

# Inventory of Terrestrial Orchids in the Baturraden Botanical Garden of Central Java

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## ARTICLE INFO

## ABSTRACT

### Article history

Received: December 6<sup>th</sup> 2022

Revised: December 8<sup>th</sup> 2022

Accepted: December 9<sup>th</sup> 2022

### Keywords

Terrestrial orchid  
Inventory  
Baturraden Botanical Garden  
Line transect

Baturraden Botanical Garden located on the slopes of Mount Slamet in the south has a high enough humidity so it is ideal for plant growth, especially orchids. As an *ex-situ* plant conservation area, the Baturraden Botanical Garden plays an important role in preserving the diversity of orchids in it. The purpose of this study was to find out the types and descriptions of terrestrial orchids in the Baturraden Botanical Garden area of Central Java. The method used in this study is a 400 m line transect method with an inter-point distance of 100 m each and data collection is carried out at 10 m each on the right and left of the line transect. Hasil research shows that there are 13 species derived from 10 genus of soil orchids. The types that have been found are *Goodyera rubicunda* (Blume) Lindl., *Calanthe pulchra* (Blume) Lindl., *Spathoglottis plicata* Blume, *Cryptostylis javanica* J.J.Sm., *Appendicula alba* Blume, *Phaius callosus* (Blume) Lindl., *Lepidogyne longifolia* Blume, *Tainia elongata* J.J.Sm., *Goodyera colorata* Blume, *Malaxis* sp. Soland. ex Sw., *Goodyera* sp. R. Br., *Goodyera procera* (Ker-Gawl.) Hook., and *Plocoglottis* sp. Blume.

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How to Cite: Astuti, S.N.C.T., Aisah, S., & Kurniawan, A.P. (2022). Inventory of Terrestrial Orchids in the Baturraden Botanical Garden of Central Java. *Journal of Biotechnology and Natural Science*, 2(2), 32-39.

## 1. Introduction

Orchid is a type of ornamental plant that has distinctive flowers with a beautiful crown and attractive color. Natural orchids or species orchids are orchids that have not undergone crosses that are still living naturally in their natural habitat. The natural habitat of natural orchids or orchid species is in forests that have humidity, light intensity and soil conditions that are in accordance with orchid growing requirements (Agustin & Widowati, 2015).

According to Comber (1990) that orchids can grow at an altitude of 500–1,500 meters above sea level. Thus in the highlands the diversity of its species will be more numerous compared to the lowlands so that each habitat will have a different species. The distribution of orchids varies depending on their height.

Baturraden Botanical Garden on the slopes of Mount Slamet in the south has a high enough humidity so it is ideal for plant growth, especially orchids. As an *ex-situ* plant conservation area, the Baturraden Botanical Garden plays an important role in preserving the diversity of orchids in it. Therefore, the purpose of this study is to find out the types and descriptions of terrestrial orchids in the Baturraden Botanical Garden area of Central Java.

## 2. Methods

The tools used in this study were stationery, a table of environmental parameters, an identification book about orchids, digital cameras, string of raffia, stakes, labels, herbarium plastics, GPS, thermohygrometers, soil testers, and lux meters. While the materials needed are terrestrial orchid species in the Baturraden Botanical Garden area.



The method used in this study is the line transect method. On the 400 m long transect line, sequentially designated central points. The distance between the points is 100 m each. The transect line is drawn from the zero point (a new hiking trail in the Baturraden Botanical Garden area at an altitude of 860 meters above sea level) to the fourth point (a new hiking trail in the Baturraden Botanical Garden area at an altitude of 933 meters above sea level). Data collection is carried out each  $\pm 10$  m on the right and left of the line transect.

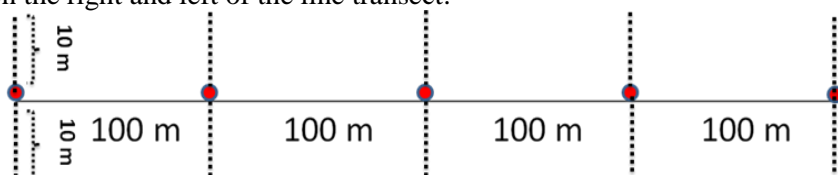


Figure 1. Methods used in sampling

The species found, photographed, then identified. Identification of the clan level was carried out by observing the morphology of plants which include leaves, roots, and flowers. For identification up to the level of the type required observation of the morphology of its flowers. Types that are not found in flowering can only be identified at the level of the clan. The identification method is based on the books *Orchids of Indonesia*, *Orchids of Sulawesi*, *Types of Orchids of Mount Halimun National Park*, and *Orchid Collection of Baturraden Botanical Garden*. The data obtained are descriptive qualitative. In addition to identification, environmental factors of orchid growth are also measured at 100 m, such as temperature, humidity, light intensity, and pH.

### 3. Results and Discussion

The topography of the Baturraden Botanical Garden is in the form of undulating and hilly mountain areas with a slope between 20% and 70%, located at an altitude of 702-1076 meters above sea level. Therefore, the Baturraden Botanical Garden area is a very ideal place for orchid plant growth because it is in accordance with the statement of Comber (1990) who said that orchids can grow at an altitude of 500-1500 meters above sea level.

The Baturraden Botanical Garden area is included in the highland group so that the distribution of orchids is also diverse. When compared to the lowlands, the number of orchids that exist will be more commonly found in the highlands. According to Liem (2004) it can be said that the highlands that the area with an altitude above 450 m from sea level and already different in general description from the tropics (hot, humid, stuffy), the air feels cool to cold and rains a lot.

The data collection location is on a new hiking trail that is still in the Baturraden Botanical Garden area. The method used in data collection is a line transect 400 m long with a width to the right and left of each  $\pm 10$  m so that when calculated the area studied is 8000 m<sup>2</sup> or equivalent to 0.8 ha. The location of data collection is an area that has not been managed so that the existence of existing soil orchids is still classified as natural orchids, namely orchids that have not undergone crossing and still live in their natural habitat. The total area of the Baturraden Botanical Garden is 143.5 ha, but the area covers all areas that have not been and have been managed. Managed areas are areas that have been faxed and those that have not been managed are areas that are still natural habitats such as those used for data retrieval. Therefore, the method used only takes 10% of the area under study, not the total area, that is, the area that is still the natural habitat for the growth of soil orchids.

Environmental factors necessary for the growth of soil orchids are temperature, light intensity and pH. According to Darmono (2006) terrestrial orchids need direct sunlight except for orchids such as *Calanthe* and *Goodyera* which require little sunlight. While the maximum temperature of soil orchids is around 28°C and the minimum temperature is 15°C because an increase in temperature exceeding 28°C can result in soil orchid plants becoming dehydrated. The environmental factors of orchid growth results from data collection were measured at every 100 m.

Based on the results of data collection in the Baturraden Botanical Garden area, it was found that there were 13 species of soil orchids from 10 genera. The ten genera of terrestrial orchids are *Goodyera*, *Calanthe*, *Spathoglottis*, *Cryptostylis*, *Appendicula*, *Phaius*, *Lepidogyne*, *Tainia*, *Malaxis* and *Plocoglottis*. The results are presented in the following table:

Table 2. Results of an inventory of terrestrial orchids in the Baturraden Botanical Garden

No	Genus	Species
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1	<i>Goodyera</i>	<i>Goodyera rubicunda</i> (Blume) Lindl.
2	<i>Calanthe</i>	<i>Calanthe pulchra</i> (Blume) Lindl.
3	<i>Spathoglottis</i>	<i>Spathoglottis plicata</i> Blume
4	<i>Cryptostylis</i>	<i>Cryptostylis javanica</i> J.J.Sm.
5	<i>Appendicula</i>	<i>Appendicula alba</i> Blume
6	<i>Phaius</i>	<i>Phaius callosus</i> (Blume) Lindl.
7	<i>Lepidogyne</i>	<i>Lepidogyne longifolia</i> Blume
8	<i>Tainia</i>	<i>Tainia elongata</i> J.J.Sm.
9	<i>Goodyera</i>	<i>Goodyera colorata</i> Blume
10	<i>Malaxis</i>	<i>Malaxis</i> sp. Soland. ex Sw.
11	<i>Goodyera</i>	<i>Goodyera</i> sp. R. Br.
12	<i>Goodyera</i>	<i>Goodyera procera</i> (Ker-Gawl.) Hook.
13	<i>Plocoglottis</i>	<i>Plocoglottis</i> sp. Blume



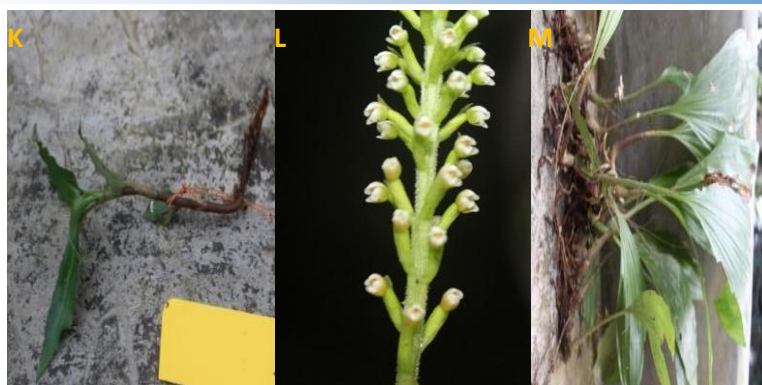


Figure 2. Species of soil orchids are found. A (*Goodyera rubicunda* (Blume) Lindl.), B (*Calanthe pulchra* (Blume) Lindl.), C (*Spathoglottis plicata* Blume), D (*Cryptostylis javanica* J.J.Sm.), E (*Appendicula alba* Blume), F (*Phaius callosus* (Blume) Lindl.), G (*Lepidogyne longifolia* Blume), H (*Tainia elongata* J.J.Sm.), I (*Goodyera colorata* Blume), J (*Malaxis* sp. Soland. ex Sw.), K (*Goodyera* sp. R. Br.), L (*Goodyera procera* (Ker-Gawl.) Hook.), M (*Plocoglottis* sp. Blume).

### ***Goodyera rubicunda* (Blume) Lindl.**

**Habitus:** This orchid is a soil orchid found at an altitude of 872 meters above sea level. It grows creeping on the surface of soils rich in humus. **Stem:** monopodial, interlaced and green, flower stalks are reddish with coarse hairs of white color. **Leaves:** lanceolate in shape, tapered at the ends, dark green on the surface and light green on the lower surface of the leaves. **Flowers:** consists of 35 florets, half of which bloom together. Exists when the bloom is not fully open, all the jewelry is reddish. The outer surface of the sepals is overgrown with coarse hairs of white color. **Lips:** pale yellow in color with tips that bend downwards. **Habitat and distribution:** this orchid lives in the shade of moist and wet forests. The population generally clusters a lot.

The habitat of the orchid *Goodyera rubicunda* (Blume) Lindl. is found in the Baturraden Botanical Garden at an altitude of 872 meters above sea level. According to Puspitaningtyas *et al.* (2003) habitat and distribution of orchid in West Java and East Java at an altitude of 400-800 meters above sea level. The difference in height shows that the height of the place for each type of orchid is not the same, some orchids in West Java and East Java can grow at an altitude of up to 800 meters above sea level but in Central Java *Goodyera rubicunda* (Blume) Lindl. can be found at an altitude of 872 masl.

### ***Calanthe pulchra* (Blume) Lindl.**

**Habitus:** a soil orchid found at an altitude of 872 meters above sea level, the plant is not always high,  $\pm 0.5$  m. **Stem:** monopodial, pseudo-tuber covered with leaf sheath. **Leaves:** 6 strands in number, long linear in shape with a widened middle, the lower leaf bone is stiffer than the surface. **Inflorescences:** erect, shorter than leaves, long peduncles, rickets shorter than the peduncle, consisting of  $\pm 50$  flower florets. **Flowers:** sepals and petal edges are tapered, orange in color. **Lips:** old orange, lateral lobes erect and short, middle lobe tapered short, spurs have a small protrusion at the end.

According to Handoyo (2010) the *Calanthe pulchra* (Blume) Lindl. orchid is a terrestrial orchid that has flowers with a light orange and dark orange color on its lips. It grows in primary forests from 600-1000 meters above sea level. Both the morphology and habitat of the *Calanthe pulchra* (Blume) Lindl. orchid from data collection are in accordance with existing theories.

### ***Spathoglottis plicata* Blume**

**Habitus:** is a soil orchid that lives on the banks of rivers, found at an altitude of 872 meters above sea level and also found at an altitude of 880 meters above sea level. **Pseudo-tubers:** ovoid, embedded under the ground. At each end of the tuber will appear leaf midrib, one stem has 5 leaves, flower stalks also appear from the tip of the tuber. **Leaves:** elongated lanceolate in shape with a tapered tip, the leaf surface is slightly folded (*plicate*). **Inflorescences:** internode flower stalks, the length of the peduncle can reach a meter with a number of flowers of about 10-30 florets, but only 5-6 florets bloom simultaneously while the others are still buds. **Flowers:** fully opened, the color of

the flowers is bright purple, the lanceolate-shaped flower sepals are widened at the base while the petal is wider. **Lips:** shaped like a spatula, pointed at the base and widened at the ends.

According to Puspitaningtyas *et al.* (2003) *Spathoglottis plicata* Blume orchid is a type of orchid commonly found on the island of Java that lives at an altitude of 0-1600 meters above sea level. It is usually found growing in meadows or on the banks of rivers, where competition with other plants is not too fierce. The orchid character obtained above is in accordance with Puspitaningtyas statement.

#### ***Cryptostylis javanica* J.J.Sm.**

**Habitus:** is a ground orchid found at an altitude of 872 meters above sea level, rooted in thick rhizomes but no tubers. Rhizome grows creeping, brownish-green in color. **Stem:** has special characteristics among other orchid stems, the stem of this orchid has a round pattern of brown, non-segmented and green color. **Leaves:** ovoid, pointed tip, glossy green berawrna with darker veins, one leaf bone protruding below the leaf surface, the leaf veins are densely arranged and not protruding. **Inflorescences:** the number of flowers of 13 florets that bloom synchronously is only 2-3 florets, flower stalks appear from the base of the stem. **Flowers:** the color of the sepals and petals is light green, long and narrow shape like a thread or rope, scattered loosely away from each other. **Lips:** erect upwards, color dominated by dark red, the tips of the lips are white and have red totols, yellowish-white monuments. **Habitat and distribution:** this orchid is found growing in the soil layer of humus and is an endemic species that only grows in Java.

In accordance with the statement of Handoyo (2010) who said that *Cryptostylis javanica* J.J.Sm. is a terrestrial orchid that lives at an altitude of 250-1600 meters above sea level. Lips perpendicular upwards and do not bend forward. The distribution of this orchid is endemic to Java.

#### ***Appendicula alba* Blume**

**Habitus:** in the form of a sympodial orchid that grows terrestrial and upright in shape, reaches 1 m in length, found at an altitude of 880 meters above sea level, near water flows, some hordes of these orchids can grow also on rocks. **Leaves:** lanceolate and the tip is halved, green in color, widened in half of the base and the tip is narrowed, the location of the leaves alternates on the stalk. **Inflorescences:** clustered at the ends of the stems (terminals) with a number of flowers of 6-8 florets, but sometimes lateral. **Flowers:** bloom simultaneously, both sepals and petals are white. **Lips:** white in color and the tip is pointed forward. **Habitat and distribution:** orchids commonly found on the island of Java.

In accordance with the statement of Handoyo (2010) who said that *Appendicula alba* Blume belongs to the type of terrestrial orchid or epiphyte that lives at an altitude of 500-1500 meters above sea level. Flowers and lips are white. Orchid distribution in Java, Sumatra, Lombok, Malaysia and the Philippines.

#### ***Phaius callosus* (Blume) Lindl.**

**Habitus:** found at an altitude of 880 meters above sea level, including terrestrial orchids up to 1.75 m high, and long flower stalks reaching 1 m, found in damp places. **Pseudo-tubers:** large and stocky, lasting for a long time even though the leaves have rotted, covered by leaf sheaths that instantly emerge from the tips of the stems. **Leaves:** quite large in size, the distance between the bones of the leaves is wide unlike *Calanthe* and *Spathoglottis*, widened in the middle, not very long and tapered at the ends. **Inflorescence:** appears on the top of the pseudo-bulb, higher than the leaves, contains 6-12 flowers. **Flowers:** at the time of blooming the sepals and petals are the same, but the sepals are slightly wider, reddish-brown, shiny, at the ends of the flowers are white. **Lips:** blended into the monument at its base, clearly protruding forward, shaped like a rolling trumpet. The lip color is white with variations of yellow on the inside of the side lobes. The ends of the edges are frilly or wavy. The spur at the base of the lips is shaped like a funnel.

In accordance with the statement of Handoyo (2010) who said that *Phaius callosus* (Blume) Lindl. is a terrestrial orchid. Flowers are dark red with a white tip. The distribution of this orchid is Sumatra, Java, Kalimantan and Sulawesi.

#### ***Lepidogyne longifolia* Blume**

**Habitus:** a terrestrial orchid found at an altitude of 880 meters above sea level, found in an open place. **Stem:** supine at ground level with the tip growing upright upwards, height reaching more than

1 m. **Leaves:** erect forming a narrow angle to the stem, elongated oblong, pointed tip, numerous, tight at the end. **Inflorescences:** humpback, erect, long pedicel, very abundant flowering, dense, reddish-green elongated triangular protective leaves, longer than the flowers, hairy. **Flowers:** not wide open, densely located, red sepals, shiny on the upper surface, elongated ovary, pointed tip curved outwards, petal rounded elongated eggs. **Lips:** white, base concave, three-lobed.

In accordance with the statement of Mahyar & Sadili (2003) who said that *Lepidogyne longifolia* Blume is a terrestrial orchid that lives at an altitude of 700-1000 meters above sea level. Sepals are green or red and petals are pale white. It grows in rather open forests. The distribution of this orchid is Malaysia, Sumatra, Java.

#### ***Tainia elongata* J.J.Sm.**

**Habitus:** includes terrestrial orchids that have creeping rhizome roots and pseudo-tubers, found at an altitude of 860 meters above sea level. **Pseudo-tubers:** round and elongated like pencils (*terete*), lined up on the roots of rhizomes, one pseudo-tuber has one leaf, not covered with leaf sheaths like other orchids, dark green while the stem is light green. **Leaves:** oval-shaped, widened in the middle, not very long, and the tips of the leaves are pointed. **Inflorescences:** the number of flowers of 15 florets that bloom simultaneously, flower stalks emerge from the roots of rhizomes, long internodes, each flower segment is like a short brown midrib. **Flowers:** at the time of blooming, both sepals and petals are greenish-brown. The sepals are long and widespread, the petal is slightly shorter and swings to its monument. **Lips:** white in color, divided into 3 lobes. **Habitat and distribution:** it is an orchid endemic to Java. Flowering when rain appears.

In accordance with the statement of Handoyo (2010) who said that *Tainia elongata* J.J.Sm. is a terrestrial orchid. Flowers are brown. The distribution of this orchid is endemic to Java.

#### ***Goodyera colorata* Blume**

**Habitus:** is a soil orchid that grows creeping on the surface of soils rich in humus, it can also be categorized as a saprophytic orchid because it lives on litter-soaked soils, found at an altitude of 904 meters above sea level, under the shade and high humidity. **Leaves:** lanceolate, tapered at the ends, dark green at the top and pale green on the lower surface, have 3 main leaf veins that are white. **Habitat and distribution:** is a type of orchid that grows in slightly shaded places.

In accordance with the statement of Puspitaningtyas *et al.* (2003) which states that the orchid *Goodyera colorata* Blume is a type of orchid that grows in a slightly shaded place. It is found in West Java and East Java at an altitude of 700-1500 meters above sea level. It is also found in Sumatra and Peninsular Malaysia. The leaves are lanceolate in dark green with three veins of white leaves.

#### ***Malaxis* sp. Soland. ex Sw.**

**Habitus:** is a ground orchid, in an open place, growing in a place close to water, found at an altitude of 933 meters above sea level. **Stem:** fleshy, light green in color, monopodial, instantly rooted, so it grows creeping. **Leaves:** wide, several to many in number, when compared to *Goodyera* the leaf surface is wavy, dark green on the upper surface and light green on the lower surface. **Habitat and distribution:** is a type of orchid that grows clustered in a slightly open place.

In accordance with the opinion of Mahyar & Sadili (2003) who said that *Malaxis* sp. Soland. ex Sw. is a genus of soil orchids. Stems fleshy, broadleaf, several to numerous in number. Inflorescences at the ends, erect, flowers numerous, and do not twist. Petals and crown open wide, lips are generally flat, the tip is split, pointing upwards, pollinia numbers four.

#### ***Goodyera* sp. R. Br.**

**Habitus:** is a ground orchid, rooted stem, spreading horizontally, on the surface of the soil, found at an altitude of 933 meters above sea level, found near water sources, some live on rocks. **Stem:** erect upwards, leafy at the bottom. **Leaves:** smaller when compared to *Malaxis* sp., the number is several to many, the edges of the leaves are wavy. **Habitat and distribution:** is a type of orchid that grows on high ground, near rocks, and near water sources.

In accordance with the opinion of Mahyar & Sadili (2003) who said that *Goodyera* sp. R. Br. is a genus of ground orchids. The stem takes root, spreads horizontally, on the surface of the soil. Stems erect upwards, leafy at the bottom. Inflorescences grow from the ends of the stems, small flowers.

Flowers are usually twisted. Pistils are single and undivided. Lips marsupial, coarse-haired on its inner surface, the tip part is flat.

#### ***Goodyera procera* (Ker-Gawl.) Hook.**

**Habitus:** ground orchids with a medium stem height above ground level, in a place close to a water source, some live on rocks, found at an altitude of 933 meters above sea level. **Leaves:** melanset, shiny green, long petioles, bulging midrib hugging the stem, in contrast to the previous *Goodyera* where the surface of this small leaf is not widened in the middle, all leaf veins are not clearly visible. **Inflorescences:** bunches, at the ends, most of the length are rakhila, flowers are numerous, flowers bloom sequentially. **Flowers:** not opening wide, bright green floral jewelry at the base and white at the ends. **Lips:** bright green, blunt ends and curved downwards.

In accordance with the opinion of Puspitaningtyas *et al.* (2003) which says that *Goodyera procera* (Ker-Gawl.) Hook. is a soil orchid with stems at ground level reaching 30-40 cm high during flowering. Melanset leaves, 13-15 x 4.5-5 cm, shiny green, petioles 4-5 cm long, bulging midrib hugging the stem. Cluster inflorescences, at the ends, most of their length are rakhila, flowers numerous (up to  $\pm 100$  florets), flowers bloom sequentially. Flowers do not open wide, bright green floral jewelry at the base and white at the end. Lips bright green, the tip is blunt and curved down. Habitat and distribution in T.N. Mt. Halimun is located on the edge of the river. Other distributions are found in Sumatra, Thailand, India, China, and Japan. Lives in forests at an altitude of 350-1,500 meters above sea level.

#### ***Plocoglottis* sp. Blume**

**Habitus:** found at an altitude of 860 meters above sea level, the soil orchid is medium-sized, thick-rooted, there are stems that are pseudo-grassed there are those that are not, those with pseudo-grasses are elongated in shape. **Leaves:** leaves are large, slightly folded elongated, the middle of the leaf is widened. **Habitat and distribution:** is a type of orchid that grows in low, dry, and shaded places.

In accordance with the opinion of Mahyar & Sadili (2003) who said that *Plocoglottis* sp. Blume is a genus of soil orchids of medium size, thick-rooted, pseudo-grassed or not. Leaves are large, slightly folded elongated. Lateral inflorescences, abundant flowering. Flowers have tugby legs and are short, polinia numbering four.

## **4. Conclusion**

Based on the results of research that has been carried out, it can be concluded that there are 13 species derived from 10 soil orchid genera found in the Baturraden Botanical Garden area. The types that have been found are *Goodyera rubicunda* (Blume) Lindl., *Calanthe pulchra* (Blume) Lindl., *Spathoglottis plicata* Blume, *Cryptostylis javanica* J.J.Sm., *Appendicula alba* Blume, *Phaius callosus* (Blume) Lindl., *Lepidogyne longifolia* Blume, *Tainia elongata* J.J.Sm., *Goodyera colorata* Blume, *Malaxis* sp. Soland. ex Sw., *Goodyera* sp. R. Br., *Goodyera procera* (Ker-Gawl.) Hook, and *Plocoglottis* sp. Blume.

## **REFERENCES**

- Agustin, D. & Widowati, H. (2015). Orchid Diversity Inventory (Orchidaceae) di Forest Resort Way Right National Safe Hall Way Kambas asa Source of Information in Conserving Nuftah Plasma. *BIOEDUCATION*, 6: 38-47.
- Darmono, D.W. (2006). *In order for the orchid to diligently bloom*. Jakarta: Penebar Swadaya.
- Comber, J.B. (1990). *Orchid of Java*. London: The Bentham-Moxon Trust Royal Botanic Gardens.
- Handoyo, F. (2010). *Orchids of Indonesia*. Jakarta: Indonesian Orchid Society.

- Liem. (2004). Bioregion-Based Management. [http://www.walhi.or.id/bioregion/nas/peng\\_basis\\_bioreg/](http://www.walhi.or.id/bioregion/nas/peng_basis_bioreg/) diakses on September 29, 2016 at 01.17 WIB.
- Mahyar, U.W., & Sadili, A. (2003). *Types of Orchids of Mount Halimun National Park*. Bogor: Biodiversity Conservation Project.
- Puspitaningtyas, D.M., Mursidawati, S., Sutrisno & Asikin, J. (2003). *Natural Orchids in the Java Island Conservation Area*. Bogor: Bogor Botanical Garden Plant Conservation Center, LIPI.