Vegetation structure and species composition of habitat types Goniothalamus macrophyllus (Blume) Hook.f. and Thomson in Lowland Forest, Kuningan Regency, West Java

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Abstract. Goniothalamus macrophyllus is a forest product that grows in lowland forests and has the potential as a medicinal plant that has not been fully utilized. The purpose of this study was to determine the vegetation structure and species composition in the area where Goniothalamus macrophyllus grows naturally. Determination of the research location using purposive sampling method. Furthermore, the sampling method in this study was encounter sampling in the lowland forests of Kuningan Regency, West Java. Goniothalamus macrophyllus was found at an altitude of 432 - 1,273 m above sea level, with a stand composition of 108 species of seedling plants, 125 species of saplings, 98 species of poles and 105 species of trees. The highest dominance at seedling level is Coffea spp, sapling level is Decapermum paniculatum, pole level is Villebrunea rubenscens, and tree level is Villebrunea rubenscens.

1. Introduction
Forests are rich in biodiversity, both wildlife and plants. The diversity of biological resources in the forest is not only limited to woody plant species, but is also covered by a variety of ground cover/undergrowth which has high species diversity [1]. The understorey is a type of basic vegetation found under forest stands, except for tree saplings. Lower plants include grasses, herbs, shrubs and ferns [2]. The genus Goniothalamus is a member of the Annonaceae family which includes about 115 species of aromatic trees and shrubs, scattered in Asia and Australia [3]. Goniothalamus has several species and among them are scattered in Thailand, Malaysia and Kalimantan [4]. The genus Goniothalamus has 50-100 species found from Southeast Asia, Malaysia, to northern tropical Australia [5]. According to [6], Goniothalamus is a forest product that has potential as a medicinal plant that has not been fully utilized.

The composition of vegetation types is the arrangement and number of individuals contained in a plant community. One of the composition and structure of vegetation is influenced by factors of place to grow in the form of climate and soil conditions [7]. The presence of vegetation in an area will provide many benefits to the surrounding environment, vegetation in the watershed plays a very important role in the ecological system related to the catchment area in the hydrological cycle, climate control both locally and globally and the conservation of diversity, especially flora. and Wallacea fauna ([8]; [7]. Each type of plant basically requires certain environmental conditions and is specific in order to grow and develop properly. Certain environmental changes and variations will have an impact
on vegetation structure and species composition. According to [9] the presence of vegetation will have a positive impact on the balance of the ecosystem, it depends on the structure and composition of the vegetation that grows in the area.

2. Methodology
The research was conducted in lowland forest, Kuningan Regency, West Java Province. Determining the location of the research using purposive sampling method, this method is a method of determining the location of the research deliberately which is considered representative. Furthermore, the sampling method in this study was encounter sampling. Plant data were collected through vegetation analysis based on the location or location of the study which had been determined based on the altitude and location where Goniothalamus macrophyllus was found. 9 sample plots were made in each location.

The size of the sub-plots for observation is determined according to the tree growth stage [10] as follows:

a. Sub plot size 2 m x 2 m for observation at seedling level (height <1.5 m);

b. Sub plot size 5 m x 5 m for stake level observations (height> 1.5 m - diameter <10 cm);

c. Sub plot size 10 m x 10 m for pile level observation (10 - 19 cm diameter); and

d. Sub plot size 20 m x 20 m for tree level observations (diameter ≥ 20 cm).

In each plot, a tree population data collection was carried out including the name of the species; measurement of diameter and height for each individual with a diameter of 10 cm and above (poles and trees); and the number of individual natural regeneration (seedlings and saplings).

3. Result and Discussion
Based on the results of vegetation analysis at an altitude of 432 - 1,273 m asl. In the lowland forests of Kuningan Regency, West Java, there were 108 species of seedling plants, 125 sapling species, 98 poles and 105 tree species. The highest number of species is generally found at an altitude of 1,175 m above sea level. and the smallest is found at an altitude of 831 m asl.

![Figure 1. Recapitulation of the number of species based on the height of the place](image)

The highest number of species at the seedling level is at an altitude of 1,273 m asl as many as 26 types, at the sapling level there are at a height of 859 m asl and 997 m asl as many as 26 types, at the pile level there are at an altitude of 1,175 m asl as many as 24 species, while at the tree level there are at an altitude of 683 m asl as many as 22 species. The lowest number of species was found at an altitude of 831 m asl as many as 2 species. Based on [11] research on lowland forest in Gunung Tilu, Kuningan Regency, the most common types are Euphorbiaceae and Moraceae family, 13 and 12 species each, 158 species of pole, 137 species of stake and 141 species of seedlings, other research in the Park National Mount Ciremai The number of understorey species was found as many as 39 species from 50 plots with a total of 147 individuals, the most common species found was Clidemia hirta (L.) D. Don. [12].
3.1 Individual density and plant dominance

a. Seedling

Based on the observation of seedling levels in the 153 sample plots in the study area, there were 108 species of seedling plants based on 5 (five) species with the highest INP value in sequence (Table 1).

| No | Altitude (m asl) | Number of Types | Total Density (Ind/ha) | Dominant Type          | Density (Ind/ha) | INP (%) |
|----|-----------------|-----------------|------------------------|------------------------|------------------|---------|
| 1  | 432             | 19              | 19.444                 | Syzygium lineatum      | 5.000            | 43.57   |
| 2  | 442             | 18              | 13.611                 | Goniothalamus          | 1.666            | 25.58   |
| 3  | 506             | 11              | 19.722                 | Aphanamiscis sp.       | 4.722            | 41.33   |
| 4  | 605             | 14              | 16.944                 | Coffea spp.            | 3.888            | 40.34   |
| 5  | 683             | 17              | 34.722                 | Coffea spp.            | 12.777           | 56.31   |
| 6  | 695             | 9               | 45.555                 | Coffea spp.            | 32.222           | 141.46  |
| 7  | 732             | 17              | 28.055                 | Ki Hayam               | 8.055            | 44.34   |
| 8  | 760             | 12              | 28.611                 | Coffea spp.            | 20.000           | 94.90   |
| 9  | 831             | 11              | 8.611                  | Murraya paniculata     | 1.666            | 42.88   |
| 10 | 859             | 18              | 22.222                 | Goniothalamus          | 1.944            | 20.51   |
| 11 | 864             | 16              | 24.722                 | Decapermum paniculatum | 8.055            | 53.27   |
| 12 | 884             | 6               | 22.500                 | Ficus involucrata      | 11.388           | 80.03   |
| 13 | 984             | 13              | 10.277                 | Helicia attenuata      | 1.666            | 37.27   |
| 14 | 997             | 12              | 27.777                 | Ficus involucrata      | 10.833           | 59      |
| 15 | 1171            | 9               | 18.888                 | Helicia attenuata      | 8.611            | 83.09   |
| 16 | 1175            | 26              | 46.111                 | Goniothalamus          | 8.888            | 29.28   |
| 17 | 1273            | 15              | 27.777                 | Helicia attenuata      | 6.388            | 41.52   |

The highest INP value at the seedling level is Coffea spp. with a value of 141.46% at an altitude of 695 m above sea level, while the lowest INP value was G. macrophyllus with a value of 20.51% at an altitude of 442 m asl. G. macrophyllus at seedling level is dominant at an altitude of 442 m asl, 859 m asl, and 1,175 m asl, with respective values of 25.58%, 20.51%, and 29.28%. G. macrophyllus seedlings can be seen in Figure 2.

b. Sapling

Based on the results of observations on 153 sample plots in the research location, there were 125 species of saplings based on 5 (five) species with the highest INP value respectively (Table 2).

| No | Altitude (m asl) | Number of Types | Total Density (Ind/ha) | Dominant Type          | Density (Ind/ha) | INP (%) |
|----|-----------------|-----------------|------------------------|------------------------|------------------|---------|
| 1  | 432             | 15              | 933                    | Decapermum paniculatum | 222              | 47.62   |
| 2  | 442             | 13              | 800                    | Platea excelsa         | 177              | 47.22   |
| 3  | 506             | 18              | 1.111                  | Syzygium lineatum      | 133              | 25.04   |

Figure 2. Seedling of Goniothalamus macrophyllus
The highest INP value at the sapling level is Decapermum paniculatum with a value of 47.62% at an altitude of 432 m asl., While the lowest INP value is Ki Surawung with a value of 18.83% at an altitude of 859 m asl. G. macrophyllus at dominant sapling level at an altitude of 864 m asl., 997 m asl., And 1,175 m asl. with respective values of 26.21%, 44.48%, and 33.69%. sapling of G. macrophyllus can be seen in Figure 3.

![Figure 3. Sapling of Goniothalamus macrophyllus](image)

c. Pole

Based on the observation at the pole level in the 153 sample plots at the research location, there were 98 species of pole level plants based on 5 (five) species with the highest IVI value respectively (Table 3).

### Table 3. Density of poles and INP in lowland forest in Kuningan Regency

| No | Altitude (m asl) | Number of Types | Total Density (Ind/ha) | Dominant Type                          | Density (Ind/ha) | INP (%) |
|----|-----------------|-----------------|------------------------|----------------------------------------|-----------------|---------|
| 1  | 432             | 8               | 355                    | Syzygium lineatum                      | 144             | 105.21  |
| 2  | 442             | 6               | 177                    | Baccaraea javanica                     | 55              | 97.80   |
| 3  | 506             | 10              | 233                    | Villebrunea rubenscens                 | 77              | 91.46   |
| 4  | 605             | 17              | 277                    | Micromelum pubescens                   | 11              | 51.11   |
| 5  | 683             | 18              | 300                    | Coffea spp.                            | 66              | 50.91   |
| 6  | 695             | 19              | 444                    | Coffea spp.                            | 155             | 81.11   |
| 7  | 732             | 14              | 255                    | Michocarpus sudaicus                   | 33              | 44.48   |
| 8  | 760             | 11              | 422                    | Swietenia macrophylla                  | 155             | 99.67   |
| 9  | 831             | 2               | 455                    | Villebrunea rubenscens                 | 400             | 248.83  |
| 10 | 859             | 17              | 633                    | Eurea javanica                         | 233             | 100.91  |
The highest INP value at the pole level was Villebrunea rubenscens with a value of 248.83%, while the lowest INP value was Maesopsis eminii with a value of 7.05. At the pole level G. macrophyllus did not dominate. Poles of G. macrophyllus can be seen in Figure 4.

![Figure 4. Poles of Goniothalamus macrophyllus](image)

**d. Trees**

Based on the observation at the pole level in the 153 sample plots in the research location, there were 105 tree species based on 5 species with the highest INP value in sequence (Table 4).

| No | Altitude (m asl) | Number of Types | Total Density (Ind/ha) | Dominant Type | Density (Ind/ha) | INP (%) |
|----|------------------|-----------------|------------------------|---------------|-----------------|---------|
| 11 | 864              | 12              | 466                    | *Eurea javanica* | 88              | 59,36   |
| 12 | 884              | 9               | 177                    | *Coffea spp.*  | 77              | 117,80  |
| 13 | 984              | 14              | 355                    | *Antidesma montanum* | 122          | 89,89   |
| 14 | 997              | 13              | 400                    | *Kalapa Ciung* | 88              | 60,23   |
| 15 | 1171             | 10              | 244                    | *Medinilla speciosa* | 77         | 69,30   |
| 16 | 1175             | 24              | 644                    | *Cratoxylon clandestinum* | 133       | 57,94   |
| 17 | 1273             | 17              | 455                    | *Cratoxylon clandestinum* | 100       | 66,17   |

The highest INP value at the tree level was Villebrunea rubenscens with a value of 119.72%, while the lowest INP value was Ficus elastica with a value of 39.74%. G. macrophyllus was not found at the tree level. G. macrophyllus is a shrub, shrub or small tree that can grow up to 8 meters [13]. Other
studies have also demonstrated that seedlings are the most common growth stage relative to saplings, poles, and trees for G. macrophyllus [14], and this age structure pattern is common in plants. Also, it is important to note the very low proportion of poles relative to seedlings and saplings in which among all sampling sites, poles were only detected at two locations, one at 997 m in elevation and the other at 1,175 m [15].

The structure and composition of plant vegetation are influenced by other interacting ecosystem components, so that vegetation that grows naturally is the result of the interaction of various environmental factors. The vegetation structure is an organization of individuals in space that forms a stand [16]. Meanwhile, forest composition is the types of constituents that occupy vegetation in a place [17]. Moraceae is one of the dominant families in the forest area of Gunung Tilu, Kuningan Regency which is one of the lowland forests [11]. While in the rehabilitation zone of Mount Ciremai National Park shows that Kaliandra dominates germination because trees today are found in many research sites, both in the bush and in pine stands [18].

4. Conclusion
This study aims to look at the plants that grow and dominate the natural habitat of Goniothalamus macrophyllus. Determination of the research location using purposive sampling method. Furthermore, the sampling method in this study was encounter - sampling. in the lowland forests of Kuningan Regency, West Java. Goniothalamus macrophyllus was found at an altitude of 432 - 1,273 m above sea level, with a stand composition of 108 species of seedling plants, 125 species of saplings, 98 species of poles and 105 species of trees. The highest dominance at seedling level is Coffea spp, sapling level is Decapermum paniculatum, pole level is Villebrunea rubenscens, and tree level is Villebrunea rubenscens.

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