

TYPES OF EPIPHYTIC ORCHIDS AND HOST PLANTS ON UNGARAN MOUNTAIN LIMBANGAN KENDAL CENTRAL JAVA AND ITS POTENTIAL AS ORCHID CONSERVATION AREA

Endah Rita SULISTYA DEWI*, Ary SUSATYO NUGROHO, Maria ULFAH

Department of Mathematics, Sciences and Information Technology, University of PGRI Semarang, Indonesia,
Jl. Sidodadi Timur No. 24 Semarang Indonesia 50125

Abstract

Orchidaceae is a family of flower plants that have many species. Estimated has around 15,000 - 20,000 species. Orchids can grow not only in the tropics and sub-tropics but also grow at various heights. In addition, orchids are also known to grow as epiphytes as well as in soil, rocks and swamps and all are called terrestrial orchids. The largest orchid distribution is found in tropical rainforests. The purpose of this study was to determine the types of epiphytic orchids and host plants at Ungaran mountain Limbangan Kendal, as well as their potential as an orchid conservation area. This research is a qualitative descriptive study, with data collection by purposive sampling. From the results of the study obtained 10 types of epiphytic orchids from 7 genera. The most common host species are Ficus. Ungaran mountain Limbangan Kendal has the potential as an orchid conservation area.

Keywords: *Epiphytic Orchid; Host Plant; Ungaran mountain*

Introduction

Reaching 4,000 species, orchidaceae is a plant family that has the most genera of species. For woody plants, Dipterocarpaceae family has 386 species, Myrtaceae (Eugenia) and Moraceae (Ficus) family has 500 species and Ericaceae family has 737 species, including 287 species of Rhododendrom and 239 species of Naccinium [1].

Orchids are very diverse flowers belonging to the Orchidaceae family [2]. The beauty of the flower shape and its wide distribution cause orchids to become a popular plant. However, the existence of orchids is often threatened with extinction due to the narrowness of the land. The land becomes narrow because it is widely used for settlements, plantations and natural damage. The benefits of natural orchids themselves are as ornamental plants, with a high selling value. Moreover, wild orchids in India is highly used as medicinal plant [3]. Epiphytic orchids are growing on other plants but are not parasites, because these orchids only live on the trunk, branches and branches of trees that are either alive or dead. Orchids belonging to this type are Phalaenopsis, Dendrobium, Vanda and Cattleya [4].

The Ungaran mountain forest area characterized by hills and valleys is a natural habitat for a variety of rare flora. One of them is included in the orchid-anggrekan tribe (Orchidaceae). Orchid plants naturally live on trees and tree branches. Trees are the most basic need for orchid life. Host trees are one of the basic needs to get good light and air circulation for orchids [5]. Trees on the North Slope of Ungaran Mountain become epiphytic living places for orchids.

* Corresponding author: endahrita@yahoo.co.id

Conservation of natural resources today is more directed towards biodiversity conservation. This is because biodiversity is now on the verge of extinction. According to [6] endangered species need to be saved based on reason, aesthetics, economy and ecosystem stability.

Research methods

This research was carried out in the northern slopes of Ungaran Mountain forest at an altitude of 500 to 1,700 meters above sea level. Administrative locations are included in the District of Limbangan, Kendal Regency, Central Java. The collection of orchid data and environmental conditions is carried out directly in the research location. This research is a qualitative descriptive study. The method used in primary data collection is the Transect Belt method. Belt transects are placed in three research stations with different heights, namely at altitudes of 500 - 900 meters, 901 - 1,300 meters and of 1,301 - 1,700 meters above sea level.

For the analysis of orchid data was made according to the Shannon Wiener Diversity Index (H') while the analysis of environmental conditions was carried out qualitatively.

Shannon-Wiener Species Diversity (H') Index.

The Shannon-Wiener Species Diversity indexed is calculated according to the following relation:

$$H' = -\sum ni/N \log ni/N \tag{1}$$

where: H' = Shannon-Wiener diversity index; ni = Many i (individual) species; N = Total number of individuals

The magnitude of the species diversity index according to Shannon-Wiener is defined as follows: H' > 3 shows that species diversity is abundant; 1 ≤ H' ≤ 3 shows that the diversity of species is abundantly moderate; H' < 1 shows that abundant species diversity is low

Analysis of Orchid Habitat Characteristics

Analysis of orchid habitat characteristics is qualitatively carried out. The analysis was carried out by carefully describing the environmental conditions of the habitat in the field. The environmental factors analyzed were both biotic and abiotic factors in the orchid habitat environment.

Analysis of the Distribution of Orchids

Analysis of orchid distribution was carried out in a qualitative descriptive manner based on the places where orchids were found. To help find out the position where the orchids are found, GPS was used.

Results and Discussion

Types of Epiphytic Orchids found in Ungaran Mountain Limbangan Kendal, Central Java

Based on the results of the research that has been done, the type of epiphytic orchid found on Ungaran Mountain Limbangan Kendal in Central Java are presented in Table 1.

Table 1. Types of Epiphytic Orchid in Ungaran Mountain Limbangan Kendal, Central Java

No	Species
1	<i>Dendrobium crumenatum</i>
2	<i>Dendrobium tetradon</i>
3	<i>Dendrobium linearifolium</i>
4	<i>Dendrobium mutabile</i>
5	<i>Agrostofilum bicuspidate</i>
6	<i>Bulbofilum lepidum</i>
7	<i>Vanda tricolor</i>
8	<i>Eria speciosa</i>
9	<i>Coelogyne speciosa</i>
10	<i>Cymbidium sp</i>

Table 2. Distribution of Epiphytic Orchids at Ungaran Mountain, Limbangan Kendal, Central Java

No	Species	Altitude (MASL)		
		500 - 900	901 – 1300	1301 - 1700
1.	<i>Dendrobium crumenatum</i>	v	v	-
2.	<i>Dendrobium tetradon</i>	v	-	-
3.	<i>Dendrobium linearifolium</i>	-	v	-
4.	<i>Dendrobium mutabile</i>	-	v	-
5.	<i>Agrostofilum bicuspidata</i>	-	-	v
6.	<i>Bulbofilum lepidum</i>	v	-	-
7.	<i>Vanda tricolor</i>	-	-	v
8.	<i>Eria speciosa</i>	-	v	-
9.	<i>Coelogyne speciosa</i>	-	v	-
10.	<i>Cymbidium sp</i>	v	-	-

The value of the Species Diversity Index (H') and the category of the level of diversity of orchid species from the three research stations are presented in Table 3.

Table 3. Epifit Orchid Orchid Diversity Index Value of the Station in Ungaran Mountain Limbangan Kendal, Central Java

Research Station	Altitude (MASL)	Species Diversity Index (H')	Type of Diversity
Station I	500..900	1,328	abundantly moderate
Station II	901...1300	1,216	abundantly moderate
Station III	1301...1700	0,705	Low

Distribution of orchids at Ungaran Mountain, Limbangan Kendal, Central Java

Ten types of epiphytic orchids found on Ungaran Mountain are distributed at different heights. In general, each type of orchid is only found at a certain height. The abundance of each type of orchid also varies. In general, the higher the place, the lower the abundance of orchids. The complete distribution and abundance of Ungaran Mountain orchids are explained as follows.

Altitude 500 - 900 MASL

Based on the research that has been done at an altitude of 500 - 900 meters above sea level, there are four types of orchids found, namely *Dendrobium crumenatum*, *Dendrobium tetradon*, *Bulbofilum lepidum*, and *Cymbidium sp*. *Dendrobium crumenatum* type dominates at that height. The total number of individual orchids is 99 individuals. When compared to the other species it is relatively the same, making the diversity index value at the first height lower than the second height. According to [7], species diversity is influenced by the distribution or distribution of individuals in each type, because a community is of many types but if the individual distribution is not evenly distributed, the community has a low diversity of species. The Shannon-Winner diversity index (H') obtained from an altitude of 500-900 meters above sea level, which is 1,328. This value indicates that the level of diversity of orchids at altitudes of 500 - 900 meters above sea level is classified as moderate.

Regarding environmental factors, namely air temperature, air humidity, and light intensity in Limbangan Gunung Resort Ungaran, Kendal Regency, the diversity index at an altitude of 500 - 900 meters above sea level is the highest compared to other heights. If you see the temperature at that height, it ranges from 24 - 26°C. And this altitude has humidity which supports the survival of orchids, which ranges from 70 - 80%. As well as at the level of 500 - 900 meters above sea level the intensity of the light is enough because the penetration of sunlight is enough and is not too obstructed by large trees. Therefore, environmental factors have a very important contribution.

According to [7], species diversity states a measure that describes the type variation of a community that is influenced by the number of species and the relative abundance of each type. A community is said to have a high species diversity if there are many species with a relatively evenly distributed number of each species.

The altitude is 901 - 1,300 MASL

At an altitude of 901 - 1,300 meters above sea level, five types of epiphytic orchids were found consisting of *Dendrobium crumenatum*, *Dendrobium linealifolium*, *Dendrobium mutabile*, *Eria speciosa*, and *Coelogyne speciosa*. The number of 50 is the total individual orchids. From five types of orchids that exists, the most abundant type is *Dendrobium linearifolium*.

The second most common type is *Dendrobium crumenatum* because of excellent ability to adapt in various environmental conditions compared to other types. This is evidenced by the existence of this type at an altitude of 500 - 900 meters and 901 - 1,300 meters above sea level. The Shannon-Winner diversity index (H') is obtained at an altitude of 901 - 1,300 meters above sea level which is equal to 1,216.

The diversity index value from 901 - 1,300 meters is still relatively moderate compared to the 1,301 - 1,700 meters above sea level. When viewed from the number of species and the total number of individuals at an altitude of 901 - 1,300 meters, it is moderate compared to 500 - 900 meters and 1,301 - 1,700 meters above sea level. Altitude of 901 - 1,300 meters above sea level has a condition of environmental factors that are different from the previous height, with temperatures of 22 - 24°C, 75 - 90% humidity and light intensity of 834 - 874lx. Humidity at this height reaches 90%. Because at the time of retrieval of data at the same time as rain falls, the environmental conditions are very humid. With such environmental factors, the orchids found at this altitude are moderate if viewed from the diversity index.

The Shannon-Winner diversity index (H') at an altitude of 901 - 1,300 meters above sea level is 1,216 which means it shows diversity at that altitude including moderate [7]. At this level, orchids such as *Dendrobium crumenatum*, *Dendrobium mutabile*, both types indicate that the location should have moderate humidity levels and moderate temperatures, because of the environmental conditions of the two types of orchids [8].

Supporting environmental conditions with temperature, light intensity, altitude, and high humidity make *Dendrobium mutabile*, *Dendrobium crumenatum*, *Eria speciosa*, *Coelogyne speciosa*, *Denrobium linearifolium* grow and reproduce well, as evidenced by the number of species found *Dendrobium*, these types has a wide distribution of the nature of life clustered and attached to one place [9].

Altitude of 1301 - 1,700 MASL

Orchid species found at an altitude of 1,301 - 1,700 meters above sea level are two types. The species found were *Agrostofilum bicuspidata*, and *Vanda tricolor*. The species *Agrostofilum bicuspidata* is the largest compared to other species. The number of species of *Agrostofilum bicuspidata* is because the environmental conditions are only in accordance with this type and can support life at this altitude. There are several factors that affect the life of orchids, namely air temperature, air humidity, and high enough light intensity that makes the species can live and breed well. The altitude of 1301 - 1,700 meters above sea level has a temperature that ranges from 19-21°C, with air temperatures as large as this type of medium orchid that is capable of living.

According to [8] orchids can live optimally at temperatures of 13 - 30°C. With the lack of supporting environmental factors, because the temperature and humidity of the air are too high, not all orchids can live at that height. Orchids are plants that can live and develop well in high humidity and low air temperatures [1]. At altitude of 500 - 900 meters and altitude of 901 - 1,300 meters above sea level, the type of *Dendrobium crumenatum* is always in the highest number but not at altitude of 1301 - 1,700 meters above sea level. At this altitude there are no types of *Dendrobium crumenatum*, *Dendrobium tetradon*, *Denrobium linearifolium*,

Dendrobium mutabile, *Bulbofilum lepidum*, *Eria speciosa*, *Coelogyne speciosa*, and *Cymbidium*. This indicates that these species include orchids that live in warm or temperate areas, so that at the height of 1,301 - 1,700 meters above sea level, these types are not found. But the difference is the influence of different environmental factors. The difference in the number of species can be caused by differences in the influence of altitude and differences in environmental conditions [10-13].

The Shannon-Winner diversity index (H ') obtained is 1,301 - 1,700 meters above sea level at 0.705. This means that the diversity index value is low and the environmental conditions of orchids in difficult conditions. Because there are influential human factors, the use of land by residents to grow tea and hunting orchids is influential. If you find the prima donna of Ungaran Mountain orchids, namely *Vanda tricolor*, without thinking about the impact of sustainability, all are looted without remaining. It also affects the diversity of orchids and their abundance.

Based on the results of the study, several types of epiphytic orchids found were described in figure 1.



Classification
 Kingdom : Plantae
 Divisio : Spermathophyta
 Classis : Liliopsida
 Order : Orchidales
 Family : Orchidaceae
 Genus : Dendrobium
 Species : *Dendrobium crumenatum*

Fig. 1. Epiphytic orchids - *Dendrobium crumenatum*

An epiphytic orchid, the sympodial stem growth system, the shape of the stem varies greatly. The leaves are in various shapes and sizes. Compound flowers usually come out from the axillary leaves, flowers 1 or many, varying from small to large, the lateral petals are triangular, the base is attached to the extension of the base of the column to form spurs, the crown is smaller or larger than the petals, lips notched 3, short column, pollinia 4 without stalk [1]. *Dendrobium* comes from the word "dendro" which means tree and "bios" which means life [11]. This orchid is the most abundant orchid on Ungaran Mountain and is found at altitudes between 500 to 1,300 meters above sea level (Figs. 2-4).



Classification
 Kingdom : Plantae
 Divisio : Spermathophyta
 Classis : Liliopsida
 Order : Orchidales
 Family : Orchidaceae
 Genus : Dendrobium
 Species : *Dendrobium linearifolium*

Fig. 2. Epiphytic orchids - *Dendrobium linearifolium*

The epiphytic orchid, herb, has ± 41 cm overall height, round rod, ± 40 cm long and ± 2 cm diameter, slippery surface. The leaves are lanceolate, green, interspersed, ± 5.5 cm long and ± 0.5 cm wide, smooth surface, flat edge, thin, pointed tip and no leaf stalks. Flowering: arises from leaf axillary, compound, consisting of 2 flowers. Flowers: yellow or white, the center of the lips is red [1]. This orchid includes orchids which are relatively common in Ungaran Mountain and are found at altitudes between 901 to 1,300 meters above sea level.



Classification
 Kingdom : Plantae
 Divisio : Spermatophyta
 Classis : Liliopsida
 Order : Orchidales
 Family : Orchidaceae
 Genus : Agrostophyllum
 Species : *Agrostophyllum bicuspdatum*

Fig. 3. *Agrostophyllum bicuspdatum*

Epiphytic orchids, herbs, stems grow very tightly on a short rhizoma. Trunk: flat, ± 15 - 40 cm long and ± 2.5 mm in diameter, slippery surface. The leaves are oval-shaped, green, ± 1.0 cm long and ± 4 mm wide, smooth surface, flat edge, thin, split ends, no leaf stalks (sessile) and located interspersed [1]. This orchid includes abundant orchids on Ungaran Mountain and is found at altitudes between 1,301 to 1,700 meters above sea level.



Classification
 Kingdom : Plantae
 Divisio : Spermatophyta
 Classis : Liliopsida
 Order : Orchidales
 Family : Orchidaceae
 Genus : Vanda
 Species : *Vanda tricolor*

Fig. 4. *Vanda tricolor*

Epiphytic orchid, is herbaceous, pandan-shaped, has height of ± 58 cm. Lanset-shaped leaves, green, ± 40 cm long and ± 4 cm wide, smooth, thin, pointed edges, flat edges and no leaf stalks. The stem is green, covered with midrib, length ± 18 cm and diameter of ± 2.5 cm [1].

Whereas the most found host plants were Ficus. The plants are *Ficus microcarpa* (Preh Tree), *Ficus fistulosa* (Wilodo Tree), *Ficus benjamina*, *Ficus ribes reinw*, and *Ficus variegata* (Gondang Tree). Ficus is a genus of plants that naturally grows in the tropics with several living species in the ugahari zone. Consisting of about 850 species, these types of Ficus can be in the form of wood trees, shrubs, creeping plants and epiphytes and hemi-epiphyte in the family Moraceae. In general, the types are known as fig, fig tree or fig wood.

Ara (Ficus) is mostly in form of green tropical plants all year round and inhabits various ecological niches, but some species that fall leaves grow limited in areas outside the tropics and in the highlands. Types of figs are identified by their unique inflorescence and typical pollination pattern (en: pollination syndrome), which involves a kind of wasp from the family Agaonidae to pollinate its closed flowers.

Epiphytic orchids like to live on branch-free stems, this is because orchids will get maximum light from the sun, while when in trees with tree vegetation with a dense canopy that dominates the orchids will not get direct sunlight. In accordance with [4] and [14] opinion, if orchids attach to the canopy in a tight canopy, the orchid will not get light, therefore the dominant epiphytic orchids attach to the top.

This type of interaction between orchids and host trees is a type of commensalism interaction. As explained by [12, 15, 16] that the interaction of commensalism is the interaction between two or more species, one of which is lucky, while the other party is not affected.

Conclusion

Natural orchids on Ungaran Mountain Limbangan Kendal in Central Java obtained 10 types of epiphytic orchids from 7 genera.

The highest number of host plants is Ficus with species of *Ficus microcarpa*, *Ficus fistulosa*, *Ficus benjamina*, *Ficus ribes reinw* and *Ficus variegata*. Ungaran Mountain Limbangan Kendal has the potential as an orchid conservation area.

Acknowledgments

We sincerely thank the Ministry of Research, Technology and Higher Education, LPPM Semarang PGRI University for facilitating research activities in 2018.

References

- [1] J.B. Comber, **Orchids of Java**, Bangkok, Charoen Silp, 1990.
- [2] C.G.G.J. van Steenis, **The Mountain Flora of Java**, Brill, Leiden, 1972
- [3] O.K. Agrawala, P. Singh, *Legislations for orchid conservation in India and development of National Red list as per IUCN criteria*, **The Journal of The Orchid Society of India**, **27**(1-2), 2013, pp 27-35.
- [4] I. Murtiningsih, *Sri Ningsih dan Muslimin. Karakteristik Pohon Inang Anggrek di Kawasan Taman Nasional Lore Lindu (Studi Kasus Desa Mataue, Kecamatan Kulawi, Kabupaten Sigi)*, **Warta Rimba**, **4**(2), 2016, pp 32-39
- [5] J.B. Comber, **Orchid of Sumatra**, Singapore Botanic Gardens, Singapore, 2000
- [6] B. Debashish, C.C. Rath, U. Mohapatra, *Medicinal Orchids in India and their Conservation*. **Floriculture and Ornamental Biotechnology**, **7**(1), 2013. pp 53-59.
- [7] E.P. Odum, **Dasar-dasar ekologi (terjemahan) edisi ke tiga**, Yogyakarta: Gajah Mada University Press, 1993.
- [8] Istiati, **Terampil Budidaya Anggrek**, Jawa Tengah, Sahabat, 2009.
- [9] Paramitha, Ardhana. I. G. P., Pharmawati. M, *Keanekaragaman Anggrek Epifit di Kawasan Taman Wisata Alam Danau Buyan-Tamblingan*, **Jurnal Metamorfosa**, **1**(1), 2012, pp 11-16.
- [10] Sriyati, *Keanekaragaman dan Pola Distribusi Tumbuhan Paku di Hutan Ack Naulim Kabupaten Simalungun*, **PhD Tesis**, Universitas Sumatera Utara, Medan, 2011.
- [11] S.A. Pranata, **Panduan Budidaya dan Perawatan Anggrek**, Agro Media Pustaka, Jakarta. 2009
- [12] Indriyanto, **Ekologi Hutan**, Bumi Aksara, Jakarta, 2006.
- [13] R. Yonzon, D. Lama, R.B. Bhujel, S. Rai, *Orchid species diversity of Darjeeling Himalaya of India*, **International Journal of Pharmacy and Life Sciences**, **3**(31), 2012, pp 33-50.
- [14] D. Agustin, H. Widowati, *Inventarisasi Keanekaragaman Anggrek (Orchidaceae) di Hutan Resort Way Kanan Balai Aman Nasional Way Kambas Sebagai Sumber Informasi*

- dalam Melestarikan Plasma Nutfah. Jurnal Bioedukasi*, **6**(1), 2015, pp 38-46, DOI: <http://dx.doi.org/10.24127/bioedukasi.v6i1.156>
- [15] A.P. Sujalu, *Analisis Vegetasi Keanekaragaman Jenis Anggrek Epifit di Hutan Bekas Tebang, Hutan Penelitian Malinau (Mrf) – Cifor*, **Media Konservasi**, **13**(3), 2008, DOI: <https://doi.org/10.29244/medkon.13.3.%25p>
- [16] B. Budiman, F. Kristianto, S. Sumarso, *Diversitas dan Karakter Kulit Batang Pohon Inang Anggrek Hitam (Coelogyne pandurata Lind.) di Kawasan Cagar Alam Kersik Luway*, **Jurnal Pembangunan Dan Alam Lestari**, **7**(1), 2016, pp 11-14.
-

Received: November 21, 2018

Accepted: February 12, 2019