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Botanical Study of the Genus *Amorphophallus* Blume in the Taman Konservasi Puspa Langka Tebat Monok, Kepahiang Regency, Bengkulu Province

RR Sri Astuti,[1*], Evelyne Riandini[1], Rochmah Supriati[1]

[1]Biology Department, Faculty of Mathematics and Natural Sciences, Bengkulu University, WR Supratman Kandang Limun St., Bengkulu City, 38371, Indonesia
[*]*e-mail: sriastuti@unib.co.id*

Abstract

Taman Konservasi Puspa Langka in Tebat Monok is an area that is often visited for natural tourism, especially because the area contains Amorphophallus *and* Rafflesia *flowers. Several botanical sources and studies show some data regarding botanical aspects, especially on the* Amorphophallus *genus, however, in the Taman Konservasi Puspa Langka area in Tebat Monok Village, Kepahiang Regency, this data is not yet complete. A biological study of the Amorphophallus plant was carried out, especially morphological characters and flowering. Five types of* Amorphophallus *were found consisting of* Amorphophallus gigas *Teijsm. & Binn. (4 individuals),* Amorphophallus manta *Hett. & Ittenb. (1 individual),* Amorphophallus titanum *(Becc.) Becc. ex Arcang (12 individuals),* Amorphophallus paeoniifolius *(Dennst.) Nicolson (3 individuals), and* Amorphophallus variabilis *Blume (2 individuals). The environmental conditions of the habitat obtained were temperatures ranging between 20-28^{o}C, soil pH 7.2-7.6, wind speed between 18-18.8 km/h, air humidity ranging between 71-73%.*

Keywords: *Amorphophallus, botany, conservation Tebat Monok, Bengkulu.*

Abstrak

Taman Konservasi Puspa Langka di Tebat Monok merupakan salah satu kawasan yang sering dikunjungi untuk wisata alam, terutama karena di kawasan itu terdapat bunga *Amorphophallus* dan *Rafflesia*. Beberapa sumber dan kajian botani menunjukkan beberapa data mengenai aspek botani terutama pada genus *Amorphophallus*, namun di kawasan Taman Konservasi Puspa Langka di Desa Tebat Monok Kabupaten Kepahiang data ini belum lengkap. Kajian studi biologi tentang tanaman *Amorphaphalus* dilakukan, terutama karakter morfologi dan saat berbunga. Ditemukan lima jenis *Amorphophallus* terdiri dari *Amorphophallus gigas* Teijsm. & Binn. (4 individu), *Amorphophallus manta* Hett. & Ittenb. (1 individu), *Amorphophallus titanum* (Becc.) Becc. ex Arcang (12 individu), *Amorphophallus paeoniifolius* (Dennst.) Nicolson (3 individu), dan *Amorphophallus variabilis* Blume (2 individu). Kondisi lingkungan habitat diperoleh suhu berkisar antara 20-28^{o}C, pH tanah 7,2-7,6, kecepatan angin yaitu antara 18-18,8 km/h, kelembaban udara berkisar antara 71-73%.

Kata Kunci : *Amorphophallus*, botani, konservasi, Tebat Monok, Bengkulu.

1. Introduction

The genus *Amorphophallus* of the family Araceae is estimated to include around 170 species [1], 63 species of which are distributed in the Malesian region [2] and more than 25 species are found in Indonesia [3]. There are 25 types found in Indonesia, of which 18 types are endemic types, namely 8 types in Sumatra, 6 types in Java, 3 types in Kalimantan, and 1 type in Sulawesi [4].

Some domesticated species mainly tuber organs that can be consumed or eaten. Domesticated types of *Amorphophallus* such as *A. paeoniifolius, A. campanulatus, A. konjac, A. muelleri, A. riveiri, A. onchophyllus, A. yunnanensis, A. yuloensis, A. nanus,* and *A. krausei*, generally live in tropical areas characterized by tuberous plants [5].

The development and growth of *Amorphophallus* plants from juvenile to adult stages shows seasonal dormancy and produces solitary leaves as they grow. Leaves have three blades, pinnatisect, bipinnatisect, or dichotomously divide the shape of the lamina larger than the supporting petiole. Cob-type compound flowers (spadix), with male and female flowers that are protogynous, and emit a distinctive odor. Another character that characterizes this plant is that it has tubers. The growth and production of *Amorphophallus* tubers depends on the level of shade, in Indonesia certain species of this plant like shade [6].

The Taman Konservasi Puspa Langka Tebat Monok, Kepahiang Regency, is one of the areas frequently visited for natural tourism, especially in that area where *Amorphophallus* and *Rafflesia* flowers are found. The topography of this location has lowland tropical rainforest heights. It borders the Musi river tributary, as well as residential plantations and protected forest areas. This area is included in the administrative area of the Kepahiang Regency government, which is around 55 km to the northeast of the provincial capital of Bengkulu. Microclimatic conditions in conservation areas support the growth and development of *Amorphophallus*. These are often found growing adjacent to air currents. This can provide an indication that good hydrological circulation is a very important factor for the growth of *Amorphophallus*. Several sources and botanical studies show that basic data regarding botanical aspects, especially on the *Amorphophallus* genus in the Bengkulu area, especially in the Taman Konservasi Puspa Langka which is located in Tebat Monok Village, Kepahiang Regency, is incomplete. For this reason, it is necessary to complete and study further regarding the botanical study of the *Amorphophallus* genus in the Taman Konservasi Langka Puspa Tebat Monok, Kepahiang Regency, Bengkulu Province.

2. Methods

The research was carried out in May–November 2021 with an exploratory study in the Taman Konservasi Puspa Langka, Tebat Monok, Kepahiang Regency, Bengkulu Province. Identification, collection and continued observation of plants is carried out at the Plant Biosystematics Laboratory, Basic Science FMIPA, UNIB.

Specimens and data were collected at conservation locations where research was in the form of cultivation locations and wild plants [7] in conservation areas. Each specimen taken from the field is given a hanging label with a description of the field data collection. Important characters that will be lost in the field are documented using a digital camera. Then it was taken to the Plant Systematics Laboratory, FMIPA, Bengkulu University for morphological observations. To complete the biological data, environmental data will be observed in the form of temperature, light intensity and soil pH.

Morphological Characterization and *Identification*

Amorphophallus specimens were collected which had complete morphological characteristics, having vegetative parts (false stems) and reproductive parts (flowers, fruit, seeds if any). Observation of the morphology of selected inflorescences includes cataphyll, flower stalk, spatha, female and male flowers, and appendix. All parts of the inflorescence were measured, such as the length of the cataphyll and stalk, length and whorl of the spatha, male and female zones, and the appendix [8].

3. Results and Discussion

Morphological Characterization and *Identification*

The results of research carried out in the Puspa Langka Conservation Area, Tebat Monok Village, Kepahiang Regency, Bengkulu Province, found five types of the *Amorphophallus* genus. These five types consist of *Amorphophallus gigas* Teijsm. & Binn. (individu), *A. manta* Hett. & Ittenb. (individu), *A. titanum* (Becc.) Becc. ex Arcang. (individu), *A. paeoniifolius* (Dennst.) Nicolson (individu), and *A. variabilis* Blume (individu).

3.1 Amorphophallus gigas Teijsm. & Binn.

Atuurkundig Tijdschrift voor Nederlandsch-Indië 24: 329. 1862. Syntype Joseph Renner Maxwell (1914) Indonesia [NHMUK BOT BM000984110]. Synonym=*A. brooksii*. Single-leaf herb, dark green leaf stalks with small to large spots, pale green, 3-4 m long, 11-20 cm in diameter, 4 m wide. The length of the stalk reaches 4 meters. The description refers to [9].

Figure 1. Habitus *Amorphophallus gigas* Teijsm.&Binn. (Personal documentation)

3.2 Amorphophallus manta Hett. & Ittenb.

Inflorescence in solitary cob, rarely growing together with leaves; when young it is protected by the flower sheath; The cob sessile, shorter or much longer than the sheath. The spadix is more or less divided into female parts, where the female flowers sit in clusters; male member; and a sterile part called the appendix, at the very top. Berry fruit has 1 to many seeds; orange-red when ripe, Rarely blue or white; Elliptical seed description refers to [10].

Figure 2. Habitus *Amorphophallus manta* Hett.& Ittenb.(Personal documentation)

3.3 Amorphophallus titanum (Becc.) Becc. ex Arcang.

Amorphophallus titanum (Becc.) Becc. ex Arcang. Tubers, inflorescences emerging from tubers, underground stems are modified to store food for the plant. Round shape weighing 70 kg or more (Holidin, personal communication). Leaves, after flowering, the inflorescence dies off and a single leaf appears instead. Reaching the size of a small tree, 7 m high and 7 m wide, the leaves consist of firm glossy green stalks speckled with cream, forming three apexes and bearing numerous leaflets. Leaves wilt before new leaves develop. When the plant is ready to flower again, the bulb goes dormant for up to four months before another inflorescence appears, growing upwards at a rate of about 10 cm per day. The flower, a large inflorescence (inflorescence structure) consists of a spatha (collar-like structure), wrapped around a spadix. Inverted bell shape spatha. Green speckled with cream on the outside, dark red on the inside. It has ribbed sides and frayed edges, reaching three meters in

circumference. The flowers are borne at the lower end of a greyish yellow spadix. The base of the spadix, within the protective space formed by the spatha, is a band of cream-colored male flowers above a ring of larger pink female flowers. The flower is ready for pollination, the spadix heats up and emits a pungent foul odor. Description refers to [10].

Figure 5. Habitus *Amorphophallus titanum*(Becc.) Becc. ex Arcang. (Personal documentation)

3.4 Amorphophallus paeoniifolius (Dennst.) Nicolson

Tuber, dark brown, depressed globose, height 20cm, diameter 30cm. Leaves, solitary, less often 2; 2-3 membranous cataphylls, of different lengths, accompany the leaves or inflorescence; Petiole 50-150 x 2-4 cm in diameter, scabrous to slightly verruculose, pale green to greenish, with pale spots. The leaf blade is 50-150 cm in diameter, pale green, divided into three main parts, the segments are divided, bifurcated and pinnate, incised to the primary vein; lobes oblong elliptical, cuspidate to acuminate, 5-15 cm long, oblique and decurrent on one side. Flowers, short peduncle, 5- 20 cm long, 3 cm wide, mottled up to 120 cm on fruit. Spatha campanulate to subcampanulate, coriaceous to fleshy, 20-30 x 25-35 cm, margin ± curved and pleated, outer surface greenish to reddish and mottled whitish, internal surface purple and verruculose at base, yellow in middle zone, purple margin at the top. Spadix 25-30 cm long; cylindrical female flowers, 5- 12 cm; obconic male flowers, 4-6 x 2-4 (at the bottom), 4-6 (towards the top) cm; Attachment globose to subglobose, or globose-conoid 7-15 x 10-15 cm (at base), purple, ± reddish. Male flowers 4-5 mm high; anthers subsessile, oval. Female flowers are 10-17 mm long; ovary 2-3 mm high, purple, usually 2 locular (Rarely 3); purple, 8-14 mm long, cylindrical; yellowish stigma with 2-3 lobes ca. diameter 1.5mm. Fruit, berries ovate to oval, red, 10-13mm long; 2 descriptions refer to [11; 12].

Figure 4. Habitus ***Amorphophallus paeoniifolius*** **(Dennst.)Nicolson** (Personal documentation)

3.5 Amorphophallus variabilis Blume

A. variabilis produces 1 - 2 leaves from tuberous lower stems 15 cm in diameter. Leaves are up to 125 cm long on stalks up to 120 cm long. Flowering stems 15 – 80 cm tall. Flower height 13.5 to 75 cm, and inflorescence (male flowers and female flowers 5.5-42.5 cm long and 0.7-3.2 cm in diameter. The male flower part is 2.5-8 cm long, and depending on the strain, the part is surrounded by the pollen sac part of the male flower . Some have different colors from their parts. Length 8 to 24 cm green. Description refers to [11].

Figure 5. Habitus *Amorphophallus variabilis* Blume (Personal documentation)

Based on the results of measurements of abiotic factors, temperature data was obtained at 20-29 ^{0}C, wind speed at 18-18.6, soil pH at 7.2-7.3, and air humidity at 71-73%. The environmental conditions where it grows are partly open because several large trees have fallen. It is suspected that this also influences changes in the vegetative and generative cycles and also the dormant period of the tubers. This is in accordance with [13]

4. Conclusions

Based on the results of observations from botanical studies that have been carried out, five types of the genus *Amorphophallus* were found. These five types consist of *Amorphophallus gigas* Teijsm. & Binn.(4 individuals), *Amorphophallus manta* Hett. & Ittenb. (1 individual), *Amorphophallus titanum* (Becc.) Becc. ex Arcang (12 individuals), *Amorphophallus paeoniifolius* (Dennst.) Nicolson (3 individuals), and *Amorphophallus variabilis* Blume (2 individuals). The environmental conditions of the habitat obtained were temperatures ranging between 20-29^{0}C, soil pH 7.2-7.3, wind speed between 18-18.8 km/h, air humidity ranging between 71-73%.

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