

Diversity and Biopotential of *Neesia altissima* in Indonesia

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Abstract. The *Neesia altissima* (Blume) is an evergreen tree that may exceed the height of 40 m, in the old specimens in nature, with erect trunk, of up to more than 1.2 m of diameter, with slightly grooved bark of greyish brown colour. In this study, we identified diversity and biopotential of *Neesia altissima* Bl. in Indonesia. *Neesia altissima* Bl. is a tree that grows up to + 40 m and distributed primarily in the primary rainforests of Malaysia and Indonesia (Sumatera, Borneo, and Java islands). In Indonesia, this endemic plant is used medicinally for treatment of gonorrhea, diuretic and diarrhea. The fruits are locally utilized in the traditional medicine as diuretics and together with the leaves, in treating the gonorrhea. Because the plant having such an important medicinal value and having endangered status, so studies on microbial endophytes from *N. altissima* in relation to discovery of alternative secondary metabolites are very important. Therefore, it is important to explore endophytic bacteria from endemic medicinal plant such as *N. altissima*, and screened their potential in producing antimicrobial compounds. The pharmacological potential of genus *Neesia* especially *Neesia altissima* Bl. in Indonesia is as of yet unexplored.

Keywords: Endemic, *Neesia altissima*, medicinal, secondary metabolites

1. Introduction

Neesia altissima is a genus of *Neesia* and *Neesia* was placed in Tracheophyta division, Magnoliopsida class, Malvales ordo, and Bombacaceae family. Currently, *Neesia* genus placed in Helicteroideae subfamily and Durioneae tribe [1]. *Neesia altissima* (Bl.) Bl. is an evergreen tree, tall which are known and exploited as a source of timber. The measurement of *Neesia altissima* may exceed the height of 40 m, in the old specimens in nature, with erect trunk, of up to more than 1.2 m of diameter, with slightly grooved bark of greyish brown colour and sometimes with short thick buttresses [2].

The distribution of *Neesia* is confined to South East Asia, they are western Indonesia, Malaya, Thailand, Singapore, and possibly Burma. *Neesia altissima* is one of indigenous plant in Indonesia that found in Borneo, Java, Sumatra. That plant is grown in primary rainforest, often along streams or in freshwater swamps while is found at altitudes between 100 m and 1800 m [2].

The species is native to Borneo, Java, Peninsular Malaysia, Singapore, Sumatra and Thailand where it grows in the pluvial primary forests, often along the water streams banks, up to about 1800 m of altitude. *Neesia altissima* is one of local plants that have many function for natural medicinal. Not many people knows about the advantage and contain of *N. altissima*. The aims of this study is identify diversity and biopotential of *Neesia altissima* Bl. in Indonesia.

2. Method

The samples are plant part of *Neesia altissima*. They were obtained from National Park of Halimun-Salak Mount, West Java province, Indonesia. The plant were identified at Botanical Division, Research Center for Biology, Indonesian Institute of Sciences, Cibinong. The secondary literature is used to authenticate this study.

3. Result and Discussion

Neesia altissima (Blume) Blume have synonyms name is *Neesia ambigua* Becc. and vernacular name is Durian (trade name for wood of several Bombacaceae (genera). In Indonesia, *N. altissima* are known bengang (general), ki bengang (Sundanese), and Durian hantu or sibengang (Sumatra). The name durian is used too for both *Durio* and *Neesia* in Timber trade [2].

Neesia is found scattered or locally frequent in evergreen, primary forest, in freshwater swamps up to 1800 m altitude and often along streams. The species occur on a wide variety of soils including shallow peat soils, damp sandy soils like groundwater podzols and gleyed clayrich soils. In Indonesia, the species *N. altissima* (non Bl.) F. Vill. is usually observed on the inner edges of the mangrove forest, often reaching the margins and bordering the tidal streams. *N. altissima* (non Bl.) F. Vill. is one of true mangrove species [3, 4, 5].

About origin and geographic distribution of *N. altissima*. It comprises 8 species and occurs in Peninsular Malaysia, Peninsular Thailand, Java, Sumatra, and Borneo. There are 7 species in Borneo while in Java, *N. altissima* flowers from February to July. The distribution of *N. altissima* was helped orangutans skills. The orangutans skills is to extract the nutritious seeds from *Neesia* fruits between Gunung Palung on Borneo and Suaq Balimbing on Sumatra. The distribution map of *Neesia* tool use in Sumatran swamps [6].

Species of *Neesia* are exploited as a source of timber. The timber is light and is suitable for light construction, cheap furniture and fitting, flooring, planking, wooden shoes, floats, low grade coffins, sliced veneer and plywood. The wood, commercially known as “durian”, light and easy to work. The disadvantages of wood are moderately soft but fairly strong; seasons well with negligible checking and warping. It fairly durable for interior work, though not lasting when exposed to the weather. The plant wood has potential for pulp and paper production, owing to the high holocellulose and low lignin content. Another using is for household utensils, carvings and inlays. It is utilized in the construction of the dwellings for the inner parts, not being too resistant to the atmospheric agents and to the xylophagous insects, for floors, frames and pannellings, is also employed in the realization of furniture, musical instruments, handicrafts of common use and in the fabrication of the plywood.

In Indonesia, *Neesia altissima* Bl. is an endemic plant that is used medicinally for treatment of gonorrhea, diuretic and diarrhea [7]. The fruits are locally utilized in the traditional medicine as diuretics and, together with the leaves in treating the gonorrhea. Although having such an important medicinal value, studies on secondary metabolites from *N. altissima* in relation to discovery of new bioactive compounds are lacking. Therefore, it is important to explore secondary metabolites from endemic medicinal plant such as *N. altissima*, and screened their potential in producing antimicrobial compounds.

Neesia altissima plant (Figure 1) were obtained at National Park of Halimun-Salak, West Java province in Indonesia. Figure 2 shows the location of *N. altissima* plant that getting for samples. The samples get from various plant parts of *N. altissima*, such as leaves, stems, roots, and seeds.



Figure 1. *Neesia altissima* plant

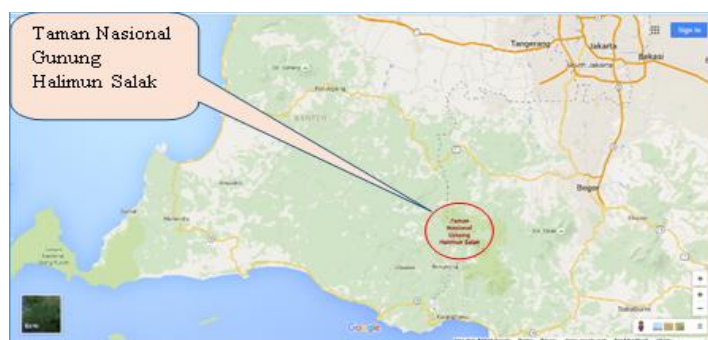
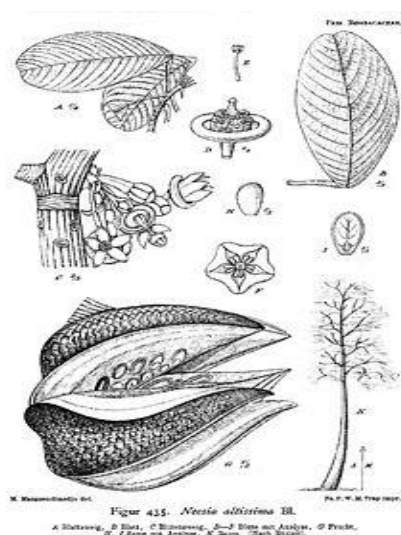
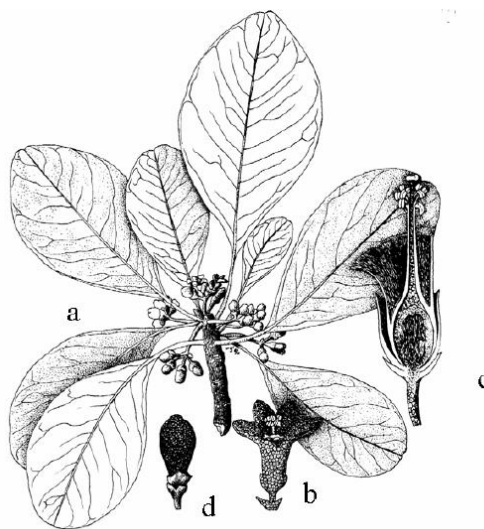


Figure 2. The location of *Neesia altissima* plant

Figure 3 describes the whole of the plant. The plant of *Neesia altissima* has the roots that spread along the surface of the soil. It may bear knobby pneumatophores. It has twigs with round leaf scars and has 6-9 leaves by 2-4 cm. The morphology of leaves are elliptic lanceolate, scaly on both sides, have a rounded point and a narrow base. The flower clusters are crowded and occur in leaf and stem axils, on stalks. The length of stalks are 1-2 mm. It's short. The calyx is bell-shaped, with 2-5 lobes an irregular limbs. The corolla is scaly, covered with short hairs, white, with 5 petals and 5 stamens that are united at the base. The flowers of *N. altissima* plant are about 5-6 mm across. *Neesia altissima* has the round fruit that is a small, pear-shaped capsule, 1-1.5 cm long, scaly, and has a persistent calyx and epicalyx. The fruit contains both (occasionally 3 or 4), calyx and epicalyx with the length are 9 mm, the seeds densely like woolly. The fruit of *N. altissima* is an ovoid, woody, loculicidally with 5-valved capsule. That fruit has a densely muricate exterior and a densely hirsute interior. The morphology of seeds are oblong, arillate, and albuminous, with flat and foliaceous cotyledons. Differs from *Campostemon schultzei* by the presence of small, scurfy scales on both sides of the leaves. In *Campostemon schultzei* are absent of both sides of the leaves. According to Bakhuizen van den Brink, the two species (elliptic in *Campostemon schultzei*, obovate-oblong to lanceolate in *Campostemon philippinense*) are differ in leaf shape, but they both have a similar range in leaf size. Tomlinson [4], said that bark of this species is scaly and without fissures.



(a)



(b)

Figure 3. The plant parts of *N. altissima* (Bl.) Bl. (a), the plant parts of *N. altissima* (non Bl.) F. Vill (b).

In the research before, species *N. altissima* contain many endophytes bacteria. A total 185 endophytic bacteria were isolated from leaves (104 or 56.21%), roots (30 or 16.21%), and stem barks (51 or 27.56%) of *N. altissima* [8]. The microecology of microbial endophytes indicates that they occupy intercellular spaces of plants [9]. This showed that majority of endophytic bacteria were distributed inside the leaf tissue rather than other organs of *N. altissima*.

Discovery of new secondary metabolites to combat resistant pathogens to existing medicines becomes important and priority [10]. Endemic medicinal plants have emerged as potential candidate as sources of novel secondary metabolites discovery due to their unique properties of secondary metabolites from plant [11, 12]. Endophytic bacteria that found *N. altissima* tissues indicates that it is important to explore endophytic bacteria from endemic medicinal plant such as *N. altissima*, and screened their potential in producing antimicrobial compounds.

4. Conclusion

In Indonesia, *Neesia altissima* is an endemic plant that the plant part of it is used medicinally for treatment of gonorrhea, diuretic and diarrhea. The species *N. altissima* contain many endophytes bacteria too. This finding highlights potential prospects from one of medicinal plants that endemic for the inventory of novel bioactive compounds.

5. References

- [1] Nyffeler R and Baum DA. 2001. *Org. Divers. Evol.* **1** 165
- [2] Chung RCK .1998. In: M.S.M. Sosef, L.T. Hong & S. Prawirohatmodjo (eds.). *Backhuy Publisher, Leiden.* **394**
- [3] Brink Bvd .1924. Group G: Trees & Shrubs. Part 2: Descriptions-Trees & shrubs. *Mangrove Guidebook for Southeast Asia* **547**
- [4] Tomlinson .1986. Group G: Trees & Shrubs. Part 2: Descriptions-Trees & shrubs. *Mangrove Guidebook for Southeast Asia* **547**
- [5] Aragones *et al.*1998. Group G: Trees & Shrubs. Part 2: Descriptions-Trees & shrubs. *Mangrove Guidebook for Southeast Asia* **547**
- [6] Schaik CPV 2001 *American J. of Physical Anthropol.* **1045**
- [7] Rahayu M, Harada K and Muzakkir A 2002 *Prosiding Simposium Nasional II Tumbuhan Obat dan Aromatik.*
- [8] Pratiwi RH, Hidayat I, Hanafi M, Mangunwardoyo W 2016 *Malaysian J. of Microbiol.* **12(4)** 300
- [9] Bacon W and Hinton M 2002 *Biologic. Control* **23** 274 Strobel G and Daisy B 2003 *Microbiol. Mol. Biol. Rev.* **67** 491
- [10] Castillo UF, et.al. 2006 *FEMS Microbiol. Let.* **255** 296
- [11] Nimnoi P and Pongslip N. 2009 *Research J. Agricultural and Biological Sci.* **5(1)** 29