ETHNOBOTANY OF KEMANG (Mangifera kemanga Blume.) AS IDENTITY FLORA OF BOGOR REGENCY

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ABSTRACT

Kemang (Mangifera kemanga Blume.) is a local fruit and has become the identity flora of Bogor Regency based on Decree of the Regent's Number 522/185/Kpts/1996. Currently, the existence of kemang is rare, and it is worried about becoming extinct. This study aimed to identify the ethnobotany of kemang in the community of Bogor Regency and to develop a conservation strategy for kemang as the identity flora of Bogor Regency. The research was carried out from April-July 2021 in Kemang District, Sukaraja District, and Leuwiliang District. Based on criteria, the research was conducted through deeply personal interviews with the local community. The characteristic of the respondent was individual who has kemang and gardeners whose gardens contain kemang. The data obtained were analyzed descriptively. Based on interviews with 30 respondents, kemang was identified by looking at leaf color, leaf shape, stem, flower, and fruit compared to mango (Mangifera indica). Kemang mainly was found growing in gardens (74%). Kemang propagation was done by seed. The most used parts were fruit (43%) and shoots (39%). Both parts were consumed directly in a fresh form. Besides having a role as a food ingredient, kemang has potential as an antioxidant, antica, and anti-degenerative. The reason people still maintain kemang because the existence of kemang is getting rare, and the selling price of kemang fruit is relatively high compared to other types of mango. In addition, kemang can also prevent soil erosion. The conservation strategies of kemang are optimizing the socialization and publication of kemang benefit, developing kemang cultivation, and developing kemang as a local fruit commodity.

Key words: conservation strategy, ethnobotany, kemang, local fruit, rare

INTRODUCTION

Humans cannot be separated from plants in fulfilling their daily needs. The information about the plant's use is usually obtained from generation to generation until now. Humans use plants to survive. Today's problem is the lack of attention and documentation of several important species as regional markers. Documentation of a species, both its ecology and the form of its use by the community, is important to avoid species extinction (Rai and Lalramghinglova 2010). Pimm et al. (2014) state that species on earth were declared extinct before the study was carried out. The ethnobotanical study is one solution to prevent it. An ethnobotanical study is a study about the interaction between humans and plants. This study is essential for species conservation (Minnis 2000; Pei 2013).

Kemang (Mangifera kemanga Blume.) is a mango family belonging to the Anacardiaceae family. Fitmawati et al. (2013) stated that kemang is a mango type that grows wild with natural distribution in Sumatra, Kalimantan, and Java. Kemang can be found along rivers in Central Sumatra (Riau and Jambi) and Southern Sumatra (Lampung, Bengkulu and South Sumatra). Kemang is rarely found outside Sumatra. Kemang can be found on Java, especially in West Java (Kostermans and Boompard 1993). Kemang was even designated as the identity flora of Bogor Regency according to the Regent's Decree No. 522/185/Kpts/1996. The determination of kemang as an identity flora is intended to maintain the sustainability and uniqueness of plants and characterize the region.

Deryanti (2014) stated that the kemang existence started to be rare. According to the Regent's Decree No. 522/185/Kpts/1996 kemang highly distributed in 17 area such as Citereup, Cimanggis, Cileungrsi, Jonggoi, Carin, Caringin, Ciurer, Ciampea, Cibungbulang, Leuwiliang, Nagung, Cigudeg, Jasinga, Semplak, Gunung Sutur, and Bojong Gede. Resida et al. (2017) stated that the scarcity of kemang is due to the reduction of the natural habitat of kemang on the Sumatra Island for oil palm plantations. Kemang fruit is categorized as a minor fruit because its economic value is not as good as mango (Mangifera indica). Kemang becomes less attractive for community cultivation. Meanwhile, kemang that is included in the indigenous fruit has benefits, including maintaining local ecological balance (garden scale) (Pratama et al. 2019) and nutritional sources (FAO 2014).

The scarcity of kemang that can lead to extinction will cause the loss of the benefits. Therefore, this study aimed to identify the ethnobotany of kemang in the community of Bogor Regency and to develop a conservation strategy for kemang as the identity flora of Bogor Regency.
RESEARCH METHOD

The research was conducted in three sub-districts in Bogor Regency, namely Leuwiliang (Cibeber I Village, Karehkel Village, Karacak Village), and Sukaraja (Sukaraja Village, Nagrak Village, Cikeas Village), and Kemang (Kemang Village, Village Pabuaran, and Pondok Udik Village) (Figure 1). Leuwiliang and Sukaraja were selected based on information from fruit traders at Pasar Anyar and the 2019 Nusantara Flower and Fruit Festival, while Kemang Subdistrict was selected due to its historical elements (name of region).

The research was conducted from April to July 2021. The tools used were cameras and an interview guide. Respondents were selected by purposive sampling with specific criteria. The criteria were individual who has *kemang* or gardeners whose gardens contain *kemang*. The data collected consisted of respondents' characteristics and ethnobotanical data. Data on respondent characteristics consist of sex, age, level of formal education, and occupation (Susiarti et al. 2020), while the ethnobotanical data includes the identification of *kemang*, habitat types, way of obtaining *kemang*, cultivation methods, utilization, and community stories related to *kemang* (Desti et al. 2019). All data collected were analyzed descriptively and presented in tables or diagrams (Tallei et al. 2019).

RESULT AND DISCUSSION

1. Characteristics of Respondents

The results of interviews with 30 respondents consisting of nine villages showed that respondents were male (76.67%) and female (23.33%) (Table 1). Setiawan (2017) states that in the agricultural sector, the role of men is more significant than women. Based on age, respondents were dominated by 41-50 years old and 51-60 years old. Those ages are considered productive ages to work to fulfill household needs (Ministry of Health of the Republic of Indonesia 2020).
The respondents had a low level of formal education. A total of 36.67% did not finish elementary school. The difficulties in accessing formal education and choosing to work instead of school were the reasons. People with an elementary education level or below interact more with their environment to learn more about the benefit of these plants (Ramdhoni et al. 2015). Most respondents worked as traders (30%) and farmers (26.67%).

2. Ethnobotany of Kemang (*Mangifera kemanga* Blume.)

a. Morphology

Respondents recognized the kemang tree based on leaf color, shape, stem, flower, and fruit. Kemang is closely related to mango (Fitmawati et al. 2013), so in describing the characteristics of kemang, people compare it with mango (*Mangifera indica*). Kemang has leaf shape and color the same as mango, but kemang leaf is longer and harder. Kemang stem is straight and reaches 20-25 m high. Kemang flower is purple. Some people said that the flower is pink. In line with Gunawan et al. (2019), kemang has a tree habitus height of 30-45 meters with light purple flowers and is panicle-shaped. Kemang fruit is yellowish-brown or light brown. The flesh is white with a large seed in the middle. The taste of the flesh is sour and astringent.

Respondents stated that the kemang fruit differs based on the size of the fruits and the color of the fruit skin. There are three types of kemang mentioned by respondents, namely kemang binglu, kemang sabuk, and kemang burik. The skin of kemang binglu is yellowish-brown with a reddish tinge. The fruit is large and tastes sweeter than others. Kemang sabuk’ skin is speckled and whitish. Kemang burik has the same features as kemang sabuk. Mulyaningsih et al. (2022) stated that there are four Bogor kemang cultivars in the Germplasm Garden, Cibinong Science Center Botanical Garden (CSC-BG), namely, lokal, sabu, binglu, gula pasir.

b. Habitat

*Kemang* is usually found in yards, gardens, and graveyards (Figure 2). *Kemang* was mainly found in gardens (74.19%). People prefer to plant *kemang* in the garden rather than in the yard because the height of the *kemang* tree reaches 35 meters, has a wide canopy, and has strong roots. People tend to cut down a large *kemang* trees because they fear falling on their houses.

The community garden is located 200-1000 m from the house. Besides *kemang*, most people also grow other local fruits such as gandaria (*Bouea macrophylla*), rambutan (*Nephelium lappaceum*), and mangosteen (*Garcinia mangostana*), melinjo (*Gnetum gnemon*), mango (*Mangifera indica*), jackfruit (*Arthocarpus heterophyllus*) and cloves (*Syzygium aromaticum*). Based on observations, most of the *kemang* are found in gardens close to water sources such as rivers or irrigation canals. It is similar to Fahrozi’s (2014) research that *Mangifera casturi* (*Kasturi*) is more commonly found near rivers and creeks. Family graves are usually located adjacent to community gardens. The wide canopy of the *kemang* makes this plant suitable for the tomb.

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Table 1 Characteristics of respondent

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Data</th>
<th>Total</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>23</td>
<td>76.67</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>23.33</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td>2</td>
<td>6.67</td>
<td></td>
</tr>
<tr>
<td>31-40</td>
<td>6</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>41-50</td>
<td>8</td>
<td>26.67</td>
<td></td>
</tr>
<tr>
<td>51-60</td>
<td>8</td>
<td>26.67</td>
<td></td>
</tr>
<tr>
<td>&gt;60</td>
<td>6</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td><strong>Formal education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>11</td>
<td>36.67</td>
<td></td>
</tr>
<tr>
<td>Elementary school</td>
<td>7</td>
<td>23.33</td>
<td></td>
</tr>
<tr>
<td>Junior High school</td>
<td>7</td>
<td>23.33</td>
<td></td>
</tr>
<tr>
<td>Senior high school</td>
<td>5</td>
<td>16.67</td>
<td></td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer</td>
<td>8</td>
<td>26.67</td>
<td></td>
</tr>
<tr>
<td>Trader</td>
<td>9</td>
<td>30.00</td>
<td></td>
</tr>
<tr>
<td>Laborer</td>
<td>3</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>Employee</td>
<td>3</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>Housewife</td>
<td>6</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>1</td>
<td>3.33</td>
<td></td>
</tr>
</tbody>
</table>
The kemang owned by the respondent was obtained by planting, growing wild, inheritance, and buying kemang trees. Most respondents obtained the kemang tree by inheritance (Figure 3). Kemang was acquired along with the garden passed down from parents to their children. The existence of the kemang was maintained because the tree still produced fruits. Most of the respondents sold the fruits to buyer in wholesales. Buyer will climb the trees, harvest the fruits, and transport kemang fruits to the local market or the other collectors. Other than inheritance, kemang was growing wild. People consume the fruit, then the seeds are thrown into the garden and then grow well (Fakhrozi 2013).

c. Kemang propagation

Based on the interview, all respondents answered that the propagation of kemang is by seed. Dodo et al. (2016) stated the propagation of kemang by seeds and grafts. Kemang seeds planted by the community usually come from the mother tree. The seeds are sown, and when they grow into seedlings, their height about 30-45 cm, the seeds are transferred to the other place. Two respondents planted kemang by transplanting seedlings. Kemang seedlings that grew wild around the mother tree were transferred to the garden. The respondent realized that the existence of kemang started to be rare, so it is necessary to plant kemang so that their children and grandchildren can see the kemang tree in the future.

d. Used part

Generally, the community uses four parts: fruit, shoots, stems, and bark. The parts used were fruit (43%) and shoots (39%) (Figure 4). Kemang fruit has white color and a refreshingly sour taste. Kemang is very distinctive. People said that the smell of kemang is the main attraction of this fruit. Kemang fruit can be consumed directly without processing.
Besides being consumed directly, kemang fruit can be processed into chili sauce, salad, and pickles. The kemang fruit used for processing is a little raw. Most respondents preferred that condition because the ripe kemang has a soft flesh texture. Every 100 grams of fruit contains 86.5 grams of water, 1 gram of protein, 0.2 grams of fat, 11.9 grams of carbohydrates, 0.005 milligrams of beta carotene, 58 milligrams of vitamin C and 200kJ of energy (Konstermans and Boompard 1993).

Another part that is used by the community is the plant shoot. Kemang shoots or young kemang leaves have a reddish color. Bogor people consume kemang shoots in their fresh form as a salad. Al Tapsi (2013) research states that some people do not like kemang shoots because of allergies. Kemang shoots cannot be taken all the time. According to respondents, the shoots can be harvested 2-3 times a year. Kemang shoots are sold wholesale. The buyer will directly climb the kemang tree and take the shoots. Besides climbing directly, people usually take kemang shoots with a small pole. Kemang shoots can be found in markets in Bogor in the form of small bundles for IDR 2500.00 – IDR 3500.00.

The next part used by the community is the stem (wood). Kemang wood is used as building material and containers. According to respondents, the quality of kemang wood was not excellent for building materials because it is soft, so it quickly rots. According to Sandri et al. (2013), kemang wood was classified in III-IV of strength. The wood is suitable for plywood, wallboard, sculpture, carving, handicrafts, and molding. The twigs and bark of kemang are used as firewood. The use of twigs and bark as firewood needs to be noticed. The smoke that is produced from burning can cause itching for some people. This incident is known as “balas kemang.” According to the respondent, the healing method is by burning a straw mat, then the smoke is directed to the itchy and swollen body part.

Some people think that the kemang tree is a haunted tree because of its large size. One of the kemang trees that is sacred and haunted is located in Kemang Village. There were many kemang trees in Kemang Village a long time ago, so the area was named ”Kemang”. There are kemang trees and Kiara trees near Kemang Village Office. Sedekah Bumi event is held every year at the place where Kemang Kiara grows, although today, there is no kemang tree there. The community of Kemang Village considers the kemang tree as the tree of their village identity, so its existence is maintained as possible.

Along with science and technology development, the benefits of kemang are not only limited to that. Several studies state that kemang has potential as an antioxidant and anticancer derived from several parts of the kemang that improve its use value (Table 2).

3. Conservation Strategies of Kemang (Mangifera kemanga)

Respondents maintain kemang existence because of the economic and ecological benefits of kemang. The economic benefit comes from the sale of kemang fruit and shoots. The price of kemang fruit in Nagrak Village and Karehkel Village is higher than local mango (bembem). The price of kemang shoots is almost the same as other vegetables, such as spinach and kale. One of the respondents stated that maintaining the kemang is that the kemang tree can hold the soil to prevent landslides. This reason underlies the respondents to plant kemang on the edge of steep soil. The price of kemang fruit and the ecological benefits felt by the community should be motivation so that it can add to the positive value of kemang.
Table 2: Content and potential of kemang part

<table>
<thead>
<tr>
<th>Part</th>
<th>Content</th>
<th>Potency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoot</td>
<td>Phenols, fatty acids, steroids, terpenoids, alkaloids, alcohols, benzene, amines, hydrocarbons</td>
<td>Antioxidant ¹</td>
</tr>
<tr>
<td>Fruit</td>
<td>Flavonoids, tannins, triterpenoids, alkaloids</td>
<td>Anticancer (cervical cancer) ²</td>
</tr>
<tr>
<td>Fruit skin</td>
<td>Tannins, triterpenoids, flavonoids, alkaloids</td>
<td>Anti-cancer (breast cancer)³</td>
</tr>
<tr>
<td>Leaf</td>
<td>Alkaloids, flavonoids, phenylpropanoids, amino acids</td>
<td>Antioxidant ⁴</td>
</tr>
<tr>
<td>Bark</td>
<td>Antioxidant compounds, phenols, flavonoids, quercetin, gallic acid</td>
<td>Antioxidant, anti degenerative ⁵</td>
</tr>
<tr>
<td>Seed</td>
<td>Flavonoids, triterpenoids, tannins, alkaloids</td>
<td>Anti-cancer (colorectal cancer)⁶</td>
</tr>
</tbody>
</table>


Based on the interview result with the community in several villages in Bogor Regency, the existence of kemang started to be rare. Respondents said that kemang was still easy to find in the past, such as on roadsides, yards, and community gardens. The scarcity of kemang is characterized by the limitations of kemang fruit and shoots on the market (Deryati 2014). The scarcity is due to illegal logging and land conversion (Resida et al. 2017). Kiloes et al. (2014) stated that the kasturi mango is less able to develop into regional fruit. The flesh was small compared to the large seed size, the age of the plant to produce was long, and the harvest period was short were the reasons. Kasturi mango is not available all year round. The state of the underdeveloped kasturi mango is the same as the kemang. Due to several reasons, it is difficult for the community to maintain kemang existence. Kemang tree with a large trunk diameter is cut down to sell the wood. The existence of other fruit plants that are more economically valuable also threatens the existence of kemang. The community prefers to maintain the existence of the commercial fruit and cut down the kemang.

Furthermore, respondents mentioned that the length of time to bear fruit and limited land become the reasons for community reluctance to cultivate and plant kemang. Kemang propagation is done by seed, so it takes decades for the kemang to produce fruit. Kemang is an annual fruit crop that requires a large area of land. It becomes an obstacle for the community because not every community member has a garden or even owns the land, and there is no space for planting kemang. The constraints above can be circumvented by applying appropriate cultivation technology and conservation efforts.

Based on the description above, it needs a conservation strategy to protect species from extinction, among others:

1. Optimizing the socialization and publication of the benefits value of kemang

They were strengthening the benefits of kemang as food, building materials, firewood, and medicine. Socialization by agricultural extension workers or related agencies will increase the knowledge or information about kemang that is still minimal. Most people do not know that kemang is designated as the identity flora of Bogor Regency. One of the solutions is adding this information to learning media, for example, environmental education. The research related to kemang also needs to be developed, especially the research related to the cultivation techniques and appropriate technology. On-farm conservation activities for local conservation in South Kalimantan for kasturi can be adopted. On-farm conservation activities are systems for cultivating and managing sustainable crops from a diverse population maintained by farmers.

2. Development of kemang cultivation

Kemang propagation still relies on seeds. The seeds come from the mother tree. Several respondents selected the mother tree. The mother tree has superior properties, including the sweet, large, and has many fruits. The seeds from the mother tree are then planted. The weakness of this propagation is the length of fruiting time, even decades.

The solution is artificial vegetative, although not all artificial vegetative can be performed on kemang. Pradnyawati et al. (2020) develop the local Balinese wani (Mangifera caesia) by grafting. Rootstock forms come from healthy and have more than six months old. The scion is derived from healthy high, yielding (seedless) wani shoots. The two rods (top and bottom) are then spliced. The joint is covered and placed in the nursery.

3. Development of kemang as one of the local fruit commodities

Until today, kemang fruit is still consumed directly in the form of fresh fruit. Kemang fruit can be developed into other processed products such as fresh drinks made by UPT Kemang District and marketed at the 2019 Nusantara Fruit and Flower Festival. Another kemang fruit product is velva kemang. Hadistiani et al. (2015) stated that processing kemang fruit into velva will improve the quality of kemang fruit. Furthermore, the
velva of the kemang fruit can be used as an alternative to meet the community's vitamin C needs.

The conservation strategy can work if there is the involvement of several parties such as the community, universities, state-owned enterprises, private companies, and related agencies, local governments. The role of these parties will influence the success of kemang conservation as the identity flora of Bogor Regency.

**CONCLUSION**

The existence of kemang has begun to be rare in the research area. People tend to leave kemang and do not plant it because the fruit is considered to have no economic value compared to other local fruit commodities. Kemang is found growing in gardens, yards, and graveyards. Communities in the study area utilize the fruit, shoots, bark, and wood of kemang. Kemang fruit and shoots are consumed directly in fresh form. Bark and small twigs are used as firewood. Kemang stems (wood) are used as building materials. The community recognizes that the existence of kemang is rare. Conservation strategies that can be carried out are developing kemang cultivation, optimizing the socialization and publication of the benefits of kemang, and developing kemang as a local fruit commodity.

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