



Morphological Characteristics of *Nepenthes* in Peat Swamp Area of Tulung Selapan, South Sumatera

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Abstract :

This study is aimed to recognise the morphological characteristics of *Nepenthes mirabilis* and *Nepenthes gracilis* in peat swamp area including stem, leaf, tendril, pitcher, flower, fruit, and seed. This study has been conducted in January until April 2019, located in Petaling Village Tulung Selapan Sub-District, Ogan Komering Ilir, South Sumatera. This study uses an exploratory method and the observation sample using the method of random plot is chosen by purposive sampling. Parameters observed morphological characteristics of *Nepenthes* include stems, leaves, tendrils, pitcher, flower, and fruit, as well as measurement of environmental factors. Based on the study, the researcher obtained two types of *Nepenthes* which are *Nepenthes mirabilis* and *Nepenthes gracilis* in peat swamp area of Petaling Village Tulung Selapan Sub-District, Ogan Komering Ilir. *Nepenthes mirabilis* has a teres stem, leaves that in the form of oblong to lanceolate, has a petiolate, the edge of the leaves is flat covered by smoothy hair, thick peristome in size of 0,4-0,5 cm. Meanwhile stem *Nepenthes gracilis* has triangular stem, leaves in formed of lanceolate, sessile, flat edge of leaves, thin peristome in size of 0,1-0,2 cm. The pitcher shape of *Nepenthes mirabilis* and *Nepenthes gracilis* are cylindrical, infundibulate, and waist. The flower of *Nepenthes mirabilis* and *Nepenthes gracilis* are compound in type of raceme inflorescences. The fruit is formed as capsula, has four lobed, and contains numerous seeds. The seed is spindle-like and white colored.

Keywords: *Nepenthes mirabilis*, *Nepenthes gracilis*, Peat swamp

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1. Introduction

Nepenthes is a type of carnivorous plants. This plant has a pitchers in leaf apex [12]. Pitcher of *Nepenthes* vary greatly from shape, size, motif, and color [16]. The distribution of *Nepenthes* is restricted to but scattered throughout the tropics, with the centre of distribution in Borneo, Sumatra, Peninsular Malaysia, Philipphines, and New Guinea [1]. Recorded 160 species of *Nepenthes* [22] and 68 species are located in Indonesia including 59 species endemic [13].

Conservation status of *Nepenthes* according to Convention on International Trade In Endangered Spesies of Wild Flora and Fauna, in apendiks II except *Nepenthes rajah* dan *Nepenthes khasiana* in apendiks I [3]. While according to red list International Union for the Conservation of Nature as many as 9 critical species, 16 endangered, 38 vurnerable, 11 near threatened, 25 low risk,

and 5 data defisient [9]. In Indonesian, *Nepenthes* protected by UU No. 05 Tahun 1990 on the conservation of natural resources and ecosystems, and PP No. 07 Tahun 1999 regarding the preservation of plant dan animal species [19].

Generally *Nepenthes* living in marginal soils and poor nutrients [13] with low phosphorus, nitrogen, and potassium and acidic environmental conditions [14]. One of the *Nepenthes* habitats is peat swamp. Peat swamp of permanently flooded land with low pH. Several types of *Nepenthes* can grow in peat swamp habitats as [11] in [6] research results in peat swamp habitats, Kalimantan Tengah were found *Nepenthes rafflesiana*, *Nepenthes gracilis*, *Nepenthes ampullaria*, *Nepenthes mirabilis*, and *Nepenthes reinwardtiana*.

Petaling village is in one of the villages that has peat swamp area, located in Tulung Selapan Sub-District, Ogan

Komerling Ilir, Sumatera Selatan province. Peat swamp overgrown with several types of plants among them *Melaleuca leucadendron*, *Melastoma malabaticum*, *Gleichenia linearis*, *Lepironia mucronata*, and as well as local community information there is a well-grown *Nepenthes* in the region. However, there has been no publication of the type of *Nepenthes* in Petaling Village. So, research on *Nepenthes* in Petaling Village needs to be done to complete data of the *Nepenthes* in Sumatera Selatan.

This study is aimed to recognise the morphological characteristics of *Nepenthes mirabilis* and *Nepenthes gracilis* in peat swamp area including stem, leaf, tendrils, pitcher, flower, fruit, and seed. The significances of this study are expected to complement the data of the types of *Nepenthes* found in South Sumatera, particularly in peat swamp area of Petaling Village, and can be used as a reference to identify *Nepenthes* that lives in peat swamps area. In addition, the results of this study are expected to be used as a *Nepenthes* basis conservation strategy that grows in the peat swamp area.

2. Materials and Methods

This study uses an exploratory method and the observation sample using the method of random plot is chosen by purposive sampling [4]. The size of plots used 2 x 2 meters of 5 plots and distance of each plot 10 m. *Nepenthes* is documented using a camera and identified by using libraries [2], [7], [10], [8].

This study has been conducted in January until April 2019, located in Petaling Village Tulung Selapan Sub-District, Ogan Komerling Ilir, South Sumatera. This area is a lowland area with an ecosystem of peat swamp forest. Tools used during research such as work stationery, munsell color, Global Positioning System (GPS), camera, lux meter, ruler, soil tester, tally sheet, thermometer, dan thermohyrometer.

Morphological Observations

Any type of *Nepenthes* that is found in the observation plot was calculated, recorded and observed through the morphology of stem, leaf, tendrils, pitcher, flower, fruit, and seed.

Observation of Plant Vegetation Around *Nepenthes*

Plant vegetation around *Nepenthes* is documented, then observed and determined the type of plant. Measurement of Environmental Factors The measurement of environmental factors is carried out simultaneously with *Nepenthes* observations. Environmental factors measured include soil temperature, light intensity, soil humidity and pH, air temperature and humidity, and altitude. Thereafter, soil samples were taken to determine the soil texture and total N.

Analysis and Presentation of Data

The observed data were analyzed descriptively and presented in the form of tables and figures.

3. Results and Discussion

Based on the study, the researcher obtained two types of *Nepenthes* which are *Nepenthes mirabilis* and *Nepenthes gracilis*.

Table 1. Species of *Nepenthes* in Peat Swamp Area of Petaling Village

No	Species	Plot				
		I	II	III	IV	V
1.	<i>Nepenthes mirabilis</i>	+	-	+	-	+
2.	<i>Nepenthes gracilis</i>	-	+	-	+	+

Abbreviations : (+) found (-) not found

Table 1 shows on plot 5 found *Nepenthes mirabilis* and *Nepenthes gracilis* grow side by side. According to [15], growth and spreading of seeds of *Nepenthes* are spatial that is limited to certain places and rarely in large numbers because the response of seeds to environmental factors depending on the type. Such as, seed of *Nepenthes* need substrate, humidity, pH, and temperature suitable for growth.

Based on observations morphological characteristics of *Nepenthes*, made simple determination keys to recognize species *Nepenthes* in peat swamp area Petaling Village:

- 1.a. The stem teres, leaves has a petiolate, the edge of the leaves is flat covered by smoothy hair, thick peristome in size of 0,4-0,5 cm broad.....*Nepenthes mirabilis*
- b. The stem shape are triangular, leaves has a petiolate, the edge of the leaves is flat, peristome thin and 0,1-0,2 cm broad.....*Nepenthes gracilis*

Nepenthes mirabilis

Nepenthes mirabilis has a teres stem, 0,6-3 cm and green yellow and red color, Lamina oblongus to lanceolate (Figure 1.a), 12-25 cm long, 2,3-6,5 cm broad, has a petiolate and the length 3,2-7 cm, margin integer, apex acute, base attenuate, and the edge of the leaves is flat covered by smoothy hair. Tendrils 7,4-18 cm long. The number of leaves a individual ranges from 7-48. Lamina adaxial and abaxial red, yellowish green, reddish green. As well as on petiolate red, reddish yellow, and yellowish green. According to [18], the stem shape are cylindrical, the lamina *Nepenthes mirabilis* lanceolate, blackish red-greenish yellow, has a petiolate, apex acute, and margin flat with hairs.

The pitcher shape of *Nepenthes mirabilis* are cylindrical, infundibulate, and waist, with lid shape are

(Figure 1.b) orbicularis and ovatus, while mouth shape are orbicularis and cordatus. The number of pitchers a individual range from 8-45 pitcher. Pitchers red, reddish green, and yellowish green. Lower pitchers has a wing, while upper pitcher without wing. According to [5], wings of upper pitcher does not develop only a prominent line.

Peristome 0,4-0,5 cm broad, yellow, red, and green-yellowish green. Teeth of peristome 104-218. According to [7], peristome of *Nepenthes mirabilis* thick, $\pm 0,3$ cm broad, and teeth of peristom pronounced.

The flower of *Nepenthes mirabilis* are compound in type of raceme inflorescences. Pedunculus male

flowers 33 cm long, rachis 43,4 cm long, and pedicellus 1-2,3 cm long, while pedunculus female flowers 27,5 cm long, rachis 33,5 cm long, and pedicellus 1,1-2,3 cm long. The number of flowers of raceme range from 110-193. Tepal orbicularis (Gambar 1.g), red, and 4. Filament form the column dan anther at the end (Gambar 1.h-i). Anther is arranged in 3 circles and the number is 32. Stigma one (Gambar 1.e), ovary superus and has four lobed. The seed is spindle-like and white colored. According to [21], flowers of *Nepenthes* single, dioceus, and aktinomorf. Ovary superus, has a 4 lobed, and contains numerous seeds.

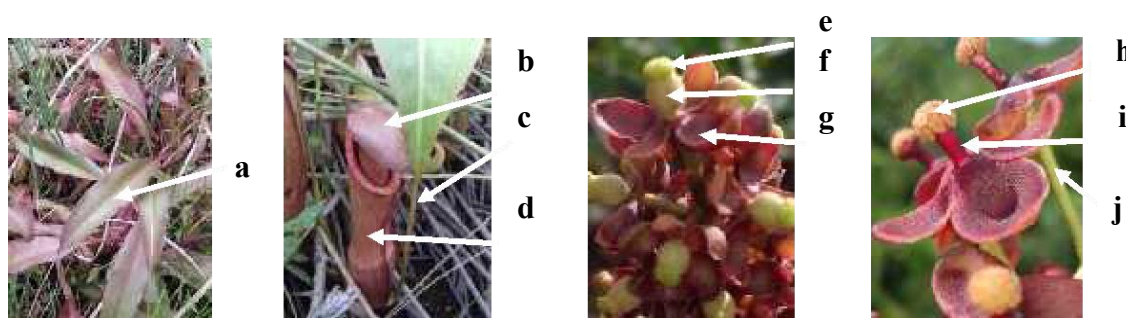


Figure 1. Morphology *Nepenthes mirabilis*, a) leaves; b) lid; c) tendril; d) pitcher; e) stigma; f) ovary; g) tepal; h) anther; i) column; dan j) pedicellus

The fruit is formed as *capsula*, yellowish green, and 1,4-3 cm long. Fruit has four lobed, and contains numerous seeds. The seed is spindle-like, white colored, 0,3 cm long, marginal, and the number range 340 seeds. Accordings to [8], the fruit is formed as capsula, slender, and both ends narrow. The seed is spindle-like and has a little endosperm.

Nepenthes mirabilis grow in the air temperature range 27,5-32°C, the soil temperature 26-27°C, the soil humidity above 80%, the air humidity 80-81%, pH 6-6,2, and light intensity 8657-9083 lux. According to [16], the optimum temperature for *Nepenthes* at noon 20-35°C and evening 18-21°C, while optimum humidity for *Nepenthes* 60%-80%.

Several types of plants that grow around *Nepenthes mirabilis* are *Digitaria* sp., *Melastoma malabatricum*, *Eleocharis dulcis*, *Isachne pulchella*, *Scleria sumatrensis*, *Gleichenia linearis*. Based on research results [14], the types of plants that grow around *Nepenthes mirabilis* are *Scleria sumatrensis* and *Melaleuca leucadendron*. According to Astuti *et al.* (2012), *Nepenthes mirabilis* found growing together *Melastoma* sp. and *Gleichenia* sp.

Nepenthes gracilis

Nepenthes gracilis has a *triangular* stem, 0,8-3 cm, and up to 1,98 m high. Stem yellowish green and red colored. According to [20], the stem shape of *Nepenthes gracilis* are *triangular*, grow up, and climbing.

The lamina shape are lanceolate (Figure 2.a), 10,2-25 cm long, 1,8-3,2 cm broad has not a petiolate, margin flat, apex acute, and base attenuate. The tendrils 7,5-21 cm long. The number of leaves a individual range from 13-30. Lamina adaxial and abaxial yellowish green colored.

The pitcher shape of *Nepenthes gracilis* are cylindrical, infundibulate, and waist. High of pitchers 5,2-14,5 cm and diameter of mouth 1,1-2,6 cm. The number of pitcher a individual range from 10-23. The lid shape of pitcher are *orbicularis*, *cordatus*, and *ovatus*, while mouth of pitcher are *obovatus* and *cordatus*. Pitcher yellowish green, red, reddish yellow, and reddish green colored, while lid yellowish green, red, red with middle yellowish green, and yellowish green. Lower pitter has a wings and upper pitcher without wings. According to [8], wings are found in lower pitchers, while in upper pitcher the wings are reduced.

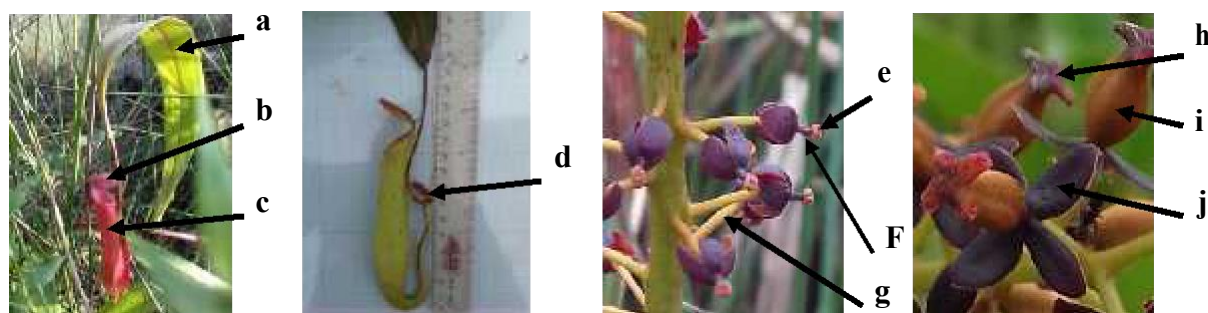


Figure 2. Morphology *Nepenthes gracilis*, a) leaves; b) lid; c) pitcher; d) tendril; e) anther; f) column; g) pedicellus; h) stigma; i) ovary; dan j) tepal

Peristome thin, 0,1-0,2 cm broad, and red, reddish yellow, yellowish green colored. Teeth of peristome 114-240 in each bag. The flower of *Nepenthes mirabilis* are compound in type of raceme inflorescences. According to [8], peristome of *Nepenthes gracilis* thin and usually green colored. Based on research results [17], peristome of *Nepenthes gracilis* \pm 0,2 cm broad and peristome teeth are usually seen only when celled.

Male flowers, pedunculus 8 cm long, rachis 37 cm long, and pedicellus 0,5-2 cm long, while in the female flowers pedunculus 22,8 cm long, rachis 30,2 cm long, and pedicellus 0,6-2 cm long. The number of flowers of raceme range from 94-183. Tepal orbicularis to oblongus, red colored. Filament form the column and anther at the end (Figure 2.e-f). Anther is arranged in 3 circles and the number is 24 and yellow colored. Stigma one (Figure 2.h), ovary superus, and has a 4 lobed.

Nepenthes gracilis grow in the air temperature range 27,5-30,7°C, the soil temperature 26-27°C, the soil humidity above 80%, the air humidity 80-81%, pH 5-6,6, and light intensity 80097-9083 lux. According to [10], *Nepenthes* can grow at 70%-95% humidity and a *Nepenthes* has a different light intensity. As *Nepenthes gracilis* and *Nepenthes mirabilis* can grow well in full sun.

Types of plants that grow around *Nepenthes gracilis* are *Melastoma malabatricum*, *Melaleuca leucadendron*, *Eleocharis dulcis*, *Gleichenia linearis*, *Scleria sumatrensis*, *Isachne pulchella*, *Leersia hexandra*. *Nepenthes gracilis* climbing in *Gleichenia linearis*, *Melastoma malabatricum*, *Melaleuca leucadendron*, and *Eleocharis dulcis*. Based on research results Astuti et al. (2012), *Nepenthes gracilis* found growing together *Gleichenia linearis*. According to Sartika et al. (2017), *Nepenthes gracilis* found climbing in *Gleichenia linearis* for body support.

4. Conclusion

1. *Nepenthes mirabilis* has a teres stem, the lamina shape are oblongus to lanceolate, has a petiolate, the edge of the leaves is flat covered by smoothy hair, apex acute, and base attenuate.
2. *Nepenthes gracilis* has a triangular stem, the lamina shape are lanceolate, has not a petiolate, margin flat, apex acute, and base attenuate.
3. Tendril position of *Nepenthes mirabilis* and *Nepenthes gracilis* located in front, side, and back pitcher.
4. *Nepenthes mirabilis* and *Nepenthes gracilis* has a three shape of pithers are cylindrical, infundibulate, and waist.
5. Peristome of *Nepenthes mirabilis* thicker (0,4-0,5 cm) more than peristome of *Nepenthes gracilis* (0,1-0,2 cm).
6. Pedunculus of *Nepenthes mirabilis* flower longer more than pedunculus of *Nepenthes gracilis* flower.

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