

Characteristics of Dalugha (*Cyrtosperma merkusii* (Hassk.) Schott.) on Sangihe Island and Siau Island

Euis F. S. Pangemanan¹, Samuel P. Ratag², Marthen T. Lasut³

^{1,2,3}Department of Forestry, Sam Ratulangi University, Manado 95115, Indonesia

¹Corresponding Author Email: euisfspangemanan[at]unsrat.ac.id

²Email: semuelratag[at]unsrat.ac.id

Abstract: These instructions provide you guidelines for preparing papers for International Journal of Science & Research (IJSR). Use this document as a template and as an instruction set. Please submit your manuscript by IJSR Online Submission Module. Dalugha (*Cyrtosperma merkusii* (Hassk.) Schott.) is known as the giant swamp taro plant, endemic to North Sulawesi and found in the Sangihe Islands and other areas bordering the southern Philippines. The tubers of this plant are widely used as food, while the leaves are used in traditional medicine and as wrappers. Research has been conducted on dalugha, but the study of its morphological characteristics is still lacking. The aim of this study was to determine the characteristics of dalugha on Siau Island and Sangihe Island. Samples were taken from Balirangen and Tanaki villages on Siau Island and Karatung 1 and Manganitu villages on Sangihe Island. Observation of morphological characteristics using a description reference based on Iese 2005; There are morphological differences between the dalugha found on Siau Island and the dalugha found on Sangihe Island. These differences include the leaves, tubers and inflorescences.

Keywords: Characteristics, dalugha, Sangihe, Siau

1. Introduction

Indonesia has extraordinary biodiversity, making it a "mega-biodiversity". According to LIPI, Indonesia's biodiversity is very rich. This includes 1500 species of algae, 80,000 species of fungus-producing plants (such as cryptogams), 595 species of crustose lichens, 2197 species of ferns, 40,000 species of seed plants, which make up 15.5% of the world's total flora, 8,157 species of vertebrates (mammals, birds, herpetofauna and fish) and 1,900 species of butterflies, which make up 10% of the world's total flora. In addition, Indonesia's native fauna consists of 386 species of birds, 270 species of mammals, 280 species of fish, 204 species of amphibians and 328 species of reptiles. The conservation of resources and biodiversity depends on human awareness of the importance of existence and biodiversity. Cyrtosperms are large geophytes with creeping rhizomes and highly stratified spiny petioles [1]. The genus currently comprises 11 species found throughout Malesia; 10 of these are in Papuasia, and *Cyrtosperma merkusii* is found in the Malay Peninsula, the Philippines, Borneo, Sumatra, Java and Oceania [2]. Dalugha (*Cyrtosperma merkusii* (Hassk.) Schott.) is a giant swamp taro endemic to North Sulawesi. It is found in the Sangihe Islands and other areas bordering the southern Philippines. Some locations are the original habitat of dalugha, such as Tamako, South Manganitu and Tatoareng [3].

Cyrtosperma merkusii is a very large plant that is cultivated as a food crop. Cultivated species can grow up to 6 metres tall and usually have no thorns, unlike wild plants which grow to about 1 cubic metre [4]. Swamp taro is a giant herbaceous plant that produces 6-8 large leaves from a short underground stem. Mature plants can reach a height of 42 metres, with arrow-shaped leaf blades 1-2 metres long suspended from sturdy stems 1-2 metres long. Swamp taro is the largest edible tuber-producing plant in the world. In some parts of Asia and the Pacific, the plant is cultivated for its tubers, which are a

rich source of carbohydrates. The local name for the giant swamp taro plant on Sangihe Island is dalugha (*Cyrtosperma merkusii* (Hassk.) Scott). It is also known by the scientific names *C. lasoides*, *C. edule* and *C. chamissonis* [5]. Certain plants can respond differently to the environment in which they grow. Each type of plant can produce different growth and yields depending on where it is grown. Some plants grow better in the shade than outdoors. This is also true of other crops. This is because a plant's genetic characteristics determine its ability to adapt to its environment [6]. Dalugha usually grows in wetlands, is salinity tolerant, shade tolerant and tolerant of soils with low nutrient content [7], [8]. The development of dalugha requires information about this plant in terms of growing conditions, as the growth response to different growing sites. The adaptation of each plant species to its location can result in different plant growth and yield. This is because the ability of plants to adapt to the environment is determined by the genetic properties of the plants [9]. The biological characteristics of dalugha related to its adaptability to the complexity of habitat variation in the tidal marsh ecosystem are still poorly understood.

Several studies have been conducted on dalugha, but not many studies have investigated the morphological characteristics of dalugha. This study was conducted to determine the morphological characteristics of dalugha in Sangihe Island and Siau Island.

2. Methodology

Samples were taken from Siau Island and Sangihe Island using purposive sampling technique. Observation of morphological characteristics, using a description reference based on [10] Iese 2005.

Morphological observations included:

- 1) Plant height: measured on the tallest plant; from the top of the highest leaf to the base of the stem.

- 2) Number of buds: count the number of buds in a cluster
- 3) Plant spread: measured at the outermost width of the plant spread
- 4) Leaves: leaf characteristics observed include shape, tip, margin and base of the leaf, colour of upper and lower surface, upper surface characteristics, leaf type, bone colour and direction of growth. Leaf lamina length : width ratio was measured at right angles to mid vein
- 5) Petiole: Petiole length is measured from the base to the tip of the petiole. Shape, colour of the upper, middle and lower third and colour of the lower third are other characteristics observed on the petiole.
- 6) Tubers: The length of the tuber is measured from the tip to the base and the weight of the tuber is weighed. Other characteristics observed are the colour of the skin of the tuber and the colour of the flesh of the tuber.
- 7) Root system and root colour
- 8) Flower stem shape, flower stem colour, flower type, spadix colour, berry colour, spathe outer surface colour, spathe shape and spathe tip shape are all aspects of the flower observed.

Data were analysed descriptively and presented tabularly.

3. Results & Discussion

Siau Tagulandang Biaro Islands Regency (Sitaro Regency) is a regency in North Sulawesi Province, capital Ondong Siau, consisting of 10 sub-districts, 4 urban villages and 80 villages.

Siau Tagulandang Biaro Islands Regency has a population of 63,533 people with 17,374 households. The people are generally fishermen and farmers. There are at least three ethnic groups, namely Ethnic Siau and Tagulandang, who are influenced by Sangihe culture and customs; and Ethnic Biaro, who are influenced by Minahasa culture. Located in the north, Sitaro Regency consists of forty-seven islands, ten of which are inhabited. 80% of Sitaro Regency is oceanic with a coastline length of ±98.6 km with an area of 275.96 km² and is located at the coordinates: 02° 4' 13" - 02 52' 47" N and 125° 09' 28" - 125° 24' 25" E. Siau Tagulandang Biaro Islands Regency [11]. Sangihe Islands Regency is an integral part of North Sulawesi Province with Tahuna as its capital. It is approximately 142 nautical miles from the capital of North Sulawesi Province, Manado, located between 20 4'13" - 40 44' 22" N and 1290 9' 28" - 1250 56' 57" E. Sangihe Islands Regency area of 736.98 km² consists of 15 sub-districts (22 villages & 145 villages) and has a population of 131,163 people with 34,227 households & a population density of 177.97 people/km² [12].

Samples for Sangihe Island were collected from Karatung 1 Village (N 03°32'46.67" E 125°30'30.25") and Manganitu Village (N 03°34'07.92" E 125°30'47.18"), while for Siau Island samples were collected from Balirangen Village (N 02°38'50.13" E 125°25'11.93") and Tanaki village (N 02°38'50.85" E 125°25'11.35").

Dalugha is found in running water streams and grows wild and well in the shade of sago. When collecting data at the research site, 2 points were taken and 5 samples were observed at each point. The sample points were chosen

randomly, taking into account the availability of the plants to be observed. The morphological characteristics of dalugha were observed on all samples. Quantitative data is the average of the observations on the sample.

Based on the results of the study, it can be seen that the height of Dalugha plants on Siau Island is relatively short (4.1 m) with a wide plant distribution (2.8 m) and the number of buds is less (2.8). Dalugha on Sangihe Island is classified as medium (5.5 m) with a wide distribution (3.23 m) and a low number of shoots (6). The number of dalugha leaves on Siau Island and Sangihe Island is normal (5-10).

Leaves base to petiole attachment : peltate (<45°, having a circular structure attached to a stalk near the centre, rather than at or near the margin; shield-whaped)shield-shaped) in both Dalugha on Siau Island and on Sangihe Island. Thorns were found at the base of the petiole of dalugha from Siau Island, whereas no thorns were found on the petiole of dalugha from Sangihe Island.

The morphological characteristics of dalugha in Siau Island and Sangihe Island are shown in Table 1.

Table 1: Morphological description of Dalugha in Siau Island and Sangihe Island

No	Trait	Siau Island	Sangihe Island
Plant Habit Description			
1.1	Plant height at maturity (m)	4,1	5,5
1.2	Number of suckers	2,8	6
1.3	Plant span/spread (m)	2,49	3,23
Leaves Descriptor			
2.1	Leaves base to petiole attachment	peltate	peltate
2.1	Spread of leaf lobes	overlapping	acute
2.3	Leaf blade margin	wavy	wavy
2.4	Leaf blade colour upper surface	dark green	green
2.5	Leaf lamina appendages/ cataphylls	absent	absent
2.6	Leaf main vein colour upper surface	yellow green	whitish
2.7	Leaf arrangement	clockwise	clockwise
2.8	Number of leaves	5,5	7,75
2.9	Leaf lamina length : width ratio	1,5 : 1	1,5 : 1
Petiole (leaf stalk) descriptor			
3.1	Colour of top third	green	green
3.2	Colour of middle third	green	green
3.3	Colour of lower third	dark green	dark green
3.4	Petiole stripes	absent	present
3.5	Petiole shape	swan's neck	swan's neck
3.6	Petiole throne/spine	present	present
Corm descriptor			
4.1	Average weight (kg)	3,7	3,1
4.2	Average circumference (cm)	63	51
4.3	Meat color	whitish yellow	reddish yellow
4.4	Skin color	brown	reddish yellow
4.5	Root color:	white	white
4.6	Root system:	fibrous	fibrous
4.7	Corm size large	63 cm	
4.8	Corm cortex colour	white	other
4.9	Corm flesh colour central part	white	other
Inflorescence of flower descriptor			
5.1	Flower formation	present	present
5.2	Flower stalk colour	dark green	dark green

5.3	Spathe (flower cover) colour	purple	yellow green
5.4	Spadix	colour pink	yellow green
5.5	Berries colour	pink	whitish
5.5	Male/bottom portion of spadix	exposed	exposed

In the pictures below we can see the morphological differences between the dalugha found on Siau Island and the dalugha found on Sangihe Island. These differences include the leaves, corm and inflorescences of dalugha.

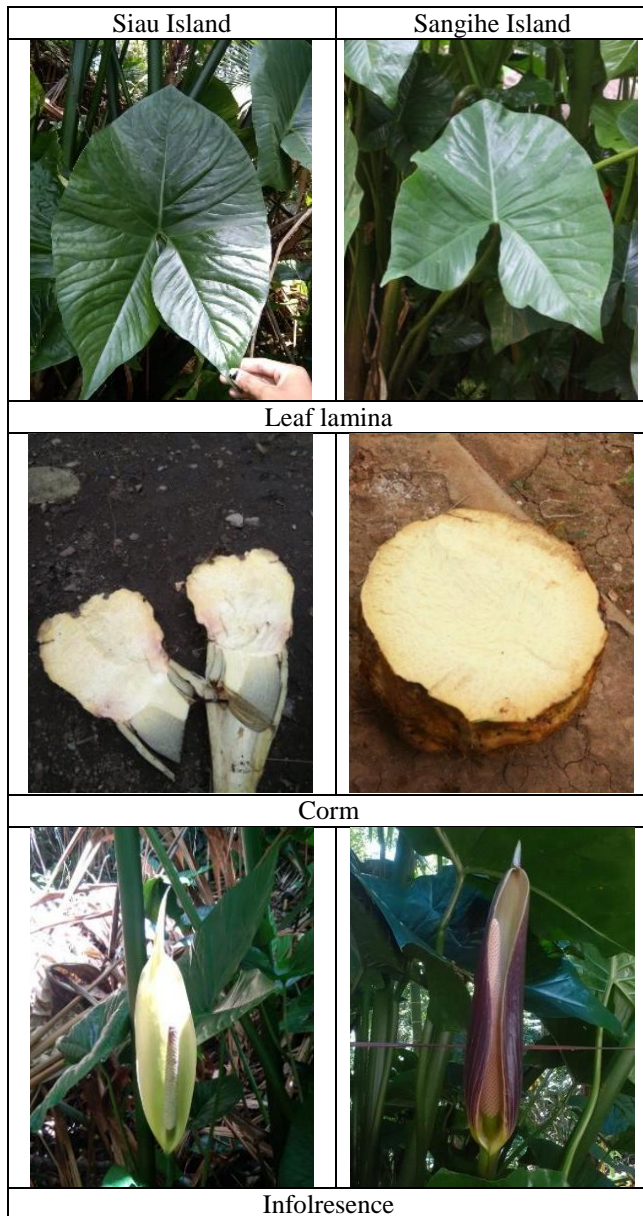


Figure 1: Morphology of Dalugha on Siau Island and Sangihe Island

4. Conclusion

There are morphological differences between the dalugha found on Siau Island and the dalugha found on Sangihe Island. These differences include the leaves, corms and inflorescences.

5. Future Scope

More research needs to be done on the microclimate in which Dalugha needs to grow.

References

- [1] Hettterscheid, W. 2008. "Cyrtosperma Genera List." [Online]. Available : http://www.aroid.org/genera/cyrtosperma/Cyrtosperma_list.php. [Accessed : Sept 2, 2023]
- [2] Hay, A. "Cyrtosperma (Araceae) and its old world allies." *Blumea*, 33(2) pp 427-469, 1988
- [3] Julianti, Eka, et al. "DNA Barcoding Tanaman dalugha (Cyrtosperma spp) dari Kepulauan Sangihe Berdasarkan Gen matK (DNA Barcoding dalugha Plant (Cyrtosperma spp) of Sangihe Island Based on matK Gene)." *Jurnal Bios Logos* 5(2). 2015.
- [4] Boos, J. 2008. The Genus *Cyrtosperma* Griff. [Online]. Available:<http://www.aroid.org/genera/cyrtosperma/cyrtosper.php>. [Accessed: Sept. 12, 2023]
- [5] Flach, M., and F. Rumawas. Plant resources of South-East Asia. Backhuys Publ., 1996.
- [6] Rao, Shiwangni, Mary Taylor, and Anjeela Jokhan. "In vivo screening of salinity tolerance in Giant Swamp Taro (*Cyrtosperma merkusii*)." *The South Pacific Journal of Natural and Applied Sciences* 32(1), pp. 33-36, 2014
- [7] Shiwangni, R. A. O. "Salinity Tolerance of Giant Swamp Taro (*Cyrtosperma merkusii*); In vitro and In vivo." Diss. The University Of the South Pacific, 2011.
- [8] Ratag, Semuel, J. Tasirin, dan E. F. Pangemanan. "Potensi Agroforestri Tanaman Talas Rawa Raksasa (*Cyrtosperma merkusii* (Hassk.) Schott) pada Lahan Rawa Pasang Surut untuk Ketahanan Pangan" *Prosiding Seminar Nasional Agroforestri IV*, pp. 2013.
- [9] Semuel P. Ratag, Zaenal Kusuma, Bagyo Yanuwadi, David A. Kaligis, Johny S. Tasirin, Christophil S. Medellu. "Temporal Variation of Soil Surface Temperature in Dalugha (*Cyrtosperma Merkusii* (Hassk.) Schott) Swamp Habitat." *International Journal of Science and Engineering Investigations* 2(15) pp. 49-51, 2013
- [10] Shiwangni Rao, Mary Taylor and Anjeela Jokhan. "A descriptor list for Giant Swamp Taro (*Cyrtosperma merkusii*) and its cultivars in the Federated States of Micronesia." *Telopea* 16, pp. 95–119, 2014
- [11] Pemerintah Kabupaten Kepulauan Siau Tagulandang Biaro. [Online] Available : <https://sulut.bpk.go.id/pemerintah-kabupaten-kepulauan-siau-tagulandang-biaro/> [Accessed : 23 September 2023]
- [12] Pemerintah Kabupaten Kepulauan Sangihe. [Online]. Available : <https://sangihekab.go.id/> [Accessed : 23 September 2023]