

Epiphytic Orchid Inventory and The Host In Bantarbolang Nature Reserve Central Java

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Abstract

Bantarbolang Nature Reserve is located in the northern part of Central Java Province. The study aiming to verify the plant species of epiphytic orchids and the host tree in the area of Bantarbolang Nature Reserve was conducted in February to April 2019. The research method used in the research was explorative methods. Data were analyzed descriptively. It was recorded that there were 5 epiphytic orchid species, i.e. *Rhynchosytilis retusa*, *Aerides odorata*, *Cymbidium bicolor*, *Dendrobium crumenatum* and *Ascocentrum miniatum*. The number of orchids found was 148 individuals, the most common species was *Rhynchosytilis retusa*. The conclusion of this research were the host trees are teak (*Tectona grandis*), putat (*Barringtonia acutangula*), bulu (*Ficus annulata*) and bungur (*Lagerstroemia speciosa*) with characteristics of hard stems, cracked surface texture, rough, mossy and not easy to peel.

Key Words: *Bantarbolang Nature Reserve, epiphytic orchid, host tree.*

INTRODUCTION

Indonesia is known as a country rich in flora and fauna, where one of the largest families that occupies 7 – 10% of flowering plants is Orchidaceae (Dressler, 1993). Java Island is one of the areas that has a high level of endemic species of orchids. Comber (1990) reported that orchids in Java reached 731 species, consisting of 390 species from East Java (49 of them were endemic), 295 species from Central Java (16 of them were endemic), and 642 species from West Java (248 of them were endemic). Orchid is one of the popular flower plants because it has unique and distinctive flower colors and shapes (Paramitha *et al.*, 2012). Epiphytic orchids are orchid species that live on other plants, usually trees, which are at the base of the tree to the branches and branches of trees. According to Benzing (1981), there were $\pm 3,000$ species of plants that can live as epiphytes from the orchid group. These orchids live in cool environment conditions, high humidity and are protected from sunlight (Hasanuddin, 2010). Host tree is one of the main needs to get good light and air circulation for epiphytic orchids. In general, the epiphytic orchid host tree has the same physical properties, namely thick, rough, cracked outer skin and relatively good canopy conditions (Murtiningsih *et al.*, 2016).

The diversity of epiphytic orchids in various species of trees and parts of trees that are host because of their dependence on micro climatic conditions of forest stands. This causes the existence of a number of epiphytic orchid colonies that can only be found in certain tree species or in certain parts of the tree (Sujalu, 2008). Orchid has unique characteristics in the shape and color of flowers as

the main attraction, so many people are interested in collecting orchids as ornamental plants. Taking natural orchids directly from their natural habitat is mostly done by ornamental plant collectors. This causes its existence in nature to be threatened, besides habitat destruction due to forest fires, illegal logging, natural disasters and the conversion of forests to settlements also encourage the extinction of natural orchids. Preservation and inventory of natural orchids is needed to prevent them from extinction (Febriliani *et al.*, 2013).

Bantarbolang Nature Reserve is located in Kebon Gede Village, Bantarbolang District, Pemalang Regency, which is dominated by teak (*Tectona grandis*). According to Schmidt & Ferguson (1951), climate classification this area is classified as type B with an average annual rainfall of 3,000 – 4,000 mm. Bantarbolang Nature Reserve has an area of 24.50 ha located at an altitude of ± 100 m above sea level with flat topography and reddish-brown latosol soil types. The daily temperature is between 26o – 28oC, minimum air humidity is 77% in September and a maximum of 85% in January (BKSDA Jateng, 2018). Most orchids found in this area are epiphytic orchids. Its current existence is very much considered given the destruction of their natural habitat due to habitat conversion (Puspitaningtyas, 2005).

Parasdyasari in 2015, conducted research on the diversity of epiphytic orchids in the Bantarbolang Nature Reserve. This research update was carried out in 2019 to collect data or re-record the diversity of epiphytic orchids in the Bantarbolang Nature Reserve. The inventory of epiphytic orchids in the area is one of the important

tasks for researchers. The characteristics of epiphytic orchid host trees also need to be studied because they are needed as a place of refuge, taking nutrients, developing and regenerating. In addition, this research is expected to be used as a source of information on germplasm conservation and adding knowledge to the community.

MATERIAL AND METHOD

The materials used in this study are 70% alcohol to preserve specimens; label paper for marking specimens; plastic bags for storing specimens; identification books and stationery. The tools used in this study are photo cameras for photographing specimens, hygrometer to measure humidity, thermometer to measure soil temperature, lux meter to measure light intensity, View Ranger application to determine coordinates. Inventory was carried out in the area around the Bantarbolang Nature Reserve, Pemalang, Central Java with coordinates of 7°00'34.0"S – 7°00'46.1"S and 109°23'18.0"E – 109°23'40.6"E. Identification and dry herbarium preparation were carried out at PUNS Biology Faculty, Jenderal Soedirman University. The research was conducted from February to April 2019.

This research method was survey with a random explorative sampling technique. The study was conducted by means of direct morphological observations and documenting orchid species and parts thereof. Morphological characterization consists of 25 characters (Balai Penelitian Tanaman Hias, 2007). The epiphytic orchid species that have been found identified with Orchids of Java (Comber, 1990). The data analyzed descriptively based on the morphological characterization of epiphytic orchids and characteristics of host trees. Host plants species and their characteristics were observed including bark surface and the zonation. Determination of zonation uses Johansson's method

(1975), which divides the host tree into 5 zones, there are:

Zone I : Tree base (first 1/3 part of tree base).

Zone II : Upper trunk (2/3 part of tree base).

Zone III : Inner canopy (branching base).

Zone IV : Outer canopy (first branch of tree).

Zone V : Outer branch.

RESULT AND DISCUSSION

Based on the observation of epiphytic orchids that grow in the Bantarbolang Nature Reserve area, 5 epiphytic orchid species belonging to 5 genera were found. They are *Rhynchostylis retusa* (L.) Blume, *Aerides odorata* Lour., *Cymbidium bicolor* Lindl., *Dendrobium crumenatum* Sw., and *Ascocentrum miniatum* (Lindl.) Schltr (Figure 2). The path that most orchids encounter is on the edge of the nature reserve. The number of individual orchids was 148 individuals. The most common orchid species found were *R. retusa*, i.e. 78 individuals, followed successively by *Aerides odorata* (56 individuals), *C. bicolor* (7 individuals), *D. crumenatum* (4 individuals), and *Ascocentrum miniatum* (3 individuals).

The morphological characterization of epiphytic orchids found to have diversity in stem, pseudobulb, leaf, flower and root color. Stem characterization includes the type of growth. The characterization of the pseudobulb involves the present or absent of a pseudobulb, pseudobulb cross section, pseudobulb longitudinal section. Leaf characterization includes leaf shape, leaf cross section, leaf apex, leaf margin, leaf surface, leaf symmetry, leaf color. Characterization of flowers includes flower position, inflorescence, flower shape, dorsal and lateral sepal shape, petal shape, sepal and petal apices, callus on the labellum, location of labellum curve, spur, pollinia number, dorsal sepal color pattern, lateral sepal color pattern, petal color patterns, and flower smell.

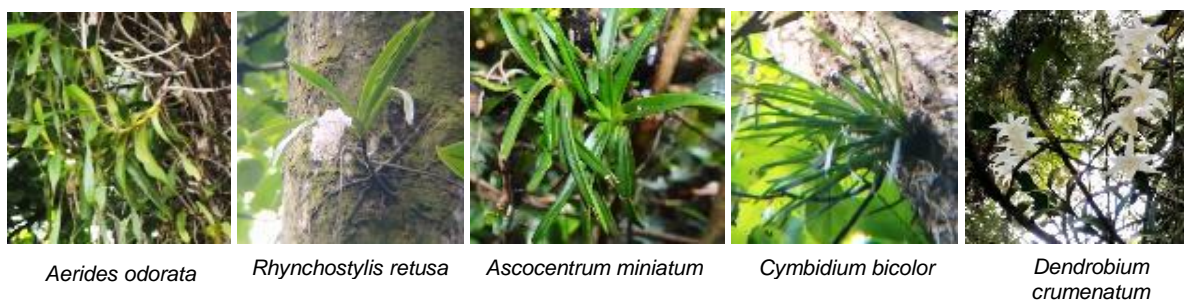


Figure 1. Epiphytic orchids found in Bantarbolang Nature Reserve.

Description of the species

1. *Aerides odorata* Lour., Fl. Cochinch. 2 : 525 (1790)

Epiphytic orchid with monopodial growth. Stem 20 – 75 cm long, 5 – 10 mm diameter. Leaves linear, 10 – 25 cm by 2 – 3 cm; leaf cross section bilaterally compressed; leaf apex acute; leaf margin

entire; leaf surface glabrous; leaf asymmetrical; leaf color green. Inflorescence racemose, ± 40 cm attached to 20 – 30 flowers; flower position axillary; flower star-shaped, white with or without various pink spotting and blotching, petals 2 – 3 cm wide; dorsal and lateral sepals lanceolate; petals shape linear; sepal and petal apices obtuse; callus on the

labellum simple; the location of the curve of the labellum in the middle; spur present; pollinia number two; dorsal sepal color pattern spotted; lateral sepal color pattern spotted; petal color pattern spotted; flower smell non aromatic. Root color whitish brown.

2. *Rhynchostylis retusa* (L.) Blume, Bijdr. : 286 (1825)

Epiphytic orchid with monopodial growth. Stem 10 – 20 cm long, ca. 17 mm diameter. Leaves linear, 25 – 40 cm by 2 – 5 cm; leaf cross section bilaterally compressed; leaf apex praemorse; leaf margin entire; leaf surface glabrous; leaf asymmetrical; leaf color green. Inflorescence racemose, 30 – 50 cm long, the length of peduncle 10 – 15 cm with the number of flowers 50 – 100; flower position axillary; flower star-shaped, white with purplish pink spots, 1 – 2 cm wide; dorsal and lateral sepal obovate; petals shape oblong; sepal and petal apices acute; callus on the labellum simple; the location of the curve of the labellum in the middle; spur present, pointing back parallel to the flower stem; pollinia number two; dorsal sepal color pattern spotted; lateral sepals color pattern spotted; petal color pattern spotted; flower smell non aromatic. Root color brownish-green.

3. *Ascocentrum miniatum* (Lindl.) Schltr. in Fedde, Repert. Beih. 1 : 975 (1913).

Epiphytic orchid with monopodial growth. Stem 3 – 10 cm long, ca. 7 mm diameter. Leaves linear, 3 – 10 cm by 0.5 – 1.75 cm; leaf cross section conduplicate; leaf apex praemorse; leaf margin entire; leaf surface glabrous; leaf asymmetrical; leaf color green. Inflorescence racemose, 20 – 25 cm long, the length of the flower stem is 5 – 8 cm, on the rachis is attached to \pm 40 adjacent flowers; flower position axillary; flower star-shape, bright reddish orange, 1 – 1.5 cm wide; dorsal and lateral sepal obovate; petal shape obovate; sepal and petal apices obtuse; callus on the labellum simple; the location of the labellum curve in the middle; spur present; pollinia number two; dorsal sepal color pattern striped; lateral sepal color pattern striped; petal color pattern striped; flower smell non aromatic. Root color brownish-green.

4. *Cymbidium bicolor* Lindl., Gen. Sp. Orchid. Pl. : 164 (1833).

Epiphytic orchid with sympodial growth. The pseudobulb is hidden by the base of the leaf, each pseudobulb has 3 – 10 leaves; pseudobulb cross section elliptical; pseudobulb longitudinal section oblong. Leaves linear, 30 – 60 cm by 1 – 2 cm; leaf cross section bilaterally compressed; leaf apex mucronate; leaf margin entire; leaf surface glabrous; leaf symmetrical; leaf color green. Inflorescence racemose, 25 cm long, attached to 6 – 13 flowers; flower position at base near pseudobulb; flower star-shaped, dark red in the middle with pale margin, \pm 4 cm wide; dorsal and lateral sepal linear; petal shape

oblong; sepal and petal apex obtuse; callus on the labellum simple; no have location of the curve of the labellum; spur absent; pollinia number four; dorsal sepal color pattern edged; lateral sepal color pattern edged; petal color pattern edged; flower smell aromatic. Root color brown.

5. *Dendrobium crumenatum* Sw. in J. Bot. (Schrader) 2 : 237 (1799).

Epiphytic orchid with sympodial growth. Pseudobulb size 2 – 5 cm by 0.1 – 1 cm; pseudobulb cross section circular; pseudobulb longitudinal section oblong. Leaves lanceolate, 3 – 9 cm by 0.5 – 2 cm; leaf cross section bilaterally compressed; leaf apex emarginated; leaf margin entire; leaf surface glabrous; leaf symmetrical; leaf color green. Flower position terminal; inflorescence racemose; flower star-shaped, flower color white, 3 – 5 cm wide; dorsal and lateral sepal elliptic; petal shape linear; sepals and petal apices acute; callus on the labellum simple; the location of the curve of the labellum at the point; spur present; pollinia number two; dorsal sepal color pattern striped; lateral sepal color pattern striped; petal color pattern striped; flower smell non aromatic. Root color whitish brown.

The number of orchids found was less than previous research by Parasdyasari (2015) which found as many as 8 epiphytic orchids species in the Bantarbolang Nature Reserve. Three species that were not found i.e. *Dendrobium stuartii*, *Oberonia* sp., and *Luisia zollingeri*. The difference in the number of species is can occur because a long time difference between the research and previous research, differences in the path of samples collection and collection times. This can also occur because of the fall of orchid host trees due to strong winds and old age, such as the *Ascocentrum miniatum* which is found attached to fallen teak tree.

Based on this research, there were 4 species of epiphytic orchid host trees in the Bantarbolang Nature Reserve, namely teak (*Tectona grandis* Lf), putat (*Barringtonia acutangula* (L.) Gaertn.), bulu (*Ficus annulata* Blume), and bungur (*Lagerstroemia speciosa* (L.) Press.). Throughout this research path, zone 5 is a zone where epiphytic orchids are not found because they are located at outer branch and are not suitable for habitat for orchid growth. This is in accordance with the statement of Marsusi *et al.* (2001). Zone 5 is rarely attached to orchids considering its position at the end of the tree, where the degree of slope is greater with the size of the trunk, often blown by the wind and the intensity of sunlight is very high. This causes the level of evapotranspiration to be very high.

The most preferred zoning of orchids to grow is zone 2 can be seen from the number of species of orchids in zone 2 (Table 1). Zones which are rarely occupied by orchids are zones 1 and 4, there is only one species that occupy this zone, namely *R. retusa* in zone 1 and *A. odorata* in zone 4. *R. retusa* occupies 2 zones and attaches to the most host trees

found in 4 species of host trees (teak, putat, bulu, and bungur). The pattern of the spread of epiphytic orchids in each zone is not the same. Suitability of orchid zoning in the host tree is different from one place to another. According to Sanford (1974), the

most suitable place to grow for orchids correlates with environmental conditions, such as humidity, light, aeration and microorganisms associated with orchids.

Table 1. Characteristics of Epiphytic Orchids Host Trees in Bantarbolang Nature Reserve

No	Local Name	Scientific Name	Family	Bark Surface	Orchids Species	Zonation
1.	Teak	<i>Tectona grandis</i>	Lamiaceae	Fine cracked texture, rough, shallow cut, not easy to peel, thin mossy	1. <i>Rhynchosytilis retusa</i> 2. <i>Aerides odorata</i> 3. <i>Cymbidium bicolor</i> 4. <i>Ascocentrum miniatum</i>	I, II III, IV II, III III
2.	Putat	<i>Barringtonia acutangula</i>	Lecythidaceae	Cracked, rough, deep-cut texture, not easy to peel, thin mossy	1. <i>Rhynchosytilis retusa</i> 2. <i>Aerides odorata</i> 3. <i>Dendrobium crumenatum</i>	II II, III, IV II
3.	Bulu	<i>Ficus annulata</i>	Moraceae	Cracked texture, rough, deep cut, easy to peel, thin mossy	1. <i>Rhynchosytilis retusa</i> 2. <i>Cymbidium bicolor</i>	II III
4.	Bungur	<i>Lagerstroemia speciosa</i>	Lythraceae	Flat texture, rough, not easy to peel, thin mossy	1. <i>Rhynchosytilis retusa</i>	II

Teak trees (*Tectona grandis*) are the hosts most commonly found in orchid plants, while hosts that have only found orchids once are bungur trees (*Lagerstroemia speciosa*). The relationship between the host and the orchid is thought to be influenced by the need for light, which is reflected in the density of the canopy and the host tree habitus. This is also supported by the number of individual orchids that ride in epiphytes, however, the association of orchid and host trees is not always specific, this also depends on the types of trees that grow in an area that can create a micro climate and an environment suitable for growth species of orchids in terms of light intensity, air movement, temperature and atmospheric humidity (Withner, 1974).

The trees found as host trees of epiphytic orchids in this research generally have the same physical characteristics, which have hard stems, cracked surface texture, rough, mossy and not easily peeled can be seen in Figure 4.6. The bark of each type of tree has distinctive physical characteristics and properties. Some of the characteristics of tree bark that influence the presence of epiphytic plants include not easy to peel, rough, hard, able to catch water, neutral acidity, and the presence of nutrients in the bark (Atmaja & Pamuji, 2011). In each tree trunk where the epiphytic orchid attaches has a thin thickness of moss. Moss plays an important role in the germination and growth of epiphytic orchids (Alvarenga *et al.*, 2010).



Figure 2. The bark surface of the epiphytic orchids host trees. Notes: (I) Teak (*Tectona grandis*); (II) Putat (*Barringtonia acutangula*); (III) Bulu (*Ficus annulata*); (IV) Bungur (*Lagerstroemia speciosa*).

The observation of this study showed that in general, the host tree species have tree bark which is not easy to peel. According to Atmaja & Pamuji (2011), epiphytic orchids prefer bark that is not easy to peel as a place of life because it is better able to hold the mass of orchids and is more sturdy as an orchid attachment. In trees that have flaky skin as easily as in bulu trees, a few epiphytic orchids are found because they will easily experience weathering which causes their skin to peel easily so that they cannot maintain the presence of epiphytic orchids. The existence of epiphytic orchids is also

more abundant in trees with cracked, cracked and rough texture. This is because the host tree that has grooves and fissures will cause epiphytic orchids to thrive while the flat host tree as in the bungur tree causes epiphytic orchids to be difficult to attach to and grow on the tree (Atmaja & Pamuji, 2011). According to Hirata *et al.* (2009), in temperate and warm forests, the size and type of host tree is the most important factor that influences the wealth of high epiphytic plants in certain host trees.

Season affects the environment, such as temperature, humidity, and sunlight intensity. Teak

trees, including tropofit plants, are shed leaves or molested in the dry season, then at the beginning of the rainy season sprout again (Purnomo & Sitompul, 2006). During the dry season, teak trees become open areas that are not covered with leaves. This condition causes high light intensity and temperature and low humidity. Only certain orchid species can live in environmental conditions such as *Dendrobium crumenatum*. *Dendrobium* is a genus of orchids that is very tolerant of drought, so it can be found in open parts of the tree (Tirta *et al.*, 2010). This research was carried out during the rainy season so that this area had a low light intensity and low temperature and high humidity. Orchids that are in accordance with this condition, like *Rhynchostylis retusa* begin to grow.

CONCLUSIONS

The Bantarbolang Nature Reserve has 5 species of epiphytic orchids, namely *Aerides odorata*, *Rhynchostylis retusa*, *Ascocentrum miniatum*, *Cymbidium bicolor*, and *Dendrobium crumenatum*. The number of orchids found was 148 individuals, the most common species was *Rhynchostylis retusa*. Trees found as hosts of epiphytic orchids, namely teak (*Tectona grandis*), putat (*Barringtonia acutangula*), bulu (*Ficus annulata*) and bungur (*Lagerstroemia speciosa*). The characteristics of the epiphytic orchid host tree have hard stems, and the surface texture is cracked, rough, mossy and not easy to peel.

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