestica* Vall

Turmeric (**Figure 2**) is a spice that has received much interest from both the medical and scientific worlds as well as from the culinary world (Priyadarsini, 2014). Curcumin has received worldwide attention for its multiple health benefits, including in Gunung Cut Village, they cultivated curcumin mainly for its health benefits especially through its anti-oxidant and anti-inflammatory mechanisms. According to Hewlings and Kalman (2017), these benefits are best achieved when curcumin is

combined with agents such as piperine, which increase its bioavailability significantly. It suggested that curcumin can help in the management of oxidative and inflammatory conditions, metabolic syndrome, arthritis, anxiety, and hyperlipidemia. It may also help in the management of exercise-induced inflammation and muscle soreness.

Curcumin is an important constituent of turmeric. A yellow-pigmented fraction isolated from the rhizomes of *Curcuma* contains curcuminoids belonging to dicinnamoyl methane group. Curcuminoids are presented to the extent of 3-5%. It is an important active ingredient responsible for the biological activity of *Curcuma* (Pandey and Katiyar, 2010).

Scientific classification

Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Liliopsida
Order	: Zingiberales
Family	: Zingiberaceae
Genus	: <i>Curcuma</i>
Species	: <i>Curcuma domestica</i> Vall



Figure 2. Tumeric rhizome (Hartati, 2013)

3.3 *Alpinia galanga* (galangal)

The people in Gunung Cut Village intensively cultivate galangal (Figure 3) in their garden. The mixture of galangal with warm water could recover chest pain and sore throat. According to the explanation of Verma et al. (2011), different parts of this plant are traditionally used for the treatment of ailments including anti-fungal, anti-tumor, anti-helminthic, anti-diuretic, anti-ulcerative, heart disease, rheumatic pains, chest pain, dyspepsia fever, diabetes, burning of liver and kidney disease.

Scientific classification

Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Liliopsida

Order	: Zingiberales
Family	: Zingiberaceae
Genus	: <i>Alpinia</i>
Species	: <i>Alpinia galanga</i>

Galangal is a native of Indonesia although its exact origin is not known, but it naturalized spread to many parts of South and South East Asia. The oldest reports about its use and existence are from southern China and Java. The sub-Himalayan zone is also believed to be a natural home of galangal. It is mostly cultivated in home gardens and organized plantations do not exist. The Netherlands imports yearly over 100 tons of fresh rhizomes and about 30 tons of dried rhizomes. The main suppliers are Thailand, Indonesia and India (Scheffer and Jansen, 1999). Many investigations have been done for chemical content of galangal rhizome. The analyzed of a rhizome sample from Indonesia reported 1,8-cineole (47.3 %), α -pinene (11.5 %), β -pinene (7.1 %), α -thujene (6.2 %), terpinen-4-ol (6.0 %), α -terpineol, limonene (4.3 % each) and many other compounds in lower concentrations (Ravindran and Divakaran, 2012).

3.4 *Kaempferia galanga* L.

Another important herb from *Zingiberaceae* that cultivated in Gunung Cut Village as herbal medicine is *Kaempferia galanga* L. Well known as kencur in Bahasa Indonesia. The society in Gunung Cut uses this herbs to cure fever, swollen and rheumatics also for culinary. The medicinal value of each parts of *Kaempferia galanga* L. have been studied for years. The rhizome, root stocks and leaves are used in different way for different medicinal purposes (figure 3). The leaves traditionally can be used for anti-inflammation, cure the sore throat, mood stabilizer, and increase the stamina. While the rhizome consumes for curing the diarrhea, anti-cancer, and stomachache.

Scientific classification

Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Liliopsida
Order	: Zingiberales
Family	: Zingiberaceae
Genus	: <i>Kaempferia</i>
Species	: <i>Kaempferia galanga</i> L.

According to the research had been done by Kanjanapothi et al. (2004), *Kaempferia galanga* L. has a lot of pharmacological activity, can be seen in the Table. 3.

Table 3. Pharmacological activities of *Kaempferia galanga* L. extracts with possible mechanism of action

Pharmacological activities	Responsible constituents	Possible mechanism of action
Analgesic and anti- inflammatory		Central mechanism involving opioid and peripheral mechanism involving cyclooxygenase pathway (Ridititid et al, 2008; Sukiman et al, 2008)
Nematicidal activity	Ethyl-trans-cinnamate, ethyl-p-methoxycinnamate (Hong et al, 2011)	Mode of delivery of constituents is partly through steam phase. Mechanism is still unclear (Hong et al, 2011).
Mosquito repellent and larvicidal activity	ethyl-p-methoxycinnamate, ethyl-cinnamate, 3-carene, 2-propionic acid (Kim et al, 2008; Sutthanont et al, 2010)	Destruction of ionic regulation in the anal gills (Insun et al, 2010).
Vasorelaxant activity	ethyl-cinnamate (Othman et al, 2006)	Inhibition of calcium influx into vascular cells, release of nitric oxide and prostaglandins from endothelial cells (Othman et al, 2002).
Antineoplastic activity	ethyl-p-methoxycinnamate (Liu et al, 2010)	Translocation of phosphatidylserine of Hep G2 cells to cell surface, resulting in an increase in sub-G cell population (Liu et al, 2010).
Anti-oxidant activity	Total phenolic content and flavonoids including luteolin and apigenin (Mustafa et al, 2010)	
Anti-microbial activity	ethyl-p-methoxycinnamate (Kanjapothi et al, 2004)	

From a review about this herbs mentioned that *Kaempferia galanga* L. is a major plant with many valuable medicinal properties. Although the rhizome is the main source of active principles, leaves are also being used in traditional medicine to treat swelling, headache, rheumatism etc. Extract of *Kaempferia galanga* L. have antioxidant, antimicrobial, analgesic, mosquito repellent sedative and wound healing activities (Nag and Mandal, 2015).

**Figure 3.** Different part of *Kaempferia galanga* L. (Nag and Mandal, 2015)

4. CONCLUSION

Gunung Cut is a village located in Aceh Barat Daya district, Aceh province, Indonesia. *Zingiberaceae* intensively cultivated in home garden in this village as medicinal plants, herbs, spice and economic purpose. There are four species of *Zingiberaceae*; *Zingiber officinale*, *Curcuma domestica* Vall., *Alpinia galanga* L., and *Kaempferia galanga* L.

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