



# Morphological Characterization and Utilization of Food Source Plants in Tomini Bay Coastal Region

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**Abstract.** The diversity of plant species that have the potential to be a food source in the coastal area of Tomini Bay can be seen from variations in their morphological forms and uses. Food source plants are very effective for consumption by people in the Tomini Bay coastal area, both as staple food and additional food. This research aims to determine the morphological characteristics and benefits of the morphological organs of food source plants in the coastal area of Tomini Bay. The research was conducted in locations directly adjacent to the waters of Tomini Bay in Gorontalo Province, namely in Botubarani Village, Bone District and Biluhu Village, Batudaa Pantai District. The method used is the exploration and interview method. Morphological data was collected by recording all the morphological characters of food source plants found at the research location. Data collection on the use of plant food sources was carried out using unstructured interviews with local communities. The research results obtained 31 types of food source plants which are members of the families poaceae, araceae, zingiberaceae, convolvulaceae, euphorbiaceae, liliaceae, amaranthaceae, solanaceae, puniceae, myrtaceae, rutaceae, fabaceae, malvaceae, lamiaceae, annonaceae, pandanaceae, musaceae, moraceae, caricaceae, annonaceae and is categorized into groups of cereals, tubers and fruit and vegetables, both those that have been cultivated by the community in gardens and yards and those that grow wild.

**Keywords:** morphological characterization, food source plants, tomini bay

## 1 Introduction

Indonesia is one of the mega biodiversity countries with Very high level of plant diversity. One example of plant variation is a group of food source plants which have diverse morphological appearances and very high utility values and are spread throughout the islands of Indonesia, including the coastal area of Tomini Bay.

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Tomini Bay is one of the largest bays in Indonesia, with an area of more than 6,000,000 hectares (ha) and borders three provinces on the island of Sulawesi, namely Central Sulawesi, North Sulawesi and Gorontalo [1]. Tomini Bay has abundant coastal resource potential for national food development [2]. The diversity of food source plants that grow in coastal areas greatly influences the land dynamics of a region. The development of population in coastal areas has an impact on the existence of plants in that place. To meet people's needs for food, it tends to have an impact on lower coastal plant diversity. For example, what happens in the mainland area of Tomini Bay, the presence of plants is increasingly homogeneous.

In essence, the diversity of plant species that have the potential to be a food source is very abundant in the Tomini Bay coastal region, but taxonomic information regarding plants that have the potential to be a food source is not yet available and their morphological characterization has never been carried out. According to Miswart [3], Characterization is an activity in finding and processing specific characters possessed by plants that can differentiate between types or individuals within one plant species. One of the plant characters that is usually used is morphological characters, because morphological characters are the most stable characters and have many very varied character attributes and have good descriptive terminology [4]. Apart from that, information on its benefits is still very limited, so many people do not know the potential of food source plants in the coastal area of Tomini Bay. Therefore, it is necessary to carry out morphological characterization and utilization of food source plants in the coastal area of Tomini Bay. This activity is also very useful for developing and managing food source plants sustainable, so that it can meet the needs of society in the future, as well as an effort to preserve biological natural resources. Apart from that, another benefit that can be provided from the results of identification and morphological characterization is as reference material for the public regarding the diversity of plant food sources in the coastal area of Tomini Bay.

## 2 Method

This research was conducted in the coastal area of Tomini Bay, Gorontalo Province in Botubarani Village, Kabila Bone District and East Biluhu Village, Batudaa Pantai District in May – June 2020, during the Covid-19 Pandemic. Covid-19 and the PSBB period was implemented in Gorontalo Province. So in its implementation there were several obstacles, including a fairly short search time and limited activities and face-to-face contact with the local community. The tools used in this research are identification books, field notes, plant organ character notes, documentation tools (camera).

The objects of this research are all types of plants that have the potential to be a food source found in the coastal area of Tomini Bay. The method used is the exploration and interview method. Exploration was carried out by collecting morphological data, identifying and recording all morphological characters of food source plants found at the research location. Data on the use of plant food

sources was obtained by unstructured interviews using lists or questionnaires. Data analysis was carried out in a descriptive manner, namely describing the morphological characteristics of observed food source plants and descriptions of the benefits of food source plants as a result of interviews with local people who were willing to be interviewed at the time of the research, as well as through literature study.

### 3 Result and Discussion

#### 3.1 Result

There are 31 types of food source plants that have been collected from the research location which is directly adjacent to the coastal area of Tomini Bay in Gorontalo Province, namely in Botubarani Village, Kabila Bone District and East Biluhu Village, Batudaa Pantai District, both those that have been cultivated by the community in gardens and yards and those that have been cultivated by the community in gardens and yards. grows wild (Table 1).

**Table 1.** List of Food Source Plant Collections for Morphological Characterization

No	General Name	Local Name	Species	Family	Habitus	Status Sample
<b>Cereals</b>						
01	Corn	Binte	<i>Zea mays</i> L.	Poaceae	Herbs/Terna	Cultivation
<b>Tubers</b>						
02	Galangal/Laos	Linggoboto	<i>Alpinia galanga</i> L. Willd	Zingiberaceae	Herbs/Terna	Cultivation
03	Fragrant lemongrass	Baramakusu	<i>Cymbopogon nardus</i> (L.) Rendle	Poaceae	Herbs/Terna	Wild
04	Belitung taro	Talas	<i>Xanthosoma sagittifolium</i> (L.)	Araceae	Herbs/Terna	Cultivation
05	Mango Curcuma (Turmeric)	Alawahu	<i>Curcuma domestica</i> Val.	Zingiberaceae	Herbs/Terna	Cultivation
06	Ornamental Sweet Potatoes	Batata	<i>Ipomoea batatas</i> Var. Margarita	Convolvulaceae	Herbs/Terna	Cultivation
07	Cassava	Kasubi	<i>Manihot esculenta</i> Crantz.	Euphorbiaceae	Shrub	Cultivation
08	Garlic	Pia	<i>Allium sativum</i> L.	Liliaceae	Herbs/Terna	Cultivation
<b>Vegetables and Fruits</b>						
09	Red Spinach	Bayam	<i>Amaranthus tricolor</i> L.	Amaranthaceae	Herbs/Terna	Cultivation
10	Cayenne pepper	Malita	<i>Capsicum frutescens</i> L.	Solanaceae	Bush	Cultivation
11	Pomegranate	Delima	<i>Punica granatum</i> L.	Lythraceae	Shrub	Cultivation
12	Water guava	Gora	<i>Syzygium aqueum</i> (Burm. f.) Alston	Myrtaceae	Tree	Cultivation
13	Guava Seeds	Dambu	<i>Psidium guajava</i> L.	Myrtaceae	Tree	Cultivation
14	Guava Bol	Upo	<i>Syzygium malaccense</i> (L.) Merr. & L.M.Perry	Myrtaceae	Tree	Cultivation
15	Lime	Litau	<i>Citrus aurantiifolia</i> (Christm.) Swingle	Rutaceae	Shrub	Cultivation
16	Long beans	Kacang Panjang	<i>Vigna unguiculata</i> (L.) Walp.	Fabaceae	Herbs/Terna	Cultivation
17	Chocolate	Coklat	<i>Theobroma cacao</i> L.	Malvaceae	Shrub	Cultivation
18	Land kale	Kato	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Herbs/Terna	Cultivation
19	Cocunut	Bongo	<i>Cocos nucifera</i> L.	Arecaceae	Tree	Cultivation/Wild
20	Kelapa Gading	Bongo Molalahu	<i>Cocos nucifera</i> var. ivory	Arecaceae	Tree	Cultivation/Wild
21	Basil	Balakama	<i>Ocimum sanctum</i> L.	Lamiaceae	Herbs/Terna	Cultivation/Wild
22	Mango	Oyile	<i>Mangifera indica</i> L.	Anacardiaceae	Tree	Cultivation/Wild
23	Jackfruit	Langge	<i>Artocarpus heterophyllus</i> Lam.	Moraceae	Tree	Cultivation/Wild
24	Pineapple	Nanati	<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	Herbs/Terna	Cultivation
25	Fragrant Pandan	Pandan	<i>Pandanus amaryllifolius</i> Roxb.	Pandanaceae	Herbs/Terna	Cultivation/Wild
26	Papaya	Popaya	<i>Carica papaya</i> L.	Caricaceae	Shrub	Cultivation
27	Banana	Lutu/Lambi	<i>Musa paradisiaca</i> L.	Musaceae	Herbs/Terna	Cultivation
28	Sugar Apple	Sirikaya	<i>Annona squamosa</i> L.	Annonaceae	Shrub	Cultivation/Wild
29	Soursoop	Langge walanda	<i>Annona muricata</i> L.	Annonaceae	Shrub	Cultivation/Wild
30	Breadfruit	Amo	<i>Artocarpus altiss</i> (Parkinson) Fosberg	Moraceae	Shrub	Cultivation/Wild
31	Purple Eggplant	Poki-poki	<i>Solanum melongena</i> L.	Solanaceae	Herbs/Terna	Cultivation

#### 3.2 Discussion

Based on the research results, it is known that 31 types of food source plants that have been collected and whose morphological characterization has been carried

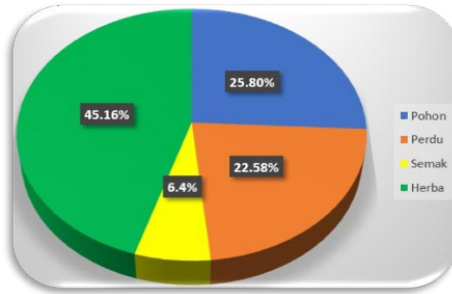


**Fig. 1.** Habitus and Morphological Organs of Food Source Plants. **Family Classification:** **Poaceae:** (1. Corn, 3. Lemongrass) **Aracaceae:** (4. Talas, 19. Kelapa, 20. Kelapa Gading) **Zingiberaceae:** (2. Lengkuas, 5. Temulawak/Turmeric) **Convolvulaceae:** (6. Ornamental Sweet Potato, 18. Land Water Spinach) **Euphorbiaceae:** (7. Cassava) **Liliaceae:** (8. Garlic) **Amaranthaceae:** (9. Red Spinach) **Solanaceae:** (10. Cayenne Pepper, 31. Purple Eggplant) **Punicaceae:** (11. Pomegranate) **Myrtaceae:** (12. Guava Water, 13. Guava Seeds, 14. Guava Bol) **Rutaceae:** (15. Lime) **Fabaceae:** (16. Long beans) **Malvaceae:** (17. Chocolate) **Lamiaceae:** (21. Basil) **Annonaceae:** (28. Sugar Apple, 29. Soursop) **Pandanaceae:** (25. Fragrant Pandan) **Musaceae:** (27. Banana) **Moraceae:** (23. Jackfruit, 30. Breadfruit) **Bromeliaceae:** (24. Pineapple) **Caricaceae:** (26. Papaya)

out are members of the Poaceae family, Aracaceae, Zingiberaceae, Convolvulaceae, Euphorbiaceae, Liliaceae, Amaranthaceae, Solanaceae, Punicaceae, Myrtaceae, Rutaceae, Fabaceae, Malvaceae, Lamiaceae, Annonaceae, Pandanaceae, Musaceae, Moraceae, Caricaceae, Annonaceae (Figure 1), while based on category habitus, 25.80% are trees. Shrub 22.58%, Herbs 45.16% and Bush 6.4% (Figure 2) and based on the percentage of sample status information, namely cultivated 68%, wild and cultivated 28% and wild 3% (Figure 3).

Based on Figure 1, the habitus and appearance of morphological organs of a number of food source plant taxa in several family categories were obtained based on the results of their morphological characterization. Morphological characters as taxonomic evidence are the main characters which continue to be used in introducing descriptions of taxa and as a basis for preparing plant classifications, because they are characters which are considered stable and easily observed with the naked eye and have a number of favorable attributes, including: (a). Has high variation, (b). Have good descriptive terminology, (c). Having the inevitability of access to herbarium specimens and fossils [4].

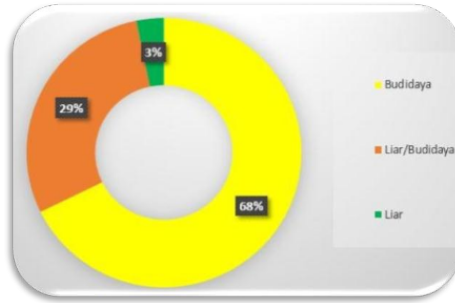
The morphological characteristics of pagan source plants can be seen based on their vegetative and generative characters which are useful for obtaining descriptions and groupings of pagan source plants so that it can make it easier to determine the plant varieties [5]. Apart from that, the advantage of morphological characters is that they can be used at all levels of the taxonomic hierarchy and have a big role in determining categories under species and are very necessary in preparing a database as a basis for further research which is very important in making the identification process more precise and effective [4].



**Fig. 2.** Percentage Diagram of Food Source Plant Habitus Categories

Based on Figure 2, it can be seen that the percentage of food source plant habitus categories in herbaceous habitus has a variety of species. This is based on differences and uniqueness morphological form of each type of plant. The existence of various variations of various types of food source plants found in the field is the basis for carrying out shape analysis in the form of morphological characteristics for each type of food source plant. Morphological characterization can be carried out by making a descriptive analysis of the individuals of the plant species being observed and characterized. In this research, in the process of identifying and collecting samples in the field, not all parts of the plant organs of the food plant group could be characterized, this was adjusted to the morphological condition of the plant at the time of observation. Plant descriptions will be useful in selecting parents in breeding programs. From this activity, plant descriptions will be produced which are important as a guide in genetic empowerment in breeding programs [6].

Based on the results of the search, a percentage of the plant groups found in each location can be made based on the status of the plants, namely plants with a herbaceous habitus which are most commonly cultivated by the community, both in gardens and in people’s yards, although there are also those that grow wild. This is because food plants with a herbaceous habit can be directly used by people in their daily activities, for example for cooking spices, traditional medicines and as snacks. Apart from that, the methods and techniques for cultivating herbaceous plants are easy and simple and do not require a large area of



**Fig. 3.** Percentage Diagram of Plant Food Source Status

land. Cultivation activities themselves are an effort to breed food plants, while diversity is the basis of plant breeding.

From the results of unstructured interviews with local communities, three main groups of food source plants in the Tomini Bay coastal area were obtained based on how they were used, namely the cereal plant group, the tuber group and the fruit and vegetable group. Food plants in groups cereal usually used as a main food, for example for making corn rice or which in Gorontalo regional language is *balobindeas* a substitute for white rice and is often used to make snacks into corn chips (corn chips), cakes or other snacks which are on a home industry scale and can be marketed by the local community. Meanwhile, for the tuber group, especially the rhizome part, it is often used as a cooking spice or for making traditional medicines, for example in *rimpang* the turmeric plant and other tuber plants can be used as a food ingredient for making cakes or snacks. Meanwhile, the vegetable and fruit groups of plants can be directly used by the community either as food ingredients that can be consumed directly, cooking spices, as well as traditional medicines for the people of Gorontalo [7] [8] [9].

In using food plants as traditional medicine in Gorontalo, people do not only use one type of plant, but often combine one part of a plant organ with another type of plant organ through a simple process. According to the community, this process is a legacy passed down from their ancestors and is based on their personal experience. Not only that, other benefits of food source plants include woody stem organs that can be used as building materials for coastal residents' residences. This has become a tradition and habit among the people of the Tomini Bay coastal area which needs to be preserved as a cultural identity.

Based on information on the diversity and use of food source plants in the coastal area of Tomini Bay, indirectly plant breeding activities carried out by the community have had a very positive impact on maintaining germplasm. A wide variety of plant food sources is very important for known, because it indicates the plant's ability to adapt well to its habitat. Apart from being a plant breeding effort, cultivation activities are also a step in finding alternative plant sources for food [7]. Likewise, studying morphological forms through the characterization

process will provide great benefits for the systematic development of plants as well as steps for long-term plant utilization.

The success of the plant cultivation process by the coastal communities of Tomini Bay in Gorontalo, in the future, can improve the character of a plant which can be the basis for determining the relationship between food source plants in the future. Because the more similarities in characteristics, the closer the relationship between plants will be [5].

## 4 Conclusion

Based on the research results, it can be concluded that the type of food source plant found in Botubarani Village, Kabila Bone District and East Biluhu Village, Batudaa Pantai District, which is the coastal area of Tomini Bay in Gorontalo Province, is corn (*Zea mays*), Galangal (*Alpinia galangal*), Fragrant lemongrass (*Cymbopogon nardus*), Spoken (*Xanthosoma sagittifolium*), Curcuma (*Curcuma domestica*), Ornamental Sweet Potato (*Ipomoea potatoes* Var. margarita), Cassava (*Manihot esculenta*), Garlic (*Allium sativum*), Red Spinach (*Amaranthus tricolor* var. ganeticus), Cayenne pepper (*Capsicum bush*), Pomegranate (*Pink garnetL*), Guava (*Syzygium aqueum*), Guava (*Psidium guajava*), Guava (*Syzygium malaccense*), Lime (*Citrus aurantiifolia*), Long beans (*Vigna sinensis*), Cocoa (*Theobroma cacao*), Land Water Spinach (*Ipomoea reptana*), Coconut (*Cocos nucifera*), Ivory Coconut (*Cocos nucifera* var. ivory), Basil (*Ocimum sanctum*), Please (*Mangifera indica*), Jackfruit (*Artocarpus heterophyllus*), Girls (*Ananas comosus*), Fragrant Pandan (*Pandanus amaryllifolius*), Pawpaw (*Carica papaya*), Banana (*Musa paradisiaca*), Sirikaya (*Annona squamosa*), Sour-sop (*Annona muricata*), Breadfruit (*Artocarpus communis*), Purple Eggplant (*Solanum melongena*), with a habitus category of 25.80% trees, 22.58% shrubs, 45.16% herbs, and 6.4% shrubs. As many as 68% of food source plants are cultivated in gardens and yards of residents' homes, 28% grow wild or are cultivated, and 3% grow wild, with benefits as food ingredients, cooking spices, medicines, and building materials.

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