The ethnobotany of Zingiberaceae as the traditional medicine ingredients utilized by Colo Muria mountain villagers, Central Java

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Abstract. Zingiberaceae is one of the natural resources used as a natural medicine by Colo Muria mountain villagers in Dawe District, Kudus Regency, Central Java. However, there is no particular study focusing on the use of the Zingiberaceae family in that area. This research aims to identify some species of the Zingiberaceae family utilized as a traditional medicine Colo Muria mountain villagers in Central Java. The data collection method is conducted by a semi-structured interview method, field observation, and documentation. The data was analyzed qualitatively. The result shows that there were 14 species utilized as traditional medicine by the Colo Gunung Muria villagers: Bangle (Zingiber purpureum Roxb.), Ginger (Zingiber officinale), Red Ginger (Alpinia purpurata k. Schum.), Cardamom (Elettaria cardamomum (l.) Maton), Kencur (Kaempferia galanga L.), Kunci (Kaempferia pandurata Roxb.), Turmeric (Curcuma domestica Val.), Bitter Ginger (Zingiber zerumbet), Lengkuas (Alpinia galanga (L.) Swartz), Parahulu (Amomum aculeatum Roxb.), Temu Lawak (Curcuma xanthorrhiza Roxb.), Temu Giring (Curcuma heynacea Val.), Temu Hitam (Curcuma aeruginosa Roxb.), and Temu Putih (Curcuma zedoaria Berg.). The processing technique of the plants was in two ways: pounded and boiled. While the methods of use were by drinking (61%), rubbed (22%), direct consumption (9%), dripped (4%), and dicethik (squeezed and dripped 4%).

Keywords: ethnobotany, zingiberaceae, ingredients.

1. Introduction
Indonesia is a country with very high biodiversity, ranking second with the most extensive biodiversity in the world after the Amazon rainforest; this is indicated by the high number of native Indonesian medicinal plants [1,2]. Zingiberaceae family is one type of plant used as an ingredient in traditional medicine [3–5]. In general, this family is known as jahe-jahean (gingers) or empon-empon (traditional herbs) by the Indonesian people. From the results studied by Lawrence [6], it was showed that this family is the biggest among the order of Zingiberales. According to Hartati et. al., [7] Zingiberaceae is one of the most dispersed plants in tropical and subtropical area, and there were approximately 19 genera and 375 species throughout Indonesia. Based on empirical data, some plants from the Zingiberaceae family are traditionally used to treat various diseases.
In Indonesia, medicinal plants and herbs are known as Jamu [8,9]. The term medicinal plants refer to some plants that can relieve pain, increase immunity, kill germs, and repair damaged organs such as kidneys, heart, lungs. Medicinal plants can also inhibit the growth of abnormal cells, such as tumors and cancer [10].

Colo Village is an area located at an altitude of 700 m above sea level, where the majority of the population embraces Islam as their religion [11]. The people of Colo Village, which is located at the foot of Mount Muria, still believe in the efficacy of various kinds of plants in their area, including plants from the Zingiberaceae family. The use of plants from the Zingiberaceae family by the community is also a form of Indonesia's cultural heritage. The utilization of these plants in the daily life of Colo villagers is related to culture, ethnicity, and biodiversity. The knowledge about Zingiberaceae plants' utilization needs to be passed on from one generation to the next. That is so that their use is not replaced by modern products or the products that contain chemicals, given the enormous benefits of Zingiberaceae plants for the community.

Plants from the Zingiberaceae family are closely related to the Colo villagers as the plants used in everyday life. Thus, this research focuses on identifying plant species from the Zingiberaceae family that are utilized by the people of Colo Village, Dawe District, Kudus Regency. This study also explored plants' use from the Zingiberaceae family to determine the types of species, benefits, and plant processing methods, especially those related to the usage as traditional medicine.

It is hoped that this research can serve as a means to motivate the community to participate in attempts to preserve natural resources.

2. Methods
This research was conducted in the Colo Village, Dawe District, Kudus Regency, Central Java. Colo village consists of four sub-village, which are: Colo, Panggang, Pandhak, dan Kombang. Data collection techniques were divided into several stages, which were: interview, observation, and documentation. Sampling was conducted using purposive and snowball sampling methods. The interview implemented was semi-structured and used interview instruments. There were forty interviewees, and the languages used were Bahasa Indonesia and Javanese language. Data obtained then were made into the presentations of kinds of usage and processing methods of the medicinal herbs.

The next method of data sampling was field observation. Field observation was conducted at the same time as the interviews while following the interviewees doing their daily chores (not all day), observing the places where the plants grew, and inventoried the species of Zingiberaceae family found. The utilization of Zingiberaceae plants for daily life was also observed. The last technique was documentation. This technique was conducted by taking pictures as well as recording while conducting the interviews. Photos of the Zingiberaceae plants used by Colo villagers were also taken from the forest, garden, or the villagers' yard. If there were some unidentified or rare plants, samples were taken for further research and stored as an herbarium.

3. Results and Discussion
Medicinal plants, or in Indonesia, better known as jamu, are divided into four categories of medicine: health care, beauty care (cosmetics), tonic, and immune booster. The utilization of traditional medicine has been increased recently and can be an interesting topic for research. Most of the medicinal plants have not been studied for new potential medicine; this phenomenon not only happened in Indonesia but also in other countries [8,12,13]. Based on the interviews conducted with 40 interviewees, there were 14 species of Zingiberaceae family or empon-empon which were utilized as medicinal plants by Colo villagers, namely: Bangle (Zingiber purpureum Roxb), Ginger (Zingiber officinale), Red Ginger (Alpinia purpurata k. Schum.), Cardamom (Elettaria cardamomum (L.) Maton), Kencur (Kaempferia galanga L.), Kunci (Kaempferia pandurata Roxb.), Turmeric (Curcuma domestica Val.), Bitter Ginger (Zingiber zerumbet), Lengkuas (Alpinia galanga (L.) Swartz), Parahulu (Amomum aculeatum Roxb.), Temu Lawak.
(Curcuma xanthorhiza Roxb.), Temu Giring (Curcuma heyneana Val.), Temu Hitam (Curcuma aeruginosa Roxb.), and Temu Putih (Curcuma zedoaria Berg.).

Table 1. Zingiberaceae Family Plant Species Utilized by the Colo Village Community

| No | Species Name (Local or generic name) | Scientific Name | Organs used |
|----|-------------------------------------|-----------------|-------------|
| 1. | Bengle (bangle)                     | *Zingiber purpureum* Roxb. | Rhizome    |
| 2. | Jahe (ginger)                       | *Zingiber officinale* | Rhizome    |
| 3. | Jahe merah (red ginger)             | *Alpinia purpurata* k. Schum. | Rhizome |
| 4. | Kapulaga (Cardamom)                 | *Elettaria cardamomum* (L.) Maton | Fruit   |
| 5. | Kencir (aromatic ginger)            | *Kaempferia pandurata* Roxb. | Rhizome |
| 6. | Kunci (finger root)                 | *Kaempferia galanga* L. | Rhizome   |
| 7. | Kuniri/Kunyit (turmeric)            | *Curcuma domestica* Val. | Rhizome   |
| 8. | Lempuyang gajah (bitter ginger)     | *Zingiber zerumbet* | Rhizome   |
| 9. | Laos/Lengkuas (greater galanga)     | *Alpinia galanga* (L.) Swartz | Rhizome |
| 10. | Wola-waliyan/Parahulu (amomum)      | *Amomum aculeatum* Roxb. | Leaf      |
| 11. | Temu lawak (Javanese turmeric)      | *Curcuma xanthorhiza* Roxb. | Rhizome   |
| 12. | Temu giring                         | *Curcuma heyneana* Val. | Rhizome   |
| 13. | Temu hitam                          | *Curcuma aeruginosa* Roxb. | Rhizome   |
| 14. | Temu putih                          | *Curcuma zedoaria* Berg. | Rhizome   |

The plants that most often used by the Colo villagers were ginger and turmeric. In experimental and preclinical studies conducted by Mahboubi [14] ginger has several activities as: anti-bacterial activities, anti-fungal activities, analgesic, anti-inflammation anti-ulcer, immunomodulator, relaxant, and warming effect from the produced essential oil. While turmeric contains diarylheptanoids, curcuminoids (curcumin, monodemethoxycurcumin, and bisdemethoxycurcumin) compounds [15]. Curcuminoids have been shown to have many pharmacological properties such as anti-oxidants, anti-protozoa [16], anti-venom activity [17], anti-microbial activity [18], anti-malaria [19] anti-inflammation [20], anti-angiogenic [21] and anti-tumor activity [22].

Table 2. Benefits and processing methods of Zingiberaceae plants

| No | Usage                  | Plant Name/Ingredient | Processing Methods                                      |
|----|------------------------|-----------------------|--------------------------------------------------------|
| 1. | Relieves colds         | Ginger, Bangle, Garlic| Prepare one finger segment each for Ginger and bangle. Then wash the garlic and pound it, boil them with 2 cups water until the remaining 1/2 cup, and then drink. |
| 2. | Treats the flu (for pregnant women) | Bangle, Dlingo (*Acorus calamus*) leaf | Chew the bangle and dlingo leaves, then rub it on the crown |
| 3. | Clears vision          | Bangle                | Grate the bangle, put in a cloth, squeeze the water and drop it in the eyes. |
| 4. | Sawanan                | Turmeric, Kunci (finger root), Bangle, Sangetan leaf, Onion | Wash All ingredients, then crush and rub it on the forehead of the patient. |
| No. | Usage                          | Plant Name/Ingredient | Processing Methods                                                                 |
|-----|-------------------------------|-----------------------|-----------------------------------------------------------------------------------|
| 5.  | Toothache remedy              | Daun jenggot (Spanish moss) | Cut ginger with the size as big as 1 thumb segment, then wash and ground coarsely and put inside the tooth cavity (can also put inside the cavity directly without grating) |
|     |                               | Adas pulosari (Foeniculum vulgare Miller) |                                                                                  |
| 6.  | Treating aches and pains (Medicine 1) | Ginger | Peel, wash, and grate the ginger. Then rub it in the sore parts of the body (can also be mixed with massage oil for massage) |
|     | Treating aches and pains (Medicine 2) | Lempuyang gajah (bitter ginger) | Sun dry the bitter ginger, temu hitam, temu lawak, temu giring and cabai jawa. Then pound and brew with warm water. |
| 7.  | Cough (Medicine 1)            | Ginger Kencur Lime juice Rock sugar | Prepare Ginger, and kencur with the size of 1 finger segment each, then peel and wash. Then crush and extract the juice, add a little warm water, then add lime juice and rock sugar. After that, drink once a day until healed |
|     | Batuk (Medicine 2)            | Cardamom Kencur | Prepare Cardamom, and kencur with the size of 1 finger segment each, grate and extract the juice, then drink. |
| 8.  | Treat heart disease           | Ginger/red ginger Temu lawak Temu hitam Betel leaf Reeds Rumput teki (Nut grass) | Prepare ginger / red ginger (use one of them), betel, reeds, temu lawak, nut grass, temu ireng then wash all of them and boil in 3 cups of water until the remained 1 cup of water. Then drink it. |
| 9.  | Treat kidney disease          | Turmeric Bitter ginger Temu lawak Kencur Soursop leaf (7-11 leaves) Mangosteen skin Noni leaves (3 leaves) Binahong leaves (5 leaves) Reed roots (7 leaves) Moringa leaves Nut grassroots (5 roots) | Prepare ginger, turmeric, bitter ginger, temu lawak, and kencur. Peel and wash them. Then boil in the pot together with the other remaining ingredients for 5 minutes |
10. Reducing fever

**Plant Name/Ingredient**
- Cardamom
- Orong-orong worm
- Rock sugar

**Processing Methods**
Peel, wash and grind the Cardamom. Then extract the juice. Add pounded orong-orong worm and rock sugar.

11. Gastric pains (Medicine 1)

**Plant Name**
- Cardamom

**Processing Methods**
Prepare 1 thumb size of Cardamom, then peel, wash, grind and extract the juice. Drink afterwards.

12. Wejah (usually consumed by mothers after childbirth, which has several benefits: to increase milk production during the postpartum breastfeeding period, and to restore stamina and maintain body fitness). This wejah can also be drunk by, both women and men to maintain fitness and physical health)

**Plant Name**
- Turmeric
- Temu lawak
- Kecembang leaves
- Duwet leaves
- Pijer leaves
- Temu hitam
- Bitter ginger
- Kunci
- Amomum
- Temu hitam
- Temu lawak
- Pecul goang leaves
- Temu ireng
- Sembukan leaves
- Semanggi gunung leaves
- Wola-waliyan leaves

**Processing Methods**
Prepare Kecembang leaves, Duwet (Syzygium cumini) leaves, Pijer leaves, Guava leaves, Tapak liman (Elephantopus scaber) leaves, Pacul goang leaves, Sembukan (Paederia foetida) leaves, Sribundi leaves, Semanggi gunung (mountain clover) leaves, wola-waliyan leaves. Then also prepare the rhizomes of Turmeric, Temu lawak, Temu hitam, Bitter ginger, Kunci, and Amomum.

For the preparation of leaves ingredients are 2-3 leaves, and for the empon-empon are 4-6 segments of finger size, except for temu ireng. Temu ireng is less compared to the others, with a ratio of 1:1/2).

Wash all ingredients, then pound the ingredients. Pour all the ingredients into a pot contained with half-boiling water. Stir well until mixed. And wait until boiled. After that, filter the potion. This protocol can yield about 600 ml wejah.

15. Treats diarrhea

**Plant Name/Ingredient**
- Turmeric
- Salt

**Processing Methods**
Peel and wash the turmeric. Then grate it, extract the juice. Add some salt and drink it.

13. Treats asthma

**Plant Name/Ingredient**
- Turmeric
- Free-range chicken eggs
- Honey

**Processing Methods**
Peel and wash the turmeric. Then grate it, extract the juice. Add 1 free-range chicken egg and add honey.

14. Treats hepatitis

**Plant Name/Ingredient**
- Turmeric
- Temu lawak
- Temu hitam
- Rock sugar
- Honey

**Processing Methods**
Peel, wash, and boil all of the Zingiberaceae with 3 glasses of water. Let evaporated until the water amount is around 1 glass, then add rock sugar.

15. Treats liver disease

**Plant Name/Ingredient**
- Turmeric
- Temu lawak

**Processing Methods**
Prepare 1 segment finger size of each turmeric and temu lawak. Peel and wash the turmeric and temu lawak. Then grate them, extract the juice. And drink it.

16. Jamu kunyit asam (to refresh the

**Plant Name/Ingredient**
- Turmeric
- Tamarind

**Processing Methods**
Peel the turmeric, and wash it. Then grate it. After that, put the turmeric, tamarind, sugar,
| No | Usage                                                                 | Plant Name/Ingredient                      | Processing Methods                                                                 |
|----|----------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------|
| 17 | Jamu pahitan (to treat diabetes, diarrhea level, lower cholesterol, aches, and dizziness) | Bitter ginger, Lengkuas, Temu lawak, Temu hitam, Sambiloto, Serai, Meniran | Prepare all leaves to be 5-7 sheets of leaves, 3-4 finger segment size of the rhizome or the Zingiberaceae, except 2 finger segment size for temu ireng. Wash and grind all ingredients. Put into almost-boiled water. Wait until the water evaporated and filter the drink. |
| 18 | Treats Panu (*Tinea versicolor*) | Lengkuas, Kerosene, Black ants | Peel, wash, and rub the greater galangal into the infected spots. You can also put a little bit of kerosene to the greater galangal and press the black ants before rubbing into the infected areas. |
| 19 | Relieve symptoms of urinary stones | Temu lawak | Thinly slice the temu lawak, boil, then drink the water. |
| 20 | Treating parasitic worms | Temu hitam | Take the Temu Hitam about one knuckle of thumb finger (1 cm), grated, take the extract and drink |
| 21 | Treating lack of appetite in children | Temu lawak | Peel and wash the temulawak. Then grate it. Put inside a cloth, then squeeze and drip the juice into the mouth (*dicethik*). Grate the temu putih, then eat directly along with guava leaves and *menthak* banana. |
| 22 | Treats cholera | Temu putih, Jambu biji (*guava*) leaves, *Menthak* banana | Wash all ingredients, the dry using the oven. Slice all ingredients then grind. After that, form the ingredients into a round form (like a pill), then packed using beeswax. Consume it by opening the packaging, directly eating it, or mixing with a half glass of warm water. Consume twice a day. For treating toothache (because of tooth cavity), you can directly put the herbs into the cavity. |
| 23 | Traditional herbs in pill form (increase body stamina, treat back pain / rheumatism, decrease high blood pressure and cholesterol, treat coughs, asthma, and toothache, can also be consumed to treat impotence) | Temu lawak, Temu hitam, Jahe merah, Kapulaga, Cabai jawa, Jinten, Adas pulosari, Adas pulowaras, Kayu sintok, Kulit kayu keningar, Kayu manis, Jinten hitam, *Helbeh*, Ketan hitam, Cengkeh, Daun kemukus | Wash all ingredients, the dry using the oven. Slice all ingredients then grind. After that, form the ingredients into a round form (like a pill), then packed using beeswax. Consume it by opening the packaging, directly eating it, or mixing with a half glass of warm water. Consume twice a day. For treating toothache (because of tooth cavity), you can directly put the herbs into the cavity. |
Based on the data shown in the table, it can be concluded that the method to use medicinal herbs from Zingiberaceae plants consists of drinking, force-feeding or chipping, rubbing, dropping, and being consumed directly. Here is the percentage of how to use traditional herbs/medicines from Zingiberaceae plants:

**Figure 1.** Percentage diagram of how to use Zingiberaceae plants by Colo Village

Based on the results of the research, there was a culture of the Colo villagers that related to the use of Zingiberaceae plants as medicine, namely: The use of Rajah. Rajah is defined as a letter or picture or sign and is used as a talisman, which is considered to have supernatural powers to protect its owner, and can be used as an antidote to cure disease and so on [23]. The method to use rajah is quite simple: rajah is soaked in a glass of warm water, then the water is used to boil the medicinal potion. Before consuming the potion, some practices were conducted, such as taking ablution, then followed by reciting Basmallah and prayer. Recited prayers depends on the ability of the patients.

Reflexology massage. The use of traditional ingredients as medicine is usually followed by other therapies, including reflexology therapy. This massage is traditionally done by massaging at certain points. The therapies must have knowledge about human nerves. Reflexology massage is still related to needling treatment (acupuncture). Consumption of traditional herbs followed by regular reflexology massage is believed by the community to accelerate diseases’ healing process.

Sawanan. Sawan disease is a non-medical disease. Based on the research results, this disease is a disease that develops from the myths/beliefs of the Javanese people. This disease often affects children, although adults can be affected too. Sawan is considered as a pain suffered due to disturbance of spirits. According to the beliefs. Someone (usually a child) can suffer from sawanan for several reasons, for example: after being at a particular place or event (funeral, graveyard, sacred sites, or else), were in certain places at sacred times, for example, in the evening (maghrib), the behavior of breastfeeding mothers who eat forbidden or sacred foods when breastfeeding their children, and sawanan can also be caused by disturbance from spirits who derived from certain plants or animals, and others. Symptoms of sawanan are increased body temperature (fever); the children usually will start to cry or fuss. Treatment can be done by applying herbal ingredients to the forehead of the affected child. The potion is made from turmeric, *kunci*, onion, *sangep* leaf, *bengle*, *jenggot* leaf, and *adas pulosari* which were pounded and then rubbed on the forehead of the person who is affected by sawanan.
4. Conclusion
There were 14 species of plants from the Zingiberaeceae family utilized by the people of Colo Village, Dawe District, Kudus Regency, Central Java Province: Bangle (Zingiber purpureum Roxb), Ginger (Zingiber officinale), Red Ginger (Zingiber officinale var. rubrum), Kapulaga (Elettaria cardamomum), Kencur (Kaempferia galanga), Lempuyang Gajah (Zingiber zerumbet), Lengkuas (Alpinia galanga), Parahulu (Amomum aculeatum Roxb.), Temu Lawak (Curcuma xanthorhiza Roxb.), Temu Giring (Curcuma zedoaria), Temu Hitam (Curcuma aeruginosa Roxb.), dan Temu Putih (Curcuma xanthorhiza). The most utilized organs were the Rhizome. As for the method of processing were generally by pounding and boiling. While the consumption methods were by drinking, dicethik (squeezed and dripped), dripped, rubbed, and direct consumption. The highest percentage of the technique was by drinking (61%), followed by rubbed (22%), direct consumption (9%), dripped (4%), and dicethik (squeezed and dripped—4%).

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