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Diversity and Distribution Patterns of Epiphytic Orchid in the Nirmala Tea Plantation, Bogor West Java

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Abstract. Tea plantations can provide microclimate conditions for many epiphytic species, including orchids, but information on their diversity is not yet available. Epiphytic orchid diversity study has been carried out at the Nirmala Tea Plantation, Bogor, West Java. The main objective of this study was to reveal the diversity of epiphytic orchids in the Nirmala Tea Plantation. The data were obtained by vegetation analysis using the purposive sampling method by making 54 plots sized 5 x 5m^2 at two different altitudes, 1050 and 1500 masl. The quantitative data were analyzed by calculating the critical value and morisita indices. The correlation between epiphytic orchid and microclimate variables was processed using Spearman bivariate correlation, performed using Canonical Correspondence Analysis. A total of 15 epiphytic orchids were found at an altitude of 1050 m asl and 10 species of epiphytic orchids at an altitude of 1500 m asl. Seven species, *Agrostophyllum longifolium* Rchb.f., *Appendicula reflexa* Blume, *Bulbophyllum* sp.2, *Dendrochilum* sp., Eria sp.1, *Flickingeria* sp, *Pholidota carnea* Lindl, were found at both altitudes. The diversity of epiphytic orchids is affected by altitude, light intensity, and wind speed. The distribution pattern of epiphytic orchids in Nirmala Tea Plantation is clumped. The results of this study report the diversity of orchids grown in tea plantations for the first time. This information is helpful for the cultivation and conservation of orchid diversity in the future.

Key words: altitude, inventory, monoculture vegetation, quantitative data

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INTRODUCTION

Orchids are well-known in tropical and subtropical regions, namely Asia, Africa, Australia, New Guinea, Malesia, the Pacific, and South America (Catzal-lx & Noguera-Savelli, 2014). Orchids are included in the Orchidaceae family, the second-largest plant family in the world, with members reaching 43,000 species of 750 genera (Fandani & Mallombasang, 2018). A total of 731 species of orchids were found on Java island, and 239 of them were endemic species (Sadili and Sundari, 2017). The number of orchids found in each province on the Java island varies, which are 642 species in West Java, 295 species in Central Java, and 390 species in East Java (Comber, 1990). Most orchids are epiphytic and/or lithophytic (about 70%) (Govaerts, 2017) that depend on the availability and characteristics of host trees, such as height and canopy area of host trees (Mondragon et al. 2015; McCormick and Jacquemyn, 2014). Sadili and Sundari (2017) and Prapitasari et al. (2020) reported more epiphytic than terrestrial orchids found in two different forests of the Gunung Gede Pangrango National Park West Java. Orchids can occupy several areas from the lowlands to the highlands. Characteristics of the highlands (500 – 1500 masl) are more suitable for orchids because the diversity of orchid species is more significant than in the lowlands (Comber, 1990). The diversity of epiphytic orchids is influenced by many environmental factors, such as habitat size, elevational gradients, light availability, soil moisture, and the regions' microclimate condition (McCormick and Jacquemyn, 2014; Betanio & Buenavista, 2018). Many studies reported that altitude is an important climatic factor affecting orchid diversity in natural habitats (Timsina et al., 2021). Altitude can influence other abiotic factors, so the composition of the epiphytic orchids that grow at different heights was interesting.

Orchids have a distinctive flower structure with variations in leaves (shape, size, and thickness), inflorescence (number inflorescence /pseudobulb, inflorescence orientation, inflorescence type, inflorescence length, number of flower per inflorescence), and floral characteristics (size, colour and form) (De, 2020). Orchid flower consists of seven floral parts, three sepals, three petals with a modified middle petal to form a labellum, and the column or gynostemium (De, 2020). The labellum characteristic is an important feature to distinguish between species and genera in Orchidaceae (Apriyanti et al., 2013). The flower pedicel is rotated 180°, so the labellum arrives at the lower part of the flower. The pollen grains unite to form two pollinias, and the stamen filament fuses with the style to form a column (Elpel, 2021).

Orchids in natural habitats continue to decline due to habitat destruction and overexploitation (Wulanesia, 2017). The more widespread forest destruction will result in these species being threatened with extinction (Hamid, 2013). Mount Halimun Salak National Park (MHSNP) has an essential role in protecting flora and fauna. Various land uses in the MHSNP have resulted in deforestation and have caused damage to the habitats and ecosystems in the conservation area. The expansion of the tea plantation area each year causes a reduction of the MHSNP area. This activity disrupts the habitat of various flora and fauna diversity (Kurniawan et al., 2013). Nirmala tea plantation is an enclave of the MHSNP adjacent to the Halimun forest. Plantation can retain some of the structural features of pristine forests and thus have the potential for conservation of epiphytic plant diversity. Tea Plantations with homogeneous vegetation can provide suitable microclimate conditions for many epiphytic species to survive and reproduce. There is a great diversity of species found in tea plantations, including epiphytic orchids. The existence of epiphytic orchids in homogeneous vegetation has been reported in coffee plantations and oil palm plantations (García-González et al., 2017; Upadhyaya et al., 2005), but there is no information on the tea plantation. Epiphytic orchids in tea plantations can be helpful as an indicator to predict biodiversity and conduct an inventory of orchid species. Species inventory is an essential step in the conservation efforts to record the diversity of species in an area as data when ecosystem changes occur (Nasution et al., 2014). This study aimed to record various epiphytic orchids found at two different altitudes in a plantation ecosystem, the Nirmala Tea Plantation, and know the abiotic factors that support the growth of epiphytic orchids. In addition, this study shows how the distribution pattern of orchid growth in plantations is much different from the orchids that live in natural forests.

METHODS

The Sampling site and time

The study began with field exploration using the cruising method in the Nirmala Tea Plantation at two different altitudes, 1050 masl and 1500 masl (Figure 1). Sampling was done by purposive sampling method by making 54 plots sized 5x5 m2 at two different heights; 31 plots at an altitude of 1050 m asl and 23 sample plots at an altitude of 1500 m asl. Each species was collected 1 to 5 individuals. The whole part of each epiphytic orchid species was collected, including the roots, stems, leaves, flowers, and fruit. Field information includes the coordinates, elevation, and habitat conditions of the location of the epiphytic orchid specimens found that were recorded. The coordinates were collected using a Garmin 62s

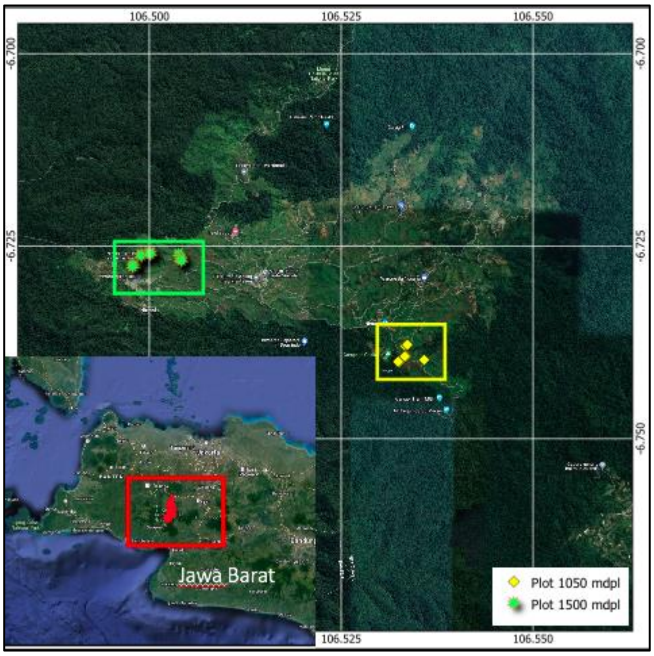

Figure 1. Research Location in the Nirmala Tea Plantation (red box)

GPSmap. Environmental data, including humidity, air temperature, wind speed, and light intensity, were measured using a 4 in 1-environment meter.

Morphological Observation and Identification

Each species of epiphytic orchid was observed in the qualitative and quantitative characters of its vegetative and generative organs. Orchid morphological characterization was carried out based on the Orchid Ornamental Plant Characterization Guide (Balithi, 2007). Identification was made by referring to several references: Orchid of Java (Comber 1990), Orchid species of Mount Halimun National Park (Mahyar & Sadili, 2003), 1001 Orchid Species That Can Flower in Indonesia (Assagaf, 2012). The identity of the orchid was verified at the Herbarium Bogoriense, LIPI Cibinong. Data from field exploration were used for orchid diversity.

Data Analysis

Data were generated using vegetation analysis. The quantitative data of vegetation were analyzed by calculating important value index (IVI) that were obtained from the relative density (RD) and Relative frequency (RF) of each species. Data on the abundance of epiphytic orchids in each plot was obtained with the formula: IVI (%) = RD (%) + RF (%); RD= Relative Density; RF = Relative Frequency (Curtis & Mcintosh, 1950). The distribution pattern of epiphytic orchids was determined by calculating the Standard Morisita Index (Ip) (Dale et al., 2002). The correlation between the epiphytic orchid and microclimate variables was analyzed using Spearman bivariate correlation and performed using Canonical Correspondence Analysis (CCA) using Canoco for Windows (Clarke & Gorley, 2005). The data is then visualized with CanoDraw at two different elevations.

RESULT AND DISCUSSION

Diversity of Epiphytic Orchids

Epiphytic orchids found at two heights of the Nirmala Tea Plantation area were 248 individuals identified as 18 species and belonging to 7 genera (Figure 2). A total of seven species, *Agrostophyllum longifolium* Rchb.f., *Appendicula reflexa* Blume, *Bulbophyllum* sp.2, *Dendrochilum* sp., *Eria* sp.2, *Flickingeria* sp., *Pholidota carnea* Lindl., were found at both elevations. Eight species of orchids, *Acriopsis liliifolia var. liliifolia*, *Agrostophyllum javanicum* Blume, *Bulbophyllum* sp.1, *Bulbophyllum* sp.3, *Bulbophyllum* sp.4, *Dendrobium mutabile* Lindl, *Eria* sp.1, *Schoenorchis juncifolia* Blume ex Reinw., were only found at an altitude of 1050 masl (Table 1). In contrast, *Bulbophyllum absconditum* J.J.Sm., *Bulbophyllum inadequate* Lindl, *Bulbophyllum* sp.5 were only found at 1500 masl (Table 2). Most epiphytic orchids (50%) scattered in the plantation belongs to the Dendrobieae tribe, while others belonged to the Cymbidieae, Epidendreae, Podochileae,

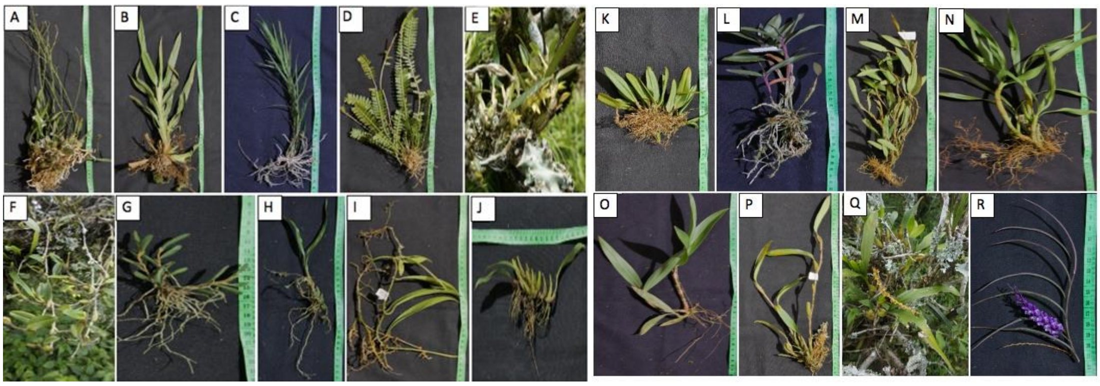

Figure 2. Orchids from the Nirmala tea plantation. A. *Acriopsis liliifolia* var. Liliifolia. B. *Agrostophyllum longifolium* Rchb.f. C. *Agrostophyllum javanicum* Blume. D. *Appendicula reflexa* Blume. E. *Bulbophyllum absconditum* J.J.Sm. F. *Bulbophyllum inaequale* Lindl. G. *Bulbophyllum* sp.1. H. *Bulbophyllum* sp.2. I. *Bulbophyllum* sp.3. J. *Bulbophyllum* sp.4. K. *Bulbophyllum* sp.5 L. *Dendrobium mutabile* Lindl. M. *Dendrochilum* sp. N. *Eria* sp1. O. *Eria* sp.2 *P. Flickingeria* sp. Q. *Pholidota carnea* Lindl R. *Schoenorchis juncifolia* Reinw. ex Blume

Table 1. Density, frequency, and essential value index at an altitude of 1050 m asl

No.	Species	n	RD (%)	RF (%)	IVI (%)
1	*Acriopsis liliifolia* var. *liliifolia*	7	10.29	7.14	17.44
2	*Agrostophyllum longifolium* Rchb.f.	11	16.18	16.67	32.84
3	*Agrostophyllum javanicum* Blume	1	1.47	2.38	3.85
4	*Appendicula reflexa* Blume	22	32.35	26.19	58.54
5	*Bulbophyllum* sp.1	1	1.47	2.38	3.85
6	*Bulbophyllum* sp.2	3	4.41	7.14	11.55
7	*Bulbophyllum* sp.3	3	4.41	4.76	9.17
8	*Bulbophyllum* sp.4	3	4.41	7.14	11.55
9	*Dendrobium mutabile* Lindl.	1	1.47	4.76	6.23
10	*Dendrochilum* sp.	3	4.41	4.76	9.17
11	*Eria* sp.1	3	4.41	2.38	6.79
12	*Eria* sp.2	3	4.41	2.38	6.79
13	*Flickingeria* sp.	4	5.88	4.76	10.64
14	*Pholidota carnea* Lindl.	1	1.47	2.38	3.85
15	*Schoenorchis juncifolia* Reinw. ex Blume	2	2.94	4.76	7.70
	Total	68	100	100	200

Note: N=number of individuals; RD= relative density; RF= relative frequency; IVI= important value index

Arethuseae, and Vandoideae tribes.

The tea plant has thick, grooved, and hard skin. The characteristics of the tea plant bark can protect many seeds of the epiphytic plant from raindrops and water flow. The size and relatively flat branching structure of the trees also allow humus formation. This character can be beneficial for the growth and development of epiphytic plants such as orchids (Sujalu et al., 2015). Fardhani et al. (2020) showed that the orchid abundance and species richness were positively correlated with the host tree size (DBH) and the number of branches of *Schima wallichii*. The diversity of epiphytic orchids found in the Nirmala tea plantation is about 32% of the epiphytic orchids found in the natural forest of Mount Halimun (56 species) (Hani et al., 2014). Nirmala Tea Plantation is an open habitat and has homogeneous vegetation, so only certain species can grow in the habitat. Such conditions reduce the diversity of epiphytic orchids that grow in these locations because the presence of epiphytic plants is influenced by climatic factors and the character of the host tree, such as crown cover, bark characteristics, and biochemistry (Fardhani et al., 2020). A lush canopy in the dry season can provide a suitable microclimate for the growth of epiphytic orchids.

Our results showed that the species richness and the frequency of epiphytic orchids differ at both altitudes. At an altitude of 1050 masl, the species diversity was higher, but the number of

Table 2. Density, frequency, and essential value index at an altitude of 1500 m dpl.

No.	Species	N	RD (%)	RF (%)	IVI (%)
1	*Agrostophyllum longifolium* Rchb.f.	13	7.22	10.20	17.43
2	*Appendicula reflexa* Blume	4	2.22	4.08	6.30
3	*Bulbophyllum absconditum* J.J.Sm.	1	0.56	2.04	2.60
4	*Bulbophyllum inaequale* Lindl.	1	0.56	2.04	2.60
5	*Bulbophyllum* sp.2	7	3.89	4.08	2.60
6	*Bulbophyllum* sp.5	1	0.56	2.04	7.97
7	*Dendrochilum* sp.	1	0.56	2.04	2.60
8	*Eria* sp.2	104	57.78	32.65	90.43
9	*Flickingeria* sp.	21	11.67	18.37	30.03
10	*Pholidota carnea* Lindl.	27	15.00	22.45	37.45
	Total	180	100	100	200

Note: RD= relative density; RF= relative frequency; IVI= important value index individuals per species found was less than at an altitude of 1500 masl. The differences could be caused by many factors, namely biotic and abiotic factors. Biotic factors such as the character of the host plant can affect the level of diversity (Liu et al., 2021). Abiotic factors such as light intensity, temperature, and wind speed significantly affect plant growth (Mitova et al., 2017).

Tea trees on both altitudes have different canopy characters. Tea canopy coverage in each study plot at the two elevations ranged from 48 to 96%. At an altitude of 1050 masl, tea trees had a wider average tree crown diameter and higher branch-free height (diameter=2,16m, height=1,5 m) than altitude 1500 masl (diameter=1,5 m, height=1.08 m). Orchids were found living under a reasonably wide crown diameter and mostly grow closer to the tree crown, while orchids at an altitude of 1500 masl were found under a less dense crown and free branch height approaching the plantation floor. The different characters of canopy coverage will form differences in the microclimate below, including the availability of sunlight for optimal growth of orchids, thus affecting the diversity of understorey species (Kunarso & Azwar, 2013). Large-diameter trees also fully maintained the ecosystem function (Lutz et al., 2018). Orchid's distance from the living foliage, at the periphery of the crown, which is continuously growing, or the number of shoot generations, from the foliage, is also an important factor affecting its diversity and abundance (Rasmussen & Rasmussen, 2018). Choden et al. (2021) found that most epiphytic orchids prefer a dense canopy in Jomotsangkha Wildlife Sanctuary, Bhutan.

Important Value Index of Epiphytic Orchids in The Nirmala Tea Plantations

Epiphytic orchid species having the highest IVI can control the growing area, especially in utilizing available resources because these species can adapt well to their environment (Fitriany et al., 2019). *Appendicula reflexa* (IVI = 58.54%) had the highest IVI value at an altitude of 1050 m asl in the tea plantation (Table 1). *Appendicula reflexa* is the most common species. Genus *Appendicula* has good adaptability, like open habitats, that are less protected from sunlight (Paramitha et al., 2012). This genus is often found living in groups. The conditions favoured by this species are under environmental conditions at an altitude of 1050 masl. Besides, *A. reflexa* orchids are less attractive to collectors so that their existence is not disturbed by humans.

Eria sp.2 (IVI = 90.43%) was the epiphytic orchid species with the highest IVI value at 1500 m asl. The IVI value of this species was much higher than that of other species (Table 2). This genus has a quite wide distribution, cosmopolitan, with high frequency. Based on its habitat, the genus *Eria* can grow in various habitats and is easy to adapt, so it is not surprising that this genus is found in many tea trees. In addition, the fruit of this genus is a capsule with six slits and has many tiny light seeds with a high dispersal capacity, making it easier to spread (Nusantara et al., 2018). *Eria* was also a common genus found in the Bodogol Forest, Gede Pangrango National Park (TNGP) (Sadili & Sundari, 2017). This study indicates that the dominant orchid species that grew in homogeneous vegetations is different, depending on the height of the growing location. Based on previous research, epiphytic diversity and the presence of dominant species were also influenced by host species and climate (Wang et al., 2017). *Oncidium poikilostalix* (Kraenzl.) MW Chase & NH Williams species can adapt and grow in Mexican coffee plantation (García-González et al., 2017). In Chinese tea plantations, 13 species of epiphytic orchids grow, and the dominant species was *Liparis elliptica* (Wang et al., 2017).

Distribution Patterns of Epiphytic Orchid

Our research showed that all epiphytic orchids (100%) found at both altitudes, 1050 masl and 1500 m asl in the Nirmala Tea Plantation, have the Standard Morishita Index (Ip value) > 0. This result means that all epiphytic orchids observed have clumped distribution patterns (Table 3). Some epiphytic orchid species living in clumps, such as *Agrostophyllum longifolium* and *Appendicula*, have strong roots and are cosmopolitan. They can be found at two different heights. Orchids living side by side also affect the distribution of orchids in a community (Waterman & Bidartondo, 2008).

Table 3. Morisita index of epiphytic orchids at an altitude of 1050 m asl and 1500 mdpl.

Species	Id	Mu	Mc	Ip	Distribution Pattern
Altitude 1050 m dpl					
Acriopsis liliifolia var. *liliifolia*	0.7	-2.3	0.3	0.7	Clumped
Agrostophyllum longifolium Rchb.f.	0.5	-0.98	0.5	0.9	Clumped
Appendicula reflexa Blume	1.5	0.1	0.8	11.1	Clumped
Bulbophyllum sp.2	0.5	-8.9	-1.2	0.6	Clumped
Bulbophyllum sp.3	0.7	-8.9	-1.2	0.6	Clumped
Bulbophyllum sp.4	0.5	-8.9	-1.2	0.6	Clumped
Dendrobium mutabile Lindl.	0.6	-18.8	-3.5	0.6	Clumped
Dendrochilum sp.	0.7	-8.9	-1.2	0.6	Clumped
Eria sp.1	1.1	-8.9	-1.2	0.6	Clumped
Eria sp.2	1.1	-8.9	-1.2	0.6	Clumped
Flickingeria sp.	0.8	-5.6	-0.5	0.6	Clumped
Schoenorchis juncifolia Reinw. ex Blume	0.6	-18.8	-3.5	0.6	Clumped
Altitude 1500 m dpl					
Agrostophyllum longifolium Rchb.f.	11.53	-1.32	0.63	0.84	Clumped
Appendicula reflexa Blume	15.50	-8.27	-0.5	0.58	Clumped
Bulbophyllum sp.5	22.14	-3.64	0.26	0.64	Clumped
Flickingeria sp.	3.54	-0.39	0.78	1.51	Clumped
Pholidota carnea Lindl.	8.39	-0.07	0.83	3.77	Clumped

Note: Id= Morisita Index; Mu: = Degree of Uniformity; Ip= Standard Morisita Index

The environmental conditions of tea plantations which are different from natural forests, require that the epiphytic orchids must have the ability to adapt both morphologically and physiologically. Many epiphytic orchids in this study have pseudobulb, especially in the genus *Bulbophyllum*, *Eria* and *Pholidota*. The pseudobulb has an essential role in orchid life since it functions as a storage for water and carbohydrates. Pseudobulbs are formed from one to several segments that can swell or shrink when moisture is stored or released. This adaptation allows orchids to thrive in areas with seasonal rainfall (Benzing, 2008). Studies on *Catasetum viridiflavum* and *Oncidium goldiana* reveal that carbohydrate reserves in pseudobulb are essential for the growth of new individuals (De, 2020).

The characteristics of the host affect the distribution of epiphyte orchids. The humidity around the host is needed for epiphytic growth. The coarse bark of the tea plant allows many epiphytic seeds to get stuck and grow and reproduce because the epiphytes can withstand higher humidity (Adhikari et al., 2012). Timsina et al. (2016) and Pant et al. (2018) also showed that the host characteristics (habit, bark texture, nature, and the host plant family) were strongly associated with epiphytic orchid diversity.

Abiotic Factors Contributed to The Orchid Diversity

The results of the measurement of climatic factors showed that the Nirmala Tea Plantation area at an altitude of 1050 masl had a temperature range of 28.2-35.4 ^{0}C, humidity (RH) ranged 46.2 to 61.7%, wind speed ranged 0.3 - 1 m/s, and light intensity ranged 3180.5 - 12624 lux. Temperature and humidity at an altitude of 1500 masl were not much different from an altitude of 1050 masl, the temperature range of 27.5 - 34.6 ^{0}C and humidity of 37.7 - 63%, but it had higher wind speed ranged 0.7 - 2 m/s, and higher light intensity of 4927 - 17170 lux.

The distribution of orchids at each altitude interval is accompanied by climatic or micro-environmental factors that support the abundance of epiphytic orchids and their growth, such as sunlight, temperature, wind speed, water availability, and altitude (de la Rosa-Manzano, 2014 Lianarti, 2019). Based on the results of the CCA analysis, the most influential or significant abiotic factor in Nirmala Tea Plantation is altitude. Our result supported a previous study that showed altitude was the most critical factor affecting epiphytic orchid diversity (Timsina et al., 2021). Altitude can affect other abiotic factors, exceptionally light intensity and wind speed. At an altitude of 1050 masl (Figure 3), the level of wind speed, altitude, and light intensity is significant.

Only altitude has a significant value at an sp2 are influenced by temperature, altitude, and wind speed factors.

Our result is in line with a previous study that reported the peak of orchid diversity occurred at

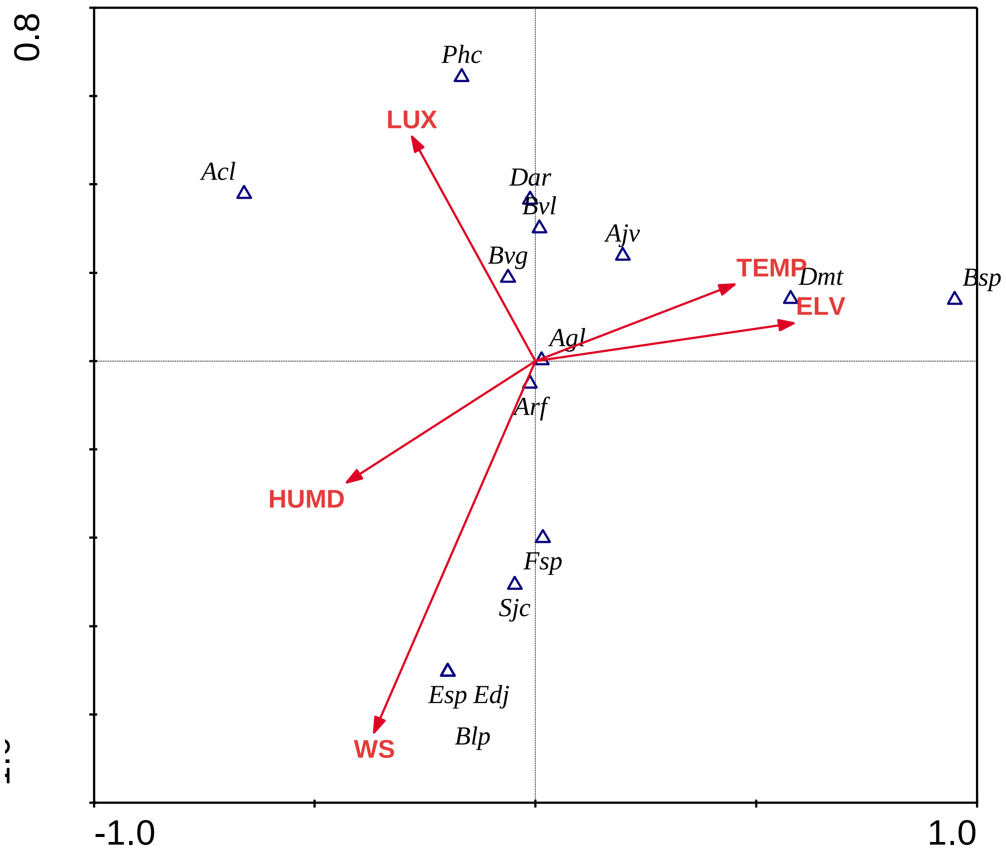

Figure 3. The CCA ordination of Epiphytic Orchids at 1050 m asl in the Nirmala Tea Plantation. TEMP: air temperature, HUMD: humidity, WS: wind speed, LUX: light intensity, ELV: altitude, Acl: *Acriopsis liliifolia* var. *liliifolia*, Agl: *Agrostophyllum longifolium* Rchb.f., Ajv*: Agrostophyllum javanicum* Blume, Arf: *Appendicula reflexa* Blume, Blp: *Bulbophyllum* sp.1 Bsp: *Bulbophyllum* sp.2 Bvg: *Bulbophyllum* sp.3 Bvl: *Bulbophyllum* sp.4, Dmt: *Dendrobium mutabile* Lindl. Dar: *Dendrochilum* sp., Edj: *Eria* sp.1 Esp: *Eria* sp.2, Fsp: *Flickingeria* sp., Phc: *Pholidota carnea Lindl*, Sjc: *Schoenorchis juncifolia* Reinw. ex Blume.

altitude of 1500 masl (Figure 4). Altitude also will affect species richness, structure and composition of understorey vegetation, soil conditions, temperature, light, and water intensity. The altitude will indirectly play a role in the photosynthesis process and will be a limiting factor that will inhibit the growth of understorey plants (Destaranti et al., 2017). The relationship between species and their abiotic environment has different effects on each species, especially those with the highest important value index (IVI), *Appendicula reflexa*, which is influenced by all observed abiotic factors. *Eria*

mid-elevation between 800 m to 1100 m, and diversity declined both at higher and lower elevations (Choden et al., 2021). The number of epiphytic orchid species on Mount Lawu, Java, is also significantly lower at lower elevations (Yulia et al., 2011). The decrease in the number of species at an altitude 1500 m asl is caused by various environmental conditions such as the availability of nutrients, increasing light intensity and wind speed so only certain species can live and survive (Astuti et al., 2017). Thus, the distribution of epiphytic orchids is strongly influenced by altitude (Adhikari et al., 2012).

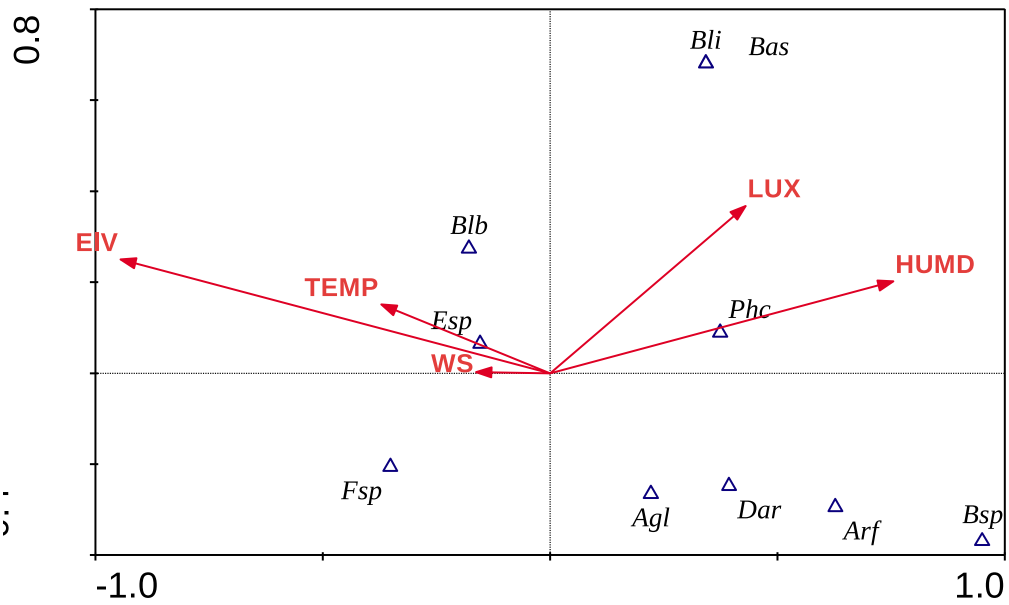

Figure 4. The CCA ordination of Epiphytic Orchids at 1500 m asl in the Nirmala Tea Plantation. TEMP: temperature, HUMD: humidity, WS: wind speed, LUX: light intensity, ELV: altitude. Agl: *Agrostophyllum longifolium* Rchb.f, Arf: *Appendicula reflexa* Blume, Bas: *Bulbophyllum absconditum* J.J.Sm. Bli: *Bulbophyllum inaequale* Lindl. Bsp: *Bulbophyllum* sp.2, Blb: *Bulbophyllum* sp.5, Dar: *Dendrochilum* sp. Esp: *Eria* sp.2, Fsp: *Flickingeria* sp., Phc: *Pholidota carnea* Lindl.

CONCLUSION

There are 18 species of epiphytic orchids belonging to 7 genera found in the Nirmala tea plantation area in Bogor, West Java. Seven species found on both altitudes (1050 and 1500 m asl) are *Agrostophyllum longifolium* Rchb.f., *Appendicula reflexa* Blume, *Bulbophyllum* sp.2, *Dendrochilum* sp., *Eria* sp.2, *Flickingeria* sp., *Pholidota carnea* Lindl. Eight species were found only at an altitude of 1050 m asl. Namely *Acriopsis liliifolia* var. *liliifolia*, *Agrostophyllum javanicum* Blume, *Bulbophyllum* sp.1, *Bulbophyllum* sp.3, *Bulbophyllum* sp.4, *Dendrobium mutabile* Lindl, *Eria* sp.1, *Schoenorchis juncifolia* Blume ex Reinw.; and three species only found at an altitude of 1500 m asl, namely *Bulbophyllum absconditum* J.J.Sm, *Bulbophyllum inaequale* Lindl, *Bulbophyllum* sp.5. Distribution patterns of epiphytic orchids at the Nirmala Tea Plantations are clumped patterns. Based on the result of CCA analysis, the abiotic factor that had the most influence or had a significant value ($P<\lambda$) was the altitude. This study provides knowledge about the distribution of epiphytic orchids to manage the ecological balance between epiphytic orchids and tea plantations. Further research is needed to analyze the association between orchid species with other epiphytes and other environmental factors.

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